

Technologies and Services in the Light of Demographic Changes

Trend Report 2008/2009

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Preface

Demographic change has become a recent buzzword for the ongoing and upcoming challenges of a society that is increasingly changing in terms of its social integrity. Besides changes with respect to migration, population aging will become a dominant factor in demographic change. According to DeStatis and Eurostat the mean-age in Europe is expected to grow from age 39 in 2007 to 43 in 2020 with a fertility rate that is already below replacement levels in many EU member states, i.e. the population and especially the share of young people is shrinking.

Although we have detailed knowledge about the upcoming challenges, little is known about possible solutions. This report reflects interdisciplinary futures research conducted by 20 students at the Center for Digital Technology and Management (CDTM) in summer 2008. It is based on a thorough scenario analysis which enabled the authors of the report to not only shed light on possible future scenarios, but also to come up with innovative ideas of products and services that might help us cope with demographic changes.

The report contains two parts: The first part discusses political, economic, social, technological and legal trends that will have impact on future scenarios in the field. Based on this trend analysis, the second part offers a series of articles that discuss scenarios for 2020 in order to understand the framework for future innovations, namely a personal vital data monitor, concepts for an intelligent home, a health data platform, a social health community, and various health and lifestyle services.

We invite you to read through the report and use it as an inspiration to take an active role for pushing forward technologies and services that are useful for our changing society.

„However good our futures research may be, we shall never be able to escape from the ultimate dilemma that all our knowledge is about the past, and all our decisions are about the future” (Ian Wilson)

Munich, Fall 2008

Patrick Nepper
CDTM Management Team

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The entire trend report was written by CDTM students in 2008. The papers compiled here do not claim to be scientifically accurate in every case; they are rather meant to give a structured and broad overview of trends relevant in the context of technologies and services for the support of elderly people.

The work is also a predecessor for major research activities for which CDTM has set up a project consortium (“CrossGeneration”) together with dedicated companies and research institutions. Working on a project grant by the Federal Ministry for Education and Research (BMBF) supported by the project execution department (“Projektträger”) at the German Aerospace Center (DLR), the consortium will conduct research that aims at providing sensor-based services for improving the health and independence of elderly people.

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Abbreviations

BAN	Body Area Networks
CMOS	Complementary Metal-Oxide Semiconductor
CT	Computed Tomography
DNA	Desoxyribonucleic Acid
DOS	Denial of Service
eGK	Elektronische Gesundheitskarte
EHC	Electronic Health Card
EHR	Electronic Health Record
EU	European Union
FP7	Seventh Framework Programme
GDP	Gross Domestic Product
GP	General Practitioner
GPS	Global Positioning System
GSM	Global System for Mobile Communications
HCI	Human-Computer Interaction
IC	Integrated Circuits
ICT	Information and Communication Technology
ID	Identification
IT	Information Technology
MEMS	Microelectomechanical Systems
PB	Patient Box
PHR	Personal Health Record
SOA	Service-Oriented Architecture
SWOT	Strengths, Weaknesses, Opportunities, Threats
UMTS	Universal Mobile Telecommunications System

VoIP	Voice-over-IP
VPN	Virtual Private Network
WLAN	Wireless Local Area Network
WWII	World War II

Part I

Trends

1

Chapter 1

Technology Supporting Elderly's Health Care and Lifestyle

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An aging population in Germany poses many challenges to the society in terms of providing adequate and quality health care to the Generation 50plus. It is interesting to see how technology can be employed to tackle these challenges and enhance the quality of life of an elderly person. Through advancement in sensor, micro system and mobile communication technology, solutions can be found to some of these challenges. Thus, by exploiting the power of technology in the daily life of an elderly person, an independent and active lifestyle can be fostered.

1.1 Introduction

The demographic structure in Germany is changing and this change is certain and unavoidable. Like many other industrialized nations in western Europe, Germany faces the problem of a decreasing birth rate in the country. Coupled with an expected increase in life expectancy among the elderly people, this situation poses many challenges to the society in terms of providing health care services and products for this particular population segment. In our paper, we attempt to look at these challenges from a technological point of view. This is because we recognize that many challenges facing a fast graying society can be solved using technological solutions. We are particularly interested in the roles emerging technologies like sensor technology, micro system and mobile communication might play in the near future (3-5 years time) for the Generation 50plus in Germany. The Generation 50plus in Germany is an important market to look at because they will make up a sizable percentage of the population in the near future. With the advent of the Internet age and a relatively tech-savvy Generation 50plus, many opportunities exist as economic activities targeting this particular group has just picked up pace recently. In the following chapters of our paper, we will first look at the existing technological devices available in the market that are relevant for the Generation 50plus. These devices are meant to support the health care and lifestyle of the elderly and can be found in both institutions for the elderly like hospitals, nursing homes, residence for seniors, as well as in the private homes of the elderly. Then we will look at innovative and cutting edge technological products that are currently in their development phase or are still not widely used and known by the Generation 50plus here in Germany. Finally we will investigate the technology behind these products and also look at some interesting up and coming technology like Web 2.0, GPS systems, and new software systems that might become important in the near future (3-5 years) for the market.

1.2 State of the Art Devices supporting Elderly's Health Care and Lifestyle

We will be looking at some selected technological devices used normally in hospitals as these devices tend to be more complex and demonstrate greater accuracy in the measurement of physiological parameters. With more elderly people choosing to live independently at home and hospitals stays becoming shorter these days, there is a need to develop health monitoring equipments that are designed for home use. Hence, in the following section, we shall first look at two equipments that might eventually find their way into the homes of the elderly and in the later sections concentrate on a couple of devices that

are already in use by the elderly at home.

1.2.1 Devices in Hospitals and Nursing Homes

1.2.1.1 Electrocardiogram Monitor

An Electrocardiogram (ECG) monitor allows nurses, doctors and trained carers to monitor the electrical activities of a patient's heart. The ECG measures your heart's electrical signal as it triggers each of the four heart chambers to pump. Electrodes that are attached to the surface of a patient's skin will then detect the electrical signals and transmits these signals to a machine that plots out the graph of the electrical signals. Through ECG monitoring, a doctor can then effectively detect a heart attack that is happening now or has happened in the past.

1.2.1.2 Blood Pressure Monitoring Devices

Hypertension is a common health problem in the elderly. Hence there is a huge market for blood pressure monitoring devices both in the clinical medicine as well as among the public. Typical monitoring devices used by doctors in hospitals include manual sphygmomanometer, which are used in conjunction with a stethoscope, and digital automated sphygmomanometers. The accuracy of such devices used in hospitals tend to be more accurate than those meant for the public. [29]

1.2.2 Devices for Private Households

1.2.2.1 Devices Assisting Elderly in Need of Care

Care services given to elderly people in need of regular care are still mostly based on human to human interactions today. With demographic changes, the demand for care services is expected to increase significantly. [14] Hence technology assisted care services will play an important role in the near future. At the moment, professional caregivers and carers have at their disposal a wide array of devices on the market to help them render care services more efficiently. For instance, lifting equipments such as stair lifts and bathtub lifts can be installed in handicap friendly homes of handicapped elderly people. Electrical wheelchairs are also another well-known form of aid that give elderly people, who are unable to walk anymore, a certain degree of mobility without physically challenging the caregivers too heavily. However, due to the high cost associated with such devices today, they are not readily available for everybody who needs them. The necessity to make home care less laborious thus requires progresses in the technological field to produce more advanced and cost effective devices. In addition to physical aids in care activities, other useful devices for caregivers are emergency buttons. Such buttons are carried

by the person as a necklace or a watch and will forward an emergency signal wireless to a base station in the same house or to the mobile phone of a caregiver, relative, or central emergency institution.[13] Although such a set up is generally accepted as being useful, they have several shortcomings. For example, when an elderly person suddenly becomes incapable of movements or survival during an emergency situations depends on the access to real time physiological data. We will discuss in the later sections possible solutions to such shortcomings in the form of continuous remote monitoring of key vital parameters, video monitoring, fall sensors and intelligent surroundings.

1.2.2.2 Equipment Supporting an Active and Independent Lifestyle for the Elderly

As the number of elderly people living in single household increases, safety issues in the homes of elderly become just as important as medical issues. The market for smoke detectors, motion detectors and alarm systems are well established. Such devices are becoming more important as a growing number of elderly people are living alone [32] and they need to feel safe in their home surroundings. Elderly people are used to using standard measurement devices such as blood pressure meters [10], weighing machines and blood glucose meters. Normally, these devices are stand alone devices and the data collected are not transferable due to the lack of external interfaces. This means that the visualization and the evaluation of the data through a computer is not possible and the patient is thus unable to get a picture of his or her own health state and progress. As a more technology savvy generation joins the ranks of the seniors, the active integration of a user into his surrounding poses new challenges like the integration of telemedicine systems and the underlying information and communication systems. Sportive elderly people can use lifestyle products such as Nike+ [9] to monitor their physical activities and training results. However, in the German market, companies making use of such technologies to provide products and services to thus growing market of elderly people are relatively few. As the healthy people within the elderly population is likely to become more used to Internet technology, the lack of this information concerning their special needs becomes obvious. Information platforms on health issues are mostly regionally-based, limited on narrow topics such as specific illnesses. [6] Furthermore, the layout of the websites is often not optimized for the elderly people e.g. ease of navigation or font sizes. [11] Mobile Communication services currently are rarely used by the elderly, although some devices are designed to be seniors-friendly. Even then, they might still lack convenience and acceptance in the society to become widespread. Since these are not technological issues but of service and design but of customer education, we shall therefore not discussed them further here.

1.3 Cutting Edge Applications and Devices supporting Elderly's Health Care and Lifestyle

In this chapter, we will look at selected technological devices and applications that are either currently available in the market but have not found widespread use among the elderly population, or those that might become available in 3 to 5 years time. Such devices and applications might become daily companions of an elderly person, helping them to lead an independent and active lifestyle, thereby improving their quality of life.

1.3.1 Remote Monitoring Applications

1.3.1.1 Electronic Tagging

Electronic Tagging is a form of non-surreptitious surveillance. It is particularly helpful for elderly people who are suffering from dementia and have a tendency of wandering or unconsciously. Electronic tagging alerts the nurse or the carer in a hospital or nursing home whenever an elderly person moves outside a predefined area. In doing so, the system frees up the carer or nurse for other critical activities while alerting them immediately when an elderly person wanders off dangerously. Such an electronic tag usually comes in the form of a worn radio transmitter designed like a watch. Monitoring stations set up in the premises detect the signal from the sender and alerts the carer whenever an elderly wanders o. However, we must not forget that there are legal implications due to the issue of data privacy associated with such a technology. Since legal issues are not part of the topic of this paper, we shall not further discuss them here.

1.3.1.2 Electronic Tracker

Employing GPS technology in mobile phones, electronic trackers allow elderly people the freedom of movement outside their predefined areas like nursing homes, hospitals etc. This however requires that an elderly person has a GPS-enabled phone with the installed software. Such a system can locate people up to an accuracy of up to 10 meters and is easily available in the market. Like electronic tagging, an electronic tracking technology has legal implications due to the issue of data privacy which we shall not further discuss here.

1.3.1.3 Decubitus Risk Monitoring

Decubitus risk monitoring technology can often be employed to optimize nursing care in hospitals or in nursing homes. With the help of multiple pressure sensors integrated into a high quality mattress, the movements of an

elderly in bed can be recorded, analyzed and evaluated both in quantity and quality by means of a computer and an intelligent software. With the help of the Braden scale, the pressure ulcer risk (bed sores) is determined. [15] If insufficient movements are detected, an alarm will be set o to alert a carer. In this way, reduction of excessive care, optimization of nurses processes and objective care giving can be achieved.

1.3.1.4 Telemedical Monitoring of Elderly after Heart Operations

Telemedical monitoring is especially useful for elderly people who have just undergone heart operations and are discharged from the hospitals. Very often, an elderly person tend to be fearful of a relapse at home, and in such a situation, the ability to obtain timely and sufficient medical advice and treatment will ease their anxiety. [20] Through integrated telemonitoring, a patient is provided with the service of a 24-hour telemedicine service center that holds their health records and knows their health conditions very well. Important physiological parameters can be made available to the service center through the following way: By placing a ECG-monitoring card with built-in sensors on the chest area, the ECG data of the patient can be read and transmitted to a mobile phone. The data will then be forwarded to the service center for analysis. This might also have legal implications due to the issue of data privacy. Since legal issues are not part of the topic of this paper, we shall not further discuss them here.

1.3.1.5 Blood Glucose Meters and Online Diary for Diabetics

Given that diabetes is a major health care challenge, blood glucose monitoring is therefore very important. Blood glucose meters are used to measure the glucose level of an elderly person. Blood samples are usually obtained by pricking the skin with a lancet and then placing the sample on a test strip which will then be read by the meter for glucose content in the blood. Through uploading the data onto an online portal, a diabetic elderly person can access their glucose level information easily at different locations. Such an online diary also allows a physician to monitor the glucose level remotely and alert the elderly person whenever a need arises. This reduces the number of trips an elderly person needs to take to the clinic or hospital. The technology behind a blood glucose meter typically involves oxidation of glucose with other chemicals or electrochemical methods. The recorded data on the meter can later be transferred to a computer which is connected to the Internet.

1.3.2 Intelligent Home

1.3.2.1 Video Communication Systems

Video communication systems allow people to see each other on a screen while talking on the phone concurrently. This is useful for elderly people who stay quite a distance apart from their children but still want to maintain regular contact with them beyond the normal phone call. Such a technology can be used in a variety of settings including private homes, hospitals, nursing homes and hospice facilities and is typically based on the existing VoIP technology available in the market.

1.3.2.2 Fall Detection Systems

For elderly people who are bedridden and suffer from serious mobility limitations, falls which are not detected within a given period of time after the accident implies a serious health risk. A computerized fall detection system can be utilized to deliver timely intervention in such situations. These systems make use of pattern recognition software and video monitoring devices to detect any forms of sudden collapse. Any untoward events generate an alert at the alarm center that monitors the elderly people continuously. [12] Alternatively, a fall detection system can also be based on a simple sensor concepts employing technologies like accelerometers and MEMS that measure very fast movements that occur during a fall. Whenever a free fall is detected, a carer in the nursing home or hospital is alerted by an alarm signal from a monitoring station connected to a central computer. Pressure sensors built into a mattress or under a carpet can also be used to detect sudden impacts or falls. Such a technology is already available but not commercially ready yet. Through using such technologies, an elderly person can live in an environment with minimum limitations to their movements usually associated with other equipment like safety bed rails or xing belts. This also reduces the number of control visits required. Motion sensors in the bedroom connected to the lighting can also be integrated into the concept of a smart home to prevent falls in the darkness.

1.3.2.3 Locking and Security systems

Intelligent locking and surveillance systems are important for the safety and privacy of elderly people. In residence for the elderly or for dementia patients, systems currently on trial include one that utilizes a personalized sensor in watches to prevent residents from entering the wrong rooms at night. Other key-less-locking systems like those that recognizes fingerprints or faces are also currently being tested for their feasibility. In an intelligent home, sensors at the windows can alarm the user if the windows are open. Dangerous electrical devices can also be switched o automatically in an intelligent home. By linking

the alarm system in an intelligent home to an external security institution violent attempts to enter a house can be detected and the request for help can thus be automated.

1.4 Driving Technology behind Product Developments for the Elderly

In this chapter we focus on technologies driving product developments for supporting elderly's health care and lifestyle. Especially we are going to describe following basic technologies:

Microelectromechanical Systems (MEMS) consist of both mechanical and electrical components. They have the ability "to sense and act as well as compute." [19] Thus it usually contains a sensor, processor and memory. Often it also comprises a communication interface. The MEMS designed by UC Berkeley named MICA Mote e.g. have a radio transceiver as well as an expansion connector for different sensors in addition to the basic processor and memory as you can see in figure 1.1. MEMS are produced for the mass market highly cost efficient by means of photolithographicbased processing analog to the production of silicon wafer. [19] In the upcoming sections we focus on trends in the area of MEMS and Sensor Technology.

Internet technologies enable affordable worldwide communication and make it more interactive by using Web 2.0 technologies. Mobile communications and VoIP replace gradually the common telephone lines. Software platforms, on the other hand, provide a stable architecture for developing complex application in a cost effective way.

1.4.1 Microelectromechanical Systems

1.4.1.1 Miniaturization of Electrical Components

In 1965 Gordon E. Moore discovered that the "complexity for minimum component costs has increased at a rate of roughly a factor of two per year" [27] which means that the number of transistors on a device roughly doubles every year. Moore's Law states a logarithmic increase in transistor density and consequently a continuous performance and efficiency increase. More than 40 years later this "law" has proven to be a good approximation (for further discussion of this topic read [36]). "More Moore" is the guiding principle behind the down-scaling of a transistor size. This happens in the world of integrated circuits (IC) whose building blocks are silicon-based Complementary Metal-Oxide Semiconductor (CMOS) (Nano-Tera: Micro/Nano-Electronics) for processors, memory, and optical sensors. Within the next five years, mass production will shift to 45nm fabrication for processors and memory continuing the down-scaling process. [22] Many fields of applications can only be realized

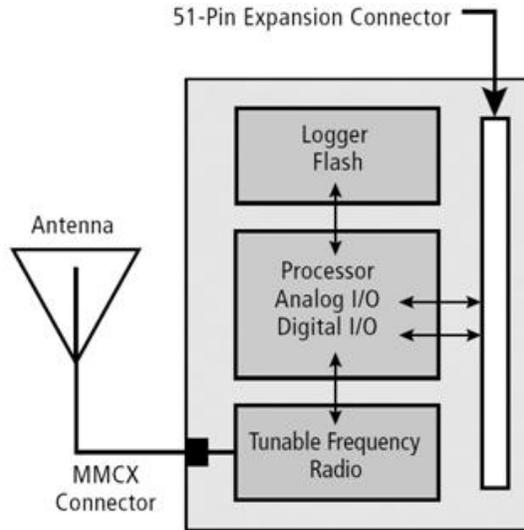


Figure 1.1: MPR400 Block Diagram
 Source: Crossbow Technology, Inc. [5]

because of the small size of current chips. For MEMS, miniaturization matters because it “leads to devices that have relatively high resonant frequencies. These high resonant frequencies in turn mean higher operating frequencies and bandwidths for sensors and actuators.” [19] “Miniaturization is especially critical for implantable devices, and one of the keys to achieving this is the availability of ultra-small, stand-alone power sources which have long life.” [33]

1.4.1.2 Integration to add Value and Speed up

Referring to the rapid development achieved through the down-scaling process, the More than Moore-movement on the one hand aims to create additional value and on the other hand attempts to pursue faster enhancement in performance and capacity through integration. One key factor to add value will be to integrate novel sensors and actuators into MEMS to enable systems to interact directly with the environment (Nano-Tera:Sensors) or to construct interfaces to enable communication with other devices. The second aim is targeted through integration at silicon level. [22] Often there are also cost advantages by integrating different functions on a chip. A good example is the capacitive accelerator e.g. applied in fall detection and airbag systems. [17] A promising opportunity for integration is achieved through biochips - molecular sensors - that could be used as lab-on-chip devices used to analyze biological elements like desoxyribonucleic acid (DNA) and proteins. For clinical applications,

biochips will be broadly available in the coming years. [22] Silicon level integration enables lower power consumption. [37] Low power consumption is crucial for most battery-powered monitoring devices.

1.4.1.3 Body Area Networks

Body Area Networks (BAN) contain MEMS with sensors to monitor the patients' health data as well as a processing unit and a wireless communication interface which sends the acquired data to the Local Processing Unit. [26] For this intracorporus communication, low power consumption is crucial for a long battery life of the wireless sensors. Although Bluetooth has a low power consumption, for this application, special communication devices and protocols like "Zigbee" are needed. The Local Processing Unit might forward the data on demand via public wireless networks like GPRS or UMTS to a service provider. [24] Lo et al. illustrated a BAN as in figure 1.2. Body Area Networks could support health care by monitoring patients for "cardiac care, diabetes management, sleep analyzes [...] care of elderly" [24]

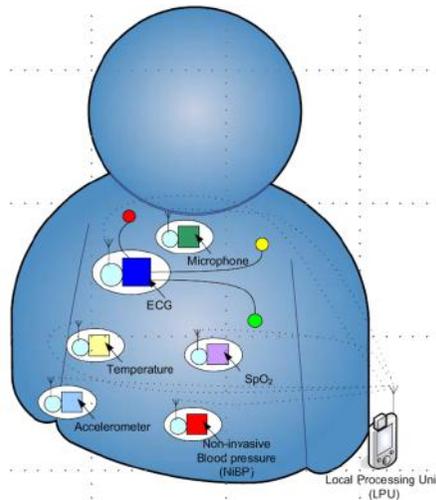


Figure 1.2: Body Area Network
Source: adapted from Lo et al. [26]

1.4.2 Internet Technologies

1.4.2.1 Web 2.0

Tom O'Reilly defines in one of his articles Web 2.0 as single practices (applications), such as social networking sites, wikis, blogs, virtual maps and peer-to-peer file sharing technologies which allow the user to enter a highly collaborative virtual world created and enriched by the users themselves. [30] Although many of the users under 50 use the advantages of these technologies very actively, for the elderly people it is a very complicated and unexplored world. According to a survey by Burst Media Corp, which took place in February 2008, only 22,9% of the people aged 55 to 64 and 12% of the 65+ believe that the web content is focused towards people at their own age. [16] The platform called Internet can bring its vast communication potential in form from wikis, blogs, portals and social networking sites to the Generation 50plus. Technologies like "Adobe Flex", "Adobe Flash", "JavaFX" or "Microsoft Silverlight" could be used to generate content directed for this group of Internet users: colorful graphics, big enough control elements, highly interactive user interfaces. RSS feeds provide another interesting opportunity for the seniors to get updates about the content they are interested in online. They are the most popular type of web feeds and are documents (often XML) which enable syndicating news, podcasts, web video streams. [31]

1.4.2.2 Internet Telephony

The voice transmission through the Internet is termed VoIP (Voice-over-Internet Protocol). It has found widespread acceptance in the public telecommunications area. VoIP services convert the voice into a digital signal and transfer it over the Internet. A call can be made directly from a computer, a special VoIP phone or a traditional one connected to a VoIP adapter. [7] In Germany, the 11 Internet providers often offer a variety of DSL packages that comes together with a location-limited VoIP flatrate. Such a technology provides an elderly person with a cost-effective communicate by means of either a VoIP-enabled phone or their PC if the corresponding software is installed. Two of the most popular VoIP protocols have already evolved into technology standards: Session Initiation Protocol (SIP) and Skype Protocol. Session Initiation Protocol (SIP) is a public domain standard and is used for implementing VoIP systems and clients. The voice messages are sent as clear text without encryption over the Internet. After Jabber, Google Talk is the next popular instant messenger which declared the possible adoption of SIP. [23]The private Skype protocol is packaged with software that implements it and allows voice and video transfer. Installing the Skype client is the single way to access the proprietary Skype network. Skype also encrypts each data package sent, thus allowing secure communication. [34]

1.4.3 Mobile Communications

1.4.3.1 Transmission Technologies

Mobile transmission technologies allow wireless data transfer over short and long distances and at the same time provide a secure and error-free transport for single data packages. All of the technologies presented in the previous chapters which make use of wireless communication are based on the functionality that mobile transmission technologies provide. One of the short-range transmission technologies is Bluetooth. The key features of Bluetooth are robustness, low power, and low cost. Supported by a wide range of devices, Bluetooth technology has been employed widely for data transfer because it allows parallel transfer of data and voice. Depending on the device class, the operating range varies between 1 and 100 meters. The Bluetooth-enabled devices, when activated, communicate through an ad-hoc network and can belong to several different networks at a certain time. This feature, along with the supported data rate of up to 3 Mbps (Bluetooth 2.0), makes it very suitable for RFID tag readers and sensor networks in various application fields. [2] Implants are quite sensitive about the power consumption as their specifications do not allow regular recharging. Since Bluetooth technology does not satisfy very extreme requirements, new standards have been developed to replace or complement it. Two prominent examples are the IEEE 802.15 TG4 standard (also called ZigBee) and Medical Implant Communications Service (MICS). "The IEEE 802.15 TG4 was chartered to investigate a low data rate solution with multi-month to multi-year battery life and very low complexity. It is operating in an unlicensed, international frequency band. Potential applications are sensors, interactive toys, smart badges, remote controls, and home automation." [3] An alternative solution to ZigBee is the Medical Implant Communications Service - an ultra-low power, unlicensed, mobile radio service for transmitting data associated with implanted medical devices. Body Area Networks used to monitor implanted sensors and MEMS usually implements one of the two standards. [18] Medium-range transmission technologies are dominated by the IEEE 802.11 standard widely known as wireless local area network. The wireless networks give one the freedom to connect to the Internet wirelessly, to use VoIP phone or to transport information from the ambient sensor systems to the local intelligent unit - for example a PC or a smartphone. In the far future the WiMAX standard is expected to replace the existing WLAN standard, since it is capable of expanding the operation range up to several tens of kilometers. However, Gartner Group considers that "By year-end 2011, mobile WiMAX will achieve less than 3% of worldwide handset penetration and handle less than 1% of mobile wireless calls." [21] Universal Mobile Telecommunications System (UMTS) is a third generation wide-area mobile technology for transmitting information. Its predecessor GSM was created for transporting packages consisting of voice data and text messages. As the users'

requirements and needs evolve, a new technology has to be developed that is capable of providing higher transfer rates. Nowadays, all mobile phones support the UMTS standard and the mobile service providers offer both GSM and UMTS services in their networks. By integrating these communication technology with their own products, developers of BAN, ambient sensor networks or single MEMS can offer a complete communication process package to a elderly customer. As compared to small and medium range technologies that have limited coverage, UMTS gives an elderly person the freedom to move around freely.

1.4.3.2 Global Navigation Satellite Systems

Satellite navigation systems provide global geospacial positioning. Some of their usage scenarios are navigation, location-based services and time synchronization. Presently, two global navigation satellite systems are in use - the American Global Positioning System (GPS) and the Russian GLONASS. [4] GPS is widely used in devices like car navigation systems, mobile phones and GPS watches. GPS consists of 24 satellites which circle the earth twice a day and transmit their signal to the earth. GPS receivers must be locked on to the signal of at least three satellites to calculate the current latitude and longitude using Technologies such as WAAS (Wide Area Augmentation System) improves the accuracy up to 3 meters. As this service is free and works 24 hours a day, it represents a cost-effective way to track patients who require permanent observation such as Alzheimer or infectious disease patients or need to be detected by an emergency crew. [8]

1.4.4 Software Applications

1.4.4.1 Tiny OS

Tiny OS is an open-source operating system implemented for wireless sensor networks. For Tiny OS, the operating system creates an abstraction of the underlying software. Through Tiny OS, rapid innovations in applications, shorter codes and fine-grained power management can be achieved. At the same time, it is also an enabler technology for the development of advanced algorithms. The influence of Tiny OS on the total cost of developing large software solutions will grow as the sensor network applications evolve. [1]

1.4.4.2 Autonomous Context-Aware Applications

As the complexity of applications running on networks increased exponentially, a new design for software systems has to be developed. The autonomous contextaware applications is the result of such a development. Based on

previously gathered information, such autonomous applications exhibit context-dependent behavior to fulfill specific goals. [35] The so-called software agents are able to decide how to act on particular input data. [28] They serve as basis for systems implemented on medical telematics platform, such as the system behind the electronic patient card in Germany. [25]

1.5 Conclusion

In our paper, we have looked at several interesting technological products for the Generation 50plus and also the technologies behind them. In doing so, we hope to identify the technological trends that are driving the market forward in the near future. From our research, we found out that an integrated intelligent environment capable of monitoring and detecting the needs and states of an elderly person, using a multitude of sensors and microsystems and mobile communication technology, will enable an elderly person to lead an active and independent lifestyle. This does not need to be at the expense of the ability to deliver timely and quality health care. We are aware that the list of products available in the market are not fully exhausted by our research. But given the scope of our paper, exhausting the full list is neither possible nor intended. What we hope to achieve through our paper is that by comparing relevant products and devices available and widely used in the market today with products and devices that are promising and currently in their development phases, we are able to have a better understanding of the technological needs and challenges inherent in a complex market where a myriad of other factors also play an important role. As technology evolves and new technology emerges to fulfill the needs of the market, further research should be conducted to see if these new technologies are relevant for the Generation 50plus.

References

- [1] Mission statement, 2004. URL <http://www.tinyos.net/special/mission>. Accessed on 13.06.2008.
- [2] Bluetooth Basics, 2007. URL <http://www.bluetooth.com/bluetooth/technology/basics.htm>. Accessed on 28.05.2008.
- [3] IEEE 802.15 TG4, 2007. URL <http://ieee802.org/15/pub/TG4.html>. Accessed on 29.05.2008.
- [4] Globalnaya navigacionnaya sputnikovaya sistema - glonass - rossiyskaya sputnikova sistema navigacii, 2008. URL <http://www.aggf.ru/glon.html>. Accessed on 22.05.2008.

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- [5] Mica2, 2008. URL http://www.xbow.com/products/Product_pdf_files/Wireless_pdf/MICA2_Datasheet.pdf. Accessed on 21.05.2008.
- [6] Informationsplattform zu Diabetes, 2008. URL <http://www.diabetes-deutschland.de>. Accessed on 22.05.2008.
- [7] Voice over internet protocol, 2008. URL <http://www.fcc.gov/voip/>. Accessed on 22.05.2008.
- [8] What is GPS?, 2008. URL <http://www8.garmin.com/aboutGPS/>. Accessed on 02.06.2008.
- [9] Nikeplus, 2008. URL http://nikerunning.nike.com/nikeos/p/nikeplus/de_DE/. Accessed on 21.05.2008.
- [10] Blutzuckermesssysteme, 2008. URL <http://www.accuchek.de/produkte/de/blutzuckermesssysteme/blutzuckermesssysteme.html>. Accessed on 22.05.2008.
- [11] Sen-info. Bewusster leben mit mehr Wissen, 2008. URL <http://www.sen-info.de/>. Accessed on 18.05.2008.
- [12] Human activity modelling for fall detection, 2008. URL http://www.i2r.a-star.edu.sg/files/documents/175/Fall_detect.pdf. Accessed on 22.05.2008.
- [13] Das Haus-Notrufsystem für ihre persönliche Sicherheit, 2008. URL <http://www.sinotel.de>. Accessed on 29.05.2008.
- [14] Demografischer Wandel in Deutschland. Auswirkungen auf Krankenhausbehandlungen und Pflegebedürftige im Bund und in den Ländern, March 2008.
- [15] E.A. Ayello. Predicting Pressure Ulcer Sore Risk. *Dermatology Nursing*, Vol. 15, Iss. 1:62, 2003.
- [16] Burst Media Corp. Online ageism - content and advertising miss an important target, 2008. URL http://burstmedia.com/pdfs/research/2008_03_01.pdf. Accessed on 30.05.2008.
- [17] W.P Eaton and Smith J.P. *Micromachined pressure sensors: review and recent developments.*, chapter Smart Material and Structure, pages 530–539. 1997.
- [18] Federal Communications Commission. Medical implant communications, 2003.

-
- [19] K.J. Gabriel. Microelectromechanical systems (mems) tutorial. *IEEE International Test Conference*, pages 17:432–441, 1998.
- [20] K. Gaede. Telemedizin gibt Sicherheit, 2008. URL <http://www.vitanet.de/fitness-gesundheit/topthema/2008/chronisch-herzkrank/>. Accessed on 24.06.2008.
- [21] Gartner. Predicts 2008: Mobile and wireless set new directions in devices and networking, 2007.
- [22] Gartner. Key issues for semiconductor devices, 2008.
- [23] Google Inc. Open communications, 2008.
- [24] V.M. Jones. From BAN to AmI-BAN: micro and nano technologies infuture Body Area Networks. Technical report, Centre for Telematics and Information Technology, University of Twente, Enschede, 2006.
- [25] S. Kirn, C. Anhalt, H. Krcmar, and A. Schweiger. *Multiagent Engineering*, chapter Agent.Hospital - Health Care Applications of Intelligent Agents, pages 199–220. Springer, 2006.
- [26] B.P.L. Lo, S. Thiemjarus, R. King, and G.-Z. Yang. Body Sensor Network: A Wireless Sensor Platform for Pervasive Healthcare Monitoring. In *Adjunct Proceedings of the 3rd International Conference on Pervasive Computing (PERVASIVE 2005)*, pages 77–80, May 2005.
- [27] G.E. Moore. Cramming more components onto integrated circuits. *IEEE Electronics*, 38:114–117, 1965.
- [28] H.S. Nwana. Software agents: An overview. *Knowledge Engineering Review*, 11:1–40, 1996.
- [29] E. O'Brien, B. Waeber, G. Parati, J. Staessen, and M.G. Myers. Blood pressure measuring devices: Recommendations of the european society of hypertension. *British Medical Journal*, 322:531–536, 2001.
- [30] T. O'Reilly. What is web 2.0 - design patterns and business models for the next generation of software, 2005. URL <http://oreilly.com/web2/archive/what-is-web-20.html>. Accessed on 02.06.2008.
- [31] M. Pilgrim. What is rss?, 2002. URL <http://www.xml.com/pub/a/2002/12/18/dive-into-xml.html>. Accessed on 05.06.2008.
- [32] J. Rübénach and J.P. Weinmann. Haushalte und Lebensformen der Bevölkerung - Ergebnisse des Mikrozensus 2006. *Wirtschaft und Statistik*, 2:123–134, 2008.

- [33] C.E. Richardson, R.M. Roop, S. Hendry, M.H. Azarian, and S. Ganesan. Sensor technology roadmapping efforts at iNEMI. *IEEE Transactions on Components and Packaging Technologies*, 28:372–375, 2005.
- [34] RTX Telecom A/S. SIP vs Skype - the battle for VoIP, 2005. URL <http://www.rtx.dk/Default.aspx?ID=949>. Accessed on 25.05.2008.
- [35] V. Sassone. Context-aware software-intensive systems: An autonomic approach. *University of Sussex*, 2004.
- [36] R.R. Schaller. Moore’s law: past, present, and future. *IEEE Spectrum*, pages 53–59, 1997.
- [37] K.L. Tai. System-in-package (sip): challenges and opportunities. In *Proceedings of the ASP Design Automation Conference 2000*, pages 191–196, 2000.

2

Chapter 2

Generation 50plus - A New Customer Segment

Benjamin Gump, Tianyi Li, Henri Palleis, Christiane Reuter

The Generation 50plus is a growing and heterogeneous group of people. As they get richer, healthier and better educated, their wish to enjoy the rest of their lives gets bigger. This implies an attractive new customer segment. While previous segmentation strategies concentrate on on how to communicate with the Generation 50plus, the key to successful marketing lies in what to communicate. This paper wants to give an overview over development trends until 2020.

2.1 Introduction

What do pope Benedict XVI, Angela Merkel and your grandparents have in common? They all belong to the so called Generation 50plus. It is not only them, but also millions of German citizens who form this growing class of people above the age of 50. The demographic change towards an aging society is a major trend in Germany. It leads to a new customer segment and thereby to an emerging market: The Generation 50plus. Soon, this group of people will be the majority in our society and therefore be the biggest group of customers. Thinking of the different types above the age of 50, it becomes obvious that the Generation 50plus is a very heterogeneous group. On that account, there is a huge need for an analysis of this emerging customer segment, in order to develop business strategies that successfully address the Generation 50plus. To clarify the question who these people are, this research paper investigates their social environment, the economic potential and their attitude towards new technologies. Within this investigation, there is an analysis of the status quo as well as an outlook on the development of the segment. As it is important, that business models address the customers adequately, it is necessary to identify the homogeneous groups within that heterogeneous segment. Therefore both, an overview of recent segmentations and a recommendable segmentation which is derived from them is provided.

2.2 Lifestyle of the Generation 50plus

As already mentioned the Generation 50plus is an heterogeneous group. This fact is also reflected in the variety of lifestyle occurrences among this population group. The level of education differs (like in every other age group), as well as their health condition. A subgroup - in most cases those at the age of 50-65 - still belong to the working population, whereas others are already retired. And finally there is a huge difference in the social environment the people of this group are integrated in. It is hence necessary to have a closer look on each of those factors in order to fully understand the composition and the way of living of the Generation 50plus.

2.2.1 Education

One key characteristic of a population group is its level of education, because in most cases this fact already gives a lot of information about the social status, employment rate, interests and hobbies.

The majority of the Generation 50plus has a degree from “Grund-/ Hauptschule”. This percentage is even getting bigger with age. Only 11% of the people older than 65 have an university degree.[38] But as shown in figure 2.1, this situation

is about to change. Men and women from younger generations are much better educated than the older ones.

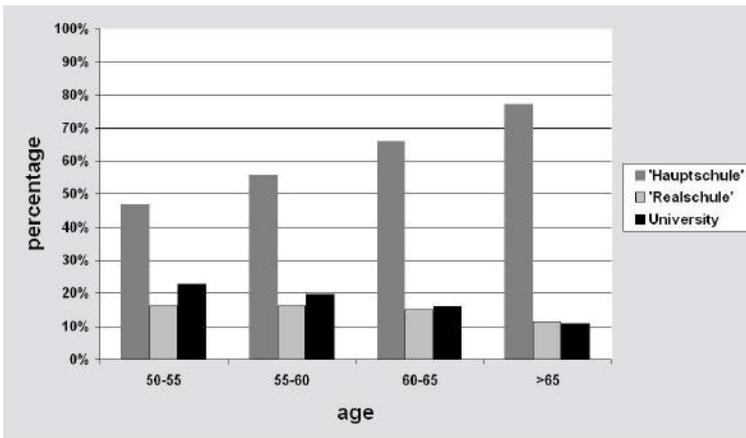


Figure 2.1: Levels of education

Source: Bundeszentrale für politische Bildung [38]

One major reason is the higher prosperity level in Germany compared to for example in the 50s. More families were/are able to afford higher education for their kids. This as a result is going to further raise the average education level of the Generation 50plus in the future. In addition to that trend one further important development can be observed. Women started to lessen the gap of education to their male fellow citizens. In 2004, 50% of all graduates from university were female. [43] Of course this change is going to influence the labor market in the future tremendously.

2.2.2 Employment

In Germany there are 49.8 million people - which is about 60% of the total population - in the working age. Because the common age of retirement is currently set to 65 it is mainly the subgroup 50-65 of the Generation 50-plus that still participates in the professional life. In 2006 those represented 30.3% of the population in the working age. [54] However even a small percentage of the people older than 65 works. In numbers it is 4.4% of the males and 1.7% of the females in this group. This also shows the overall fact that less women work than men (see figure 2.2).

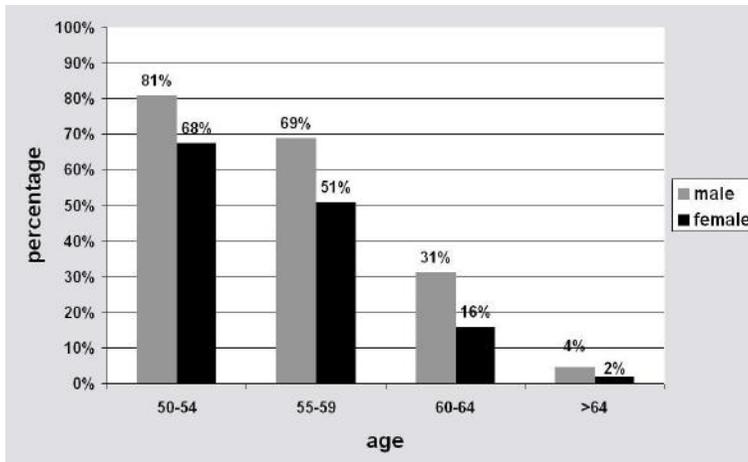


Figure 2.2: Percentage of men and women with jobs
Source: Statistisches Bundesamt [54]

But it is interesting to notice that this is about to shift. Among all subgroups in the Generation 50plus the percentage of employed women is increasing whereas in the male population the percentage of working men is decreasing. The latter is mainly a result of the invalidity pension which has become more and more common over the past couple of years. However this development will definitely turn back. The age of retirement will be raised to 67 in order to have a 55% employment rate in the Generation 50plus by the year 2010 (draft law of the German government). On the other hand the Generation 50plus is now going to be “filled” with the first emancipated generation. This explains the augmenting percentage of women working. But with this changing composition of the group of working people automatically comes along the need for adaption of the labor market. For those women participating in the professional life, it becomes more and more difficult to juggle their career in a family. The first effects are already noticeable: Shrinking birthrates.

2.2.3 Social Environment

2.2.3.1 Family

Comparing households of younger people with those of the Generation 50plus, one thing is notable: the size. To average it is 2.2 people living in an household of people from 50-64. This results from the fact that parents at this age often have kids still living at home. However this situation changes as they are getting older. An household of the age-group 65-74 (75+) consists of 1.6 (1.4) residents. [53] Those numbers reflect the fact that older people tend to live

in single households. Which is of course often a result of the partner's death. But it is not only for the very old people that single-households continue to be very popular. This is a general trend in the Generation 50plus. [57] When talking about the family environment one needs to face the fact that nowadays the family structure no longer looks like in former times. Kids leave their parents home very soon and if so they not necessarily stay in the same town or even country. In former times the social network of the Generation 50plus was mainly restricted to the family, which in most cases lived in the same house/apartment, and the immediate neighbors. Nowadays the family plays a less important role than in the past. People at the age of 40 (the future Generation 50plus) are extremely independent and have replaced family with career/job as the number one preference. This free (sometimes perceived as arrogant and egoistic) lifestyle is consequently the dominant version for the Generation 50plus.

2.2.3.2 Hobbies

Thanks to the advancements of communication and transportation possibilities and the better health condition (see next section) of elderly people, their recreational activities have shifted from passive to much more active. It is still the TV that is front-runner for the elderly (89% watch TV on a daily basis) [55] however they become more and more interested in other activities. Seniors go to university, travel around the globe and surf in the Internet. The "very old generation" (75+) and their ancient lifestyle is about to die off. The future Generation 50plus is more active and open-minded. Which is of course on the one hand a result of the raising level of education but on the other hand it is because the current "Generation 40-50" is that different. As already mentioned the previous section, young (< 50 years) people are much more independent and adventuresome. They have the money (compared to the war generation that partially forms the present Generation 50plus), are much better educated and familiarized with new technology and they grew up in a very internationally oriented society. These "new" men with their "new" expectations regarding self-fulfillment, career and retirement differ enormously from what is currently known as the Generation 50plus.

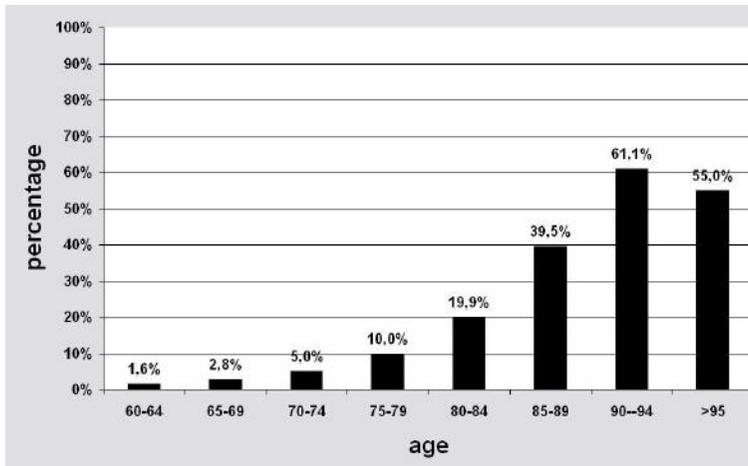


Figure 2.3: Percentage of people in need of care
Source: Bundeszentrale für politische Bildung [38]

2.2.4 Health Condition

The health condition of the Generation 50plus is one of the major characteristics of this population group. It also is the biggest issue when talking about demographic change because the costs related to health treatment are highly positively correlated with age. The older a human being becomes, the less healthy he or she statistically is. 32% of the 40-54 year old people is considered healthy. This number goes down to 14% for the 55-69 years old and ends at 7% for those in the age-range of 70-85. Another important notice is the multi-morbidity among elderly people. It is about 25% of the people older than 70 which suffer from more than five diseases at the same time. [57]

When looking into the future the situation is on the one hand the same. Members of the Generation 50plus will still be less healthy than the younger ones. However, on the other hand the future members of the Generation 50plus (now 40-50) have been born in a safe and prospering time of the country (compared to the people from the Generation 50plus which in large part belong to the war generation). Consequently their overall health condition is much better. This and the fact that health care possibilities constantly improve induces a much higher health level of elderly in the future than it is nowadays. Nevertheless, with raising age comes worse health condition and with worse health condition usually comes the need for medical treatment and ever so often need for nursing. Figure 2.3 shows the percentage of those in need of care for each age-group. If younger than 70 this percentage is still single-digit. However it goes up to 20 percent and higher when passing the

age of 70. [38]

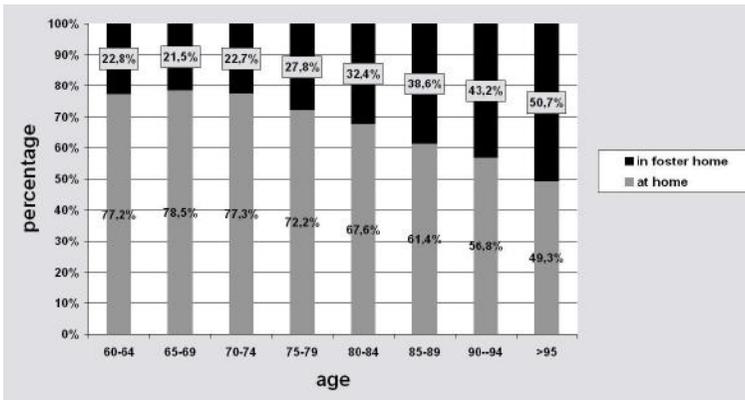


Figure 2.4: Distribution of nursing types (at home vs. in foster home)
Source: Bundeszentrale für politische Bildung [38]

Those numbers are already very high and they are expected to even raise 20% (40%) until the year 2010 (2020) (Q: 9) (for completeness figure 2.4 shows the percentile distribution of nursing at home and in a foster home (Q: 1). In order to keep the body in good shape and maintain the health status of a 50 year old man/woman sports are a natural and effective way to do so. Currently it is 37.8% of people at the age of 50-64 and 50.4% of those older than 65, who do not do any sports at all. In addition to that it is only 18.5% (17.1%) who do more than four hours per week. But the good news is that there is a trend towards doing more sports (among all age groups). [55]

This again is one consequence of the overall trend concerning the future lifestyle occurrence of the Generation 50plus: active instead of passive! It is interesting to see that even the health condition of the Generation 50plus is worse than in the other age-segments, it is still 54.1% of the males and 44% of the females older than 65, who consider their own health as good or very good. [38]

With better medical treatment and advanced health care this “positive” misinterpretation of the own health status is even going to increase. In the future there is more importance attached to the idiom: “one is only as old as its own perception says”. Classifying people in the Generation 50plus only by their age will be misleading. Instead it is the new customer’s own perception of his or her fitness that dominates future marketing strategies and product developments.

2.3 The Generation 50plus - An Economic Factor

At the moment, the Generation 50plus is in possession of more than half of the total private wealth in Germany and this proportion will significantly raise in the future [45]. Through all this accumulated wealth, the Generation 50plus is an important factor in the German economy. It is therefore necessary to take a closer look at the income structure and the consumer behavior of these people, in order to grasp the full extend of consumer potential, which lies with the Generation 50plus.

2.3.1 Income Structure

2.3.1.1 Different Types of Income

As the Generation 50plus is a very heterogeneous group, there is a huge variety of income sources. Whereas the age group of 50-64 represents about 30% of the whole working population, above that age, the rate of employment is close to zero. A closer look at the population older than 65 shows, that in the old federal states (new states), on average 91% (99%) of the men and 82% (99%) of the women receive pensions from the statutory pension insurance. This is not the only considerable source of income within the retirement age, because in the old federal states (new states) about 46% (2%) of the men and 9% (1%) of the women receive additional income from a company pension scheme. [58]

In the future, there will be a wider spread of income sources, because the current pension system will not preserve the same level of pensions for future generations. Therefore the legislative framework is about to change towards a system that encourages private retirement provision. There are already state-aided private retirement provision models, that motivate the people to additionally save money. That leads to a change of values among the younger generations. They have to actively save money now, in order to spend it in their retirement age. This implicates that the prospective Generation 50plus will be much more willing to spend their money, as they have been saving for their entire life, just for that purpose.

2.3.1.2 Different Amounts of Income

The variety in income sources leads to a wide range of amounts of income among different age groups. Due to the different rates of employment, there is a wide gap between the average income of EUR 3,530 per month for the 50-60 year-old and EUR 2,896 for the 60-65 year-old. Above that age the numbers still decrease. This is due to the fact, that the average amount received from the statutory pension insurance, which is the main income source above 65, is much lower than the average amount of wages. The average income for people

from 65-75 of EUR 2,425 per month still decreases to EUR 2,037 for people above the age of 75. [42]

There is not only a big difference between, but also within the age groups. The most diverse group are the people from 60-65. As there are people who are still employed, about 12% of the group have an income higher than EUR 5,000 per month. Almost 25% have a monthly income above EUR 3,600, whereas about another 25% only have less than EUR 1,500 per month. In the group of 65-75 year-old, these differences are still obvious, but the overall amount of money declines. Hence, 40% of the group range between EUR 1,500 and EUR 2,600 per month, almost 30% are below EUR 1,500 and 15% still receive more than EUR 3,600. An analysis of the people older than 75 shows, that 11% live on less than 900 Euro per month. [46]

	2003	2005	2010	2020	2030	2040	2050
Increase in income (w/o pensions) in %		3	11	28,8	49,5	73,5	101,3
Increase in pensions in %		0,5	5,5	18,5	29,5	47,3	69,4
Wages (2003 = 100%)	100,0	103,0	111,0	128,8	149,5	173,5	201,3
Pensions	48	48,2	50,6	56,9	62,2	70,7	81,3
Gross level of pensions (in %)	48	46,8	45,6	44,2	41,6	40,8	40,4

Table 2.1: Expected development in income up to 2050

Source: Buslei et al. [42]

An extrapolation (see table 2.1) of the “Deutsches Institut für Wirtschaftsforschung” shows the development of wages and pensions in Germany until 2050. The pensions will reach a 18.5% higher level in 2020. Nevertheless, it is obvious that the pensions cannot keep pace with the wages and therefore the income of the pensioners will decrease in comparison to people who are still employed. Today, the level of pensions compared to the wages is at 48%. Until 2020, this level will fall to 44.2% of the income of people who are still working. The overall result of this trend will be a wide gap between rich and poor. Those who cannot afford to save enough money today, will be worse off in the future.

2.3.1.3 Private Wealth of the Generation 50plus

Analyzing the Generation 50plus as an economic factor, it is not sufficient to just look at their current income. The overall spending power is higher than their monthly income, because most of them have worked during their lifetime and thereby accumulated some assets. Figure 6 shows the average assets of people in Germany differentiated by age.

The highest potential of spending power lies with the people at the age around 50. In 2005, the group of 50-59 year-old had an average spending power of EUR 238.6 billion or EUR 24,008 per citizen. The group at the age

of 60-64 and the people above 64 are almost equal with a spending power of EUR 20,443 and EUR 19,691 respectively. [47]

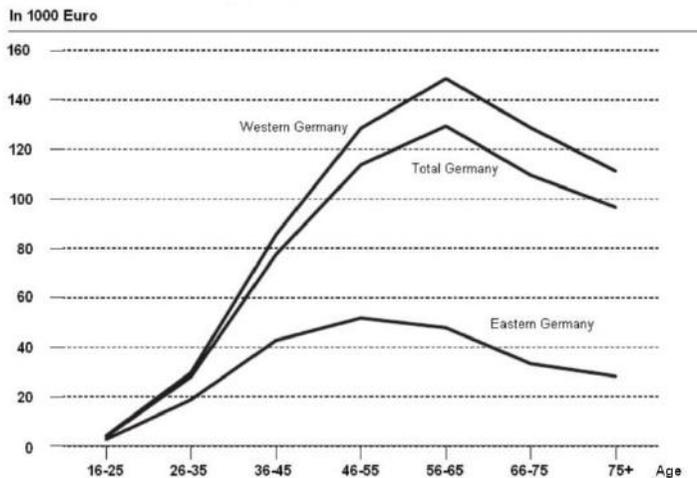


Figure 2.5: Private assets in Germany (2002)

Source: Grabka and Frick [48]

Combining this information with the extrapolation in figure 2.1 it becomes recognizable, that the overall spending power of the Generation 50plus will rise in value. This is due to the growing wages and pensions. Another factor for increased spending power in the future are heritages. By additionally taking into account the demographic change, the major trend for the development of the Generation 50plus towards the most valuable customer group becomes obvious. That why the term “Best Agers” has established. In 2020, the people above the age of 50 will be addressable not only for standard products, but also particularly for luxury goods and very exclusive services such as extensive product support.

2.3.2 Consumer Behavior

2.3.2.1 Purchase Decision of the Generation 50plus

It is very important to know the decision making process when purchasing a product in order to define the Generation 50plus as a new customer segment. A major factor in this decision is those people’s distinct brand loyalty. When purchasing goods, about 39.1% stick to brands they are familiar with and 41% percent buy their goods only in shops they already know. Concerning food even 60% almost always go to the same grocery store. This shows that the

decision to purchase a product mainly relies on the own experiences. [44]

Year		Age of the main income receiver					
		below 35	35-50	50-60	60-65	65-75	75+
Average		Consumer spending per household and month in Euro					
2003	2.118	1.752	2.430	2.564	2.317	2.045	1.600
2010	2.103	1.702	2.382	2.531	2.341	2.038	1.626
2020	2.104	1.713	2.366	2.501	2.350	2.054	1.640
Total		Consumer spending of all households in billion Euro					
2003	996	133,56	364,44	181,44	88,44	147,96	79,68
2010	1.020	139,56	353,28	207,72	70,20	152,28	96,72
2020	1.023	139,20	291,00	232,80	86,52	147,96	125,76
2050	935	123,96	255,60	169,44	76,56	140,88	168,36

Table 2.2: Assumed consumption in Germany (based on the demographic change)

Source: adapted from Grabka and Frick [48]

According to a meta-study, conducted by “Pricewaterhouse Coopers”, it will be very important for companies in the future to focus on four key success factors, in order to satisfy the Generation 50plus: Quality, Convenience, Advisory and Services. The study also fosters the deduction in section 2.2.4, that the “feel” age is much more important than the real age. So in the future, it will be necessary to do an “Ageless Marketing” to address the Generation 50plus. [51]

2.3.2.2 Consumer Spending

Analyzing the spending of the Generation 50plus also reveals big differences within this group of customers. The extrapolation in table 2.2 shows the development for the consumer spending of German households (based on the demographic change). In 2020 there will be a decline in spending per household. Though, an examination of the age groups reveals, that the amount of spending by the Generation 50plus will increase significantly. As the people in the age above 50 already stand for 50% of the total consumption, in 2020 they will represent almost 60% and therefore be the biggest customer group. While the overall spending in the age group of the 35-50 year-old will be EUR 73.44 billion lower in 2020, the spending of the people above 75 will be EUR 46.08 billion higher than it is today. Not only the overall spending of the Generation 50plus will be higher, but also the percentage of income which is spent, is with up to 84% compared to 71% (35-50 year-old) a lot higher and this is not about to shift until 2020. [42]

A closer look at the distribution of spending reveals specific trends of consumption for the Generation 50plus. At the moment, the highest amount is spent for habitation. This trend will only continue with the people over 75 years. [42]

Health care products will have the highest increase in demand. Until 2020, the spending could rise more than 20% and also the spending for hobbies and travels will increase. [53] This implies, that prospective Generations 50plus will be more concerned about their health condition and will more actively organize their recreational activities.

2.4 Technology

Technology plays a big role in daily life and influences society in many aspects. Especially the rapidly growing Internet and the mobile radio are symbols for a new lifestyle as well as a new growing economic branch. Due to longer life expectation the demographic change requires technology to cope with the needs of the elderly. Technology has the potential to ease life for the elderly as well as to enable them to keep a vital social environment.

2.4.1 Conventional Media

Nowadays the elderly still spent a lot of time consuming television, radio, sound and print media. According to a study by the “Adolf Grimme Institut” and the “Instiut für Medien- und Kompetenzforschung”, television consumption increases by age: 50-59 year-old watch 200 minutes per day, 60 to 69 year-old watch 240 minutes and elderly older than 70 years watches on average 256 minutes of television (see figure 2.6). [40]

An expert survey within the study shows, that television consumption by the elderly will not change in the next couple of years, because it will still be a valuable social event. Therefore they will play a more important role as target group for television channels, even though the leisure behavior of old and young will align to each other. The Generation 50plus consumes 42 minutes of print media, on average 6 minutes more than the general citizen. The survey also reveals, that the consumption of print media will diminish and being replaced by the Internet. [40]

2.4.2 Evolving Technologies

2.4.2.1 Internet

The Internet represents best the changing technology landscape towards a high speed information society. Looking at the characteristics of the internet users among the Generation 50plus, age is not the most important factor. Just like mentioned in the sections “Lifestyle” and “Economic Factors”, the Internet users are a heterogeneous group, most influenced by the level of education and their social status. More than 62% of all the people older than 50 years, who graduated from university, have internet access, while only 9.8% of the

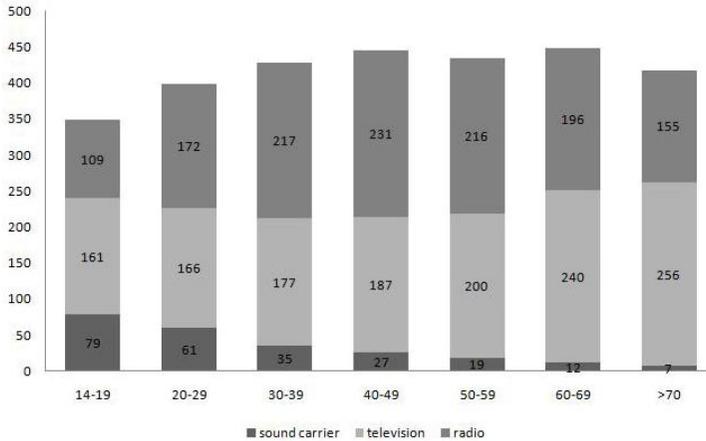


Figure 2.6: Conventional media usage
Source: Adolf Grimme Institut [40]

elderly, who only graduated from “Volksschule” without an apprenticeship use the Internet. Asked for the reason why not using the Internet, most elderly responded either that they have never used it, hence they do not need it, it is too complicated or they do not feel skilled enough. [60] Not using the Internet leads to a syndrome which many scientists call “Digital Divide”. It separates the ones who participate and are able to receive the information to satisfy their needs, and those who are not, which mainly is the uneducated and poorer part of society. [41]

According to Prof. Dr. Kerstin Schill from the University of Bremen, different internet technologies and communication technologies will play an important role in the closer future [41]. In 2007, a survey of TNS Infratest and Initiative D21 showed, that the Internet is growing rapidly among the Generation 50plus with a growth rate of almost 100% over the period of the last six years. Looking at the data, 58.3% of the age group ranging from 50-59 years, 35.5% of the age group ranging from 60-69 years and 13.2% of the citizen older than 70 years use the Internet compared to 80-90% in the age group from 14-39 (figure 2.7) .[60]

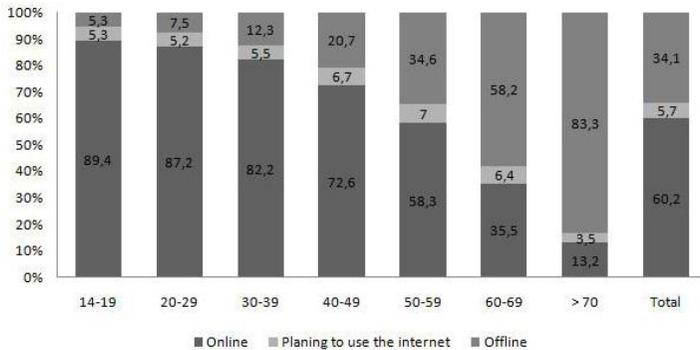


Figure 2.7: Online and offline internet usage
 Source: Adolf Grimme Institut [40]

The growth will continue through targeted marketing, products and public training possibilities. Most of the elderly utilize the Internet for pragmatic purposes, such as emailing or information procurement [49], whereas the younger generations use multimedia applications like listening to music or watching videos over the Internet, as well as socializing over new applications like instant messaging or Web 2.0 communities [49]. As prospective Generations 50plus will be well educated, more familiar with the Internet (see figure 2.7) and in a better financial situation, they will spend more money on hardware and applications, as well as on knowledge how to use the technology. Most of them will be active members of the high speed information society, using new technologies like video on demand, socializing or video conferencing on the Internet. In general the Generation 50plus of the year 2020 will be more affine to computers and are capable of coping with new internet technologies. Using the Internet will be a common activity among the elderly, hence the gap of the “Digital Devide” within the society will close.

2.4.2.2 Cell Phones

Another important technology market with a future full of potentials is the cell phone market. According to study of TNS Infratest 70% of the 50-59 year-old, 52% of the 60-69 year-old and only 27% of the people at the age of 70 and older own a mobile phone. Even though the penetration rate is the highest among the younger part of society (see figure 2.7), cell phone usage is also growing rapidly among the elderly. The percentage of the Generation 50plus which already uses a cell phone, grew significantly over the last couple of years. In 2006, the it made up one third of the overall market.[61]

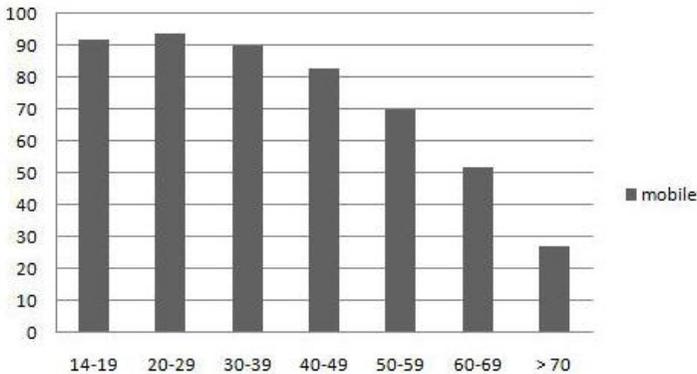


Figure 2.8: Cell phone users distribution
Source: TNS Infratest [61]

Due to this, the trend will continue, whereas especially the people above 60 show the highest growth potential. Compared to the younger generation, most of the older people use the cell phone less frequently. In a discussion organized by the consumer protection organizations by some federal states in Germany most elderly were not adverse to cell phones, acknowledging the new found freedom to be able to call for help anytime anywhere. The biggest issues concerning using a cell phone were the usability and the misleading price structures. [39] Similar to the internet users, today's 30 to 49 years old are very well equipped with cell phones (see figure 2.8), hence the generation in 2020 will be well adapted to the modern cell phone technologies. According to an expert survey mobile communication will become an daily life escort for the Generation 50plus. It will be able to use a cell phone with more than just the basics function. The generation in 2020 will be well adapted to the modern cell phone technologies such as mobile computing, mobile broadband and more sophisticated services.

2.4.3 Needs and Perception of Technology

Due to the biological process the overall condition of the human body will decrease with age. The elderly have problems with their sight, their general physical condition, color perception as well as strength, mobility, ability to respond and learn. Today's products are not yet adjusted to the needs of elderly. According to a survey conducted by the TU Berlin more that 60% of the elderly have problems with technical products and about 30% do not use products, because they seem to be too complicated. One common example is the user interfaces of cell phones. More than 63% of the surveyed elderly between 55 and 85 years do not understand the control menu. Therefore it becomes more

and more important for businesses to integrate the Generation 50plus within the product development process. Biological problems will endure for future Generation 50plus, but due to better educational and financial situations the general affinity for technology will be higher. Since today's middle-aged citizen works intensively with modern technology, they will be able to adopt to new technological issues. Technical products still have to adjust to the needs of the elderly, especially concerning user interfaces, usability issues, coherent dialogs between human and system.

2.5 Generation 50plus as a Heterogeneous Group

2.5.1 Segmenting the “Best Agers” is Important

For today's young people the Generation 50plus can contain both their parents and their grandparents. This circumstance explains that it is not sufficient to consider the Generation 50plus as one target group. It also shows that the current Generation 50plus differs from future ones. [51] Thus, the Generation 50plus is not only heterogeneous, but also dynamic. In order to cope with the diversity of lifestyles and expectations it is necessary to consider this group in a more distinguished way than today. [51]

2.5.1.1 Segmenting by Age

The aim of segmenting is to divide the heterogeneous into smaller homogeneous groups in order to identify specific characteristics and needs. Nowadays, the Generation 50plus feels younger than it is. As discussed above, actual age is becoming less important than the felt age. Therefore, it is not sufficient to divide the group only chronologically by age. It is important to ask for values and attitudes - not only present, but also future ones. In terms of marketing this will be important to meet the varying and changing needs. [51] Today's older people do not conform to the “classic” stereotypes anymore and show a highly different consumer behavior from former old generations. [56]

2.5.1.2 The Status Quo of Typologies

Parts of the economy have realized that the “Best Agers” are a neglected attractive target group. Marketing researchers made several attempts to divide the Generation 50plus in subsegments. A lot of different typologies were created and the names and amounts of sub-segments differ from case to case. However, Pricewaterhouse Coopers analyzed several studies and found out that most of the segmentations base on the following three dimensions: *Attitude*, *Behavior* and *Lifestyle*. The segmentation results from elementary questions: Do people have a positive or rather negative attitude towards life? Are they

open-minded or passive and conservative? Do they have an active or a passive lifestyle? [51] An often quoted study is the “Best Ager Typology” by TNS Infratest. In 2003 and 2005 they conducted a representative study to divide the older generation into subgroups. They did not focus on a special market and therefore the identified subgroups are generic. Three subgroups were identified in 2003 and confirmed in 2005: The “Passive Older People” (37%), the “Cultural Actives” (33%) and the “Experience-driven Actives” (30%). Within the study, the segmentation is based on the semiometric model. Using this model, words function as an indicators to measure values within the society. [59] In this way, each group can be matched to its individual “Value Profile”. Due to the observed changes between the first and the second study, TNS Infratest could provide an outlook on the segment size development in the close future.

The “Experienced-driven Actives” will grow very quickly. This group represents the picture of the “new” older generation, which often is associated with individual and hedonistic values: People who enjoy consciously their standard of life instead of saving all their money. [50] On the other hand, the segment of the passive old people, who are not consumption-oriented will not become smaller in the near future. There will always be people from different ages who become sick, loose their partner or experience financial troubles and therefore adopt a rather passive lifestyle. Despite the insight that obviously types and lifestyles are the key factors to identify sub-segments within the “Best Agers”, most of the marketing people today do not know how to handle them and run out in creating new typology concepts. The question seems to be: How to communicate with them? “Best Agers” are still considered as the “other” consumers. Some marketing people might fear that a concentration on them might strain their images with negative connotations. Careless they miss to open a promising market. [52]

2.5.2 Marketing Trends

“Markets have changed; now it’s time for marketing to change.” [62] Although marketing has not yet found strategies to cope with the spending power, the lifestyles and the specific needs of the Generation 50plus, the awareness of their importance as the relevant target group will establish in the next years. They are the group with the biggest spending power and as showed above, their spending power will even increase until 2020. By focusing on the “Best Agers”, there will be developed different strategies in order to meet their needs and their potential. There will be two major ways to address them: A more sophisticated way of segmenting on the one hand and no segmenting at all on the other hand.

2.5.2.1 Segmenting on Two Levels

The above mentioned “Best Ager Typology” by TNS Infratest is reasonable because the segmentation is based fundamentally on values. However, it is not precise enough to develop market entry strategies or to identify specific needs. The growing group of the “Experienced-driven Actives” may be characterized by a certain amount of values which they have in common. But as this group grows, the variety of represented lifestyles will finally lead to another heterogeneous group. Both the level of education and health will increase in the close future. In addition to that, the use of information techniques will be further established in the Generation 50plus as well. In this way, more and more people will fit the pattern of the “Experienced-driven Actives”. It will be necessary to find more distinguished ways of specifying sub-segments. Roland Berger provides a promising concept by defining eight archetypes of the German population, which can be seen as the basic types of people in our society. [52] Through the individual value profile, each person - not only “Best Agers” - can be assigned to one basic type. By combining the idea of the archetypes with previous segmentation strategies, it will be possible to distinguish between active and passive lifestyles on a low level and on a high level to consider the “Generation 50 plus” as the same sort of people as everyone else. In this way, marketing will be able to identify the profile of the “Best Agers” and integrate them into target group research. The focus will shift from “How to communicate with them” to “What to communicate to them”. By relying on these basic types, marketing will also be able to cope with the dynamics of this segment, because there will not occur the need of a completely new typology. Instead, there will be a check for changed “Value Profiles”, while the concepts stays the same.

2.5.2.2 Gap between Rich and Poor

As explained in 2.3.1.2, a gap between the ones, who will be able to supplement their pension through private saving models and those who will not, will emerge. Although this gap will not become visible in the very close future, it will be important for marketing research to realize it early. The “Golden Generation”, which is represented by wealthy and demanding customers who are willing to spend their money for high-quality products and services will be joined by a group of older people who do not have the same capabilities, but still are demanding. In segmentation processes it will be an important aspect to consider.

2.5.2.3 Ageless Marketing

A good trend indicator for German marketing is Japan. They are dealing with the aging of the society as well, but the development is ahead. A promising

strategy to reach older consumers is to offer products which are attractive for all consumers. In this case, a segmentation of the Generation 50plus is dispensable. Successful “Ageless Marketing” is based on universal and age-independent values. [51]

One of the mega trends is “Convenience”. It aims at user friendly handling of products. In Japan, an extremely easy to use cell phone was a big success with both young and old people. “Ageless Marketing” considers the fact that often there is no age-related separator concerning consumer behavior. In Japan, “Ageless Marketing” is successfully applied to the food industry, the health care sector, the mobile communication technology and the car industry. [51] In Germany, “Ageless Marketing” is expected to become an important strategy as well. For example, we have seen that mobile communication is establishing among the Generation 50plus. A need for easy-to-handle cell phones will be of general interest though.

2.6 Conclusion

The Generation 50plus is a growing population group. As both its percentage of the population and its spending power are going to rise until 2020, it will become the focus of marketing activity. Both the level of education and healthiness will rise and bear a growing number of active older people willing to spend money in order to retain their good health status. Felt age will become more important than real age. Information techniques will establish further quickly and arouse a specific need for user friendly products. The willingness to spend money in order to enjoy life will increase and “Best Ager” will be particularly addressable for luxury goods and exclusive services. This new customer potential needs to be faced with adequate marketing strategies. While current segmentation strategies concentrate on the “Best Ager” as the “other” customer, it will be important to realize that he will move into the center of attention. Sophisticated segmenting and “Ageless Marketing” are keys to cope with specific needs. Besides all, it should be considered early that the gap between rich and poor, which already exists in society, will not spare the Generation 50plus, which means that for the so-called “Golden Generation” all the glitters will not be gold.

References

- [38] Bundeszentrale für politische Bildung. URL <http://www.bpb.de>. Accessed on 25.05.2008.
- [39] Zielgruppenorientierte Verbraucherarbeit für und mit Senioren. Ergebnisse und Handlungsempfehlungen, May 2005.

- [40] Adolf Grimme Institut. Ein Blick in die Zukunft: Demographischer Wandel und Fernsehnutzung, 2007. URL http://www.lpr-hessen.de/files/Studie_DemografischerWandelundFernsehnutzung.pdf. Accessed on 25.05.2008.
- [41] S. Budde and C. Fischer. *Die abgehängte Generation?* 2007.
- [42] H. Buslei, E. Schulz, and V. Steiner. *Auswirkungen des demographischen Wandels auf die private Nachfrage nach Gütern und Dienstleistungen in Deutschland bis 2050*. Deutsches Institut für Wirtschaftsforschung, 2007.
- [43] Deutsches Institut für Internationale Pädagogische Forschung. Bildung in Deutschland. Ein indikatorengestützter Bericht mit einer Analyse zu Bildung und Migration, 2006. URL <http://www.bildungsbericht.de/zeigen.html?seite=4288>. Accessed on 25.05.2008.
- [44] R. Focken. Kleines Klientel - großes Potential. *Markenartikel*, 6:38–40, 2006.
- [45] Forschungsgesellschaft für Gerontologie e.V. *Finanzdienstleistungen im Alter*. Forschungsgesellschaft für Gerontologie e.V., 2006.
- [46] Forschungsgesellschaft für Gerontologie e.V. *Wirtschaftskraft Alter - Verständlich für jung und alt*. Forschungsgesellschaft für Gerontologie e.V., 2006.
- [47] Gesellschaft für Konsumforschung. Verteilung der Altersspezifischen Kaufkraft in Deutschland, 2005. URL http://gfk-macon.de/gfk_macon_news/0205_Verteilung_der_Altersspezifischen_Kaufkraft.htm. Accessed on 19.05.2008.
- [48] M. Grabka and J. Frick. Vermögen in Deutschland wesentlich ungleicher verteilt als Einkommen. *DIW Wochenbericht*, 45:665–684, 2007.
- [49] C. Gscheidle and M. Fisch. Onliner 2007: Das "Mitmach-Netz" im Breitbandzeitalter - PC-Ausstattung und Formen aktiver Internetnutzung: Ergebnisse der ARD/ZDF-Online-Studie 2007. *Media Perspektiven*, 8: 393–405, 2007.
- [50] M. Knigge, K. Gruber, and J. Hofmann. *Auf dem Prüfstand der Senioren. Alternde Kunden fordern Unternehmen auf allen Ebenen*. Deutsche Bank Research, 2003.
- [51] PriceWaterhouseCoopers. 'Generation 55+' - Chancen für Handel und Konsumgüterindustrie, 2006. URL http://www.wemako.ch/_pdf/Generation55.pdf. Accessed on 19.05.2008.

- [52] Roland Berger Strategy Consultants. *Brand-Power-Studie*. Roland Berger Strategy Consultants, 2005.
- [53] Roland Berger Strategy Consultants. *Wirtschaftsmotor Alter*. Bundesministerium für Familien, Senioren, Frauen und Jugend, 2007.
- [54] Statistisches Bundesamt. *Bevölkerung Deutschlands bis 2050*. 2006.
- [55] Statistisches Bundesamt. *Datenreport 2006 - Zahlen und Fakten über die Bundesrepublik Deutschland - Auszug aus Teil II*. 2006.
- [56] I. Szmigin and M. Carrigan. Learning to love the older consumer. *Journal of Consumer Behaviour*, 1:22–34, 2001.
- [57] C. Tesch-Römer, H. Engstler, and S. Wurm. *Sozialer Wandel und individuelle Entwicklung in der zweiten Lebenshälfte*. Deutsches Zentrum für Altersfragen: Alterssurvey, 2005.
- [58] TNS Infratest. Alterssicherung in Deutschland 2003 - Zusammenfassung wichtiger Untersuchungsergebnisse, 2005. URL http://www.bmas.de/coremedia/generator/2786/property=pdf/alterssicherung__berichtsband__z__zusammenfassung__der__wichtigsten__ergebnisse.pdf. Accessed on 20.05.2008.
- [59] TNS Infratest. Semiometrie. Best Ager-Typologie 2005 - Status quo und aktuelle Trends, 2005.
- [60] TNS Infratest. (N)Onliner Atlas 2007, 2007. URL http://old.initiated21.de/fileadmin/files/NOA__Umzug/NOA__Atlanten/NONLINER-Atlas2007.pdf.
- [61] TNS Infratest. *Monitoring Informations- und Kommunikationswirtschaft*. 2007.
- [62] D.B. Wolfe and R.E. Snyder. *Ageless Marketing: Strategies for Reaching the Hearts & Minds of the New Customer Majority*. Kaplan Publishing, 2003.

3

Chapter 3

New Service Models and Players

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In the next five years, Germany is facing new economic challenges and chances due to its aging society. Although the demand for health and home care services increases constantly, existing service models do not completely saturate the differentiated needs of their main target group, the Generation 50plus. Orienting on the heterogeneous demands of that market segment, established providers will offer modifications and variations of their existing services. Additionally, being attracted by high purchasing power of elderly people, new players will enter the home and service sector and adjust their current service models or even create new ones to meet their specific demands. This increasing competition forces providers into need for technological innovations reducing costs and enhancing quality. This article will take a look at the current service models before focusing on trends for future service models.

3.1 Introduction

There is a great necessity for service innovation in the German health and home care sector. This is the conclusion the “Impulskreis Dienstleitungen” comes to in its interim results of 2005. [65] Several facts speak for this. Due to the demographic change, chronic illness and care dependency increase in Germany’s aging society. [65] Additionally, changes towards modern family structures, with single households and working women, require a relocation of elderly people’s maintenance from family care into new and adjusted service models. [107] Furthermore the implementation of Diagnosis Related Groups respectively the Case-Based Lump Sum System causes enormous cost pressure in the inpatient sector. This leads to a considerable decrease in surgical bed time, causing a shift of high-maintenance patients to home based and ambulant health care. [90]

This paper conducts a study of home and health care services for elderly people and reveals decisive drivers that highlight the need for innovative service models in this segment. Part of the study is an analysis of promising service models and components of home based care that contribute to a healthy and convenient life in seniority.

As there is a smooth transition from health care to home care it is hard to distinguish both terms from each other. Home care or home based care is the health and personal care of persons with physical handicaps in the broader sense provided in the home environment, usually by family members, community members, non-governmental organizations, community based organizations or health workers. [113] The term health care covers even more as it is the “provision of services that helps individuals achieve an optimal state of well-being, in any setting or stage in the human life cycle”. [112]

In order to differentiate between several service types in the home and health care market this paper’s structure follows the logic provided by Wolfgang Neumann in his paper called “Unsere Gesellschaft wird älter — Neue Geschäftsmodelle im Gesundheitswesen”. He defines three kinds of services which are clearly distinguishable from each other.

There can be no exact forecast about the development of the future service markets. But there are several hints that the market’s dynamic further intensifies. Demographic development, individualized demand, increasing globalization and an accelerating technological advance might frame the foundation of change. Therefore new needs, markets and services will arise. [107]

3.2 Current Service Models

Currently we have a variety of health care and home care services on the German domestic market. The service providers are public organizations, non-profit organizations such as the “Deutsches Rotes Kreuz” or private

service providers. As already stated, health and home care cannot be separated strictly. To classify the existing services, a deeper look into the demand and needs of the target group provides us with a more convenient categorization. We can roughly distinguish three different service segments for the target group of people over 50. The first group of services aims at healthy and active people who live their lives in a health conscious way. The next service segment is directed at those who are already in a state of illness or need help in daily life. Third we find a market segment for people who are themselves caring for e.g. a family member. [98] The following chapter introduces a variety of specific services in each of the three segments to give an overview over the current models in the market.

3.2.1 Services for the Active and Health Oriented Generation 50plus

People in their fifties or sixties are usually not yet in a state of illness. They are active, health oriented older people who mainly want to keep their level of vitality. Therefore they are willing to consume services which help them to maintain their current physical status. These services are mostly preventing illnesses or postponing the occurrence of typical phenomena of aging. The main fields which satisfy these demands are sports, mental training or health oriented wellness.

3.2.1.1 Fitness Services

Older people do not possess the same physical status as the youth. The risk of injury and the probability of overstraining the body is increasing with the age. Sports activities for older people have to be designed in a way to reduce these risks while the desired effect of prevention of illnesses and health problems deriving from aging must not be neglected. Sport activities often take place in local sports clubs. In Germany there are around 90 000 sports clubs. [89] For older people the clubs should serve as a contact point. To promote the attractiveness of sports in a club the “DOSB - Deutscher Olympischer Sportbund”¹ initiated a program called “richtig fit ab 50”, a program for appropriate fitness for people 50plus.² [74]

¹German Olympic Sports Association

²The initiative aimed at activating local sports clubs to extend their program for the needs of older people, especially those who were not into sports anymore. The *DOSB* set up a homepage as a central platform containing information for appropriate sports activities in combination with nutrition recommendation. Local sports clubs ought to provide older people with special services, e.g. sports courses and wellness programs. The four participating federal state sports associations developed a different concept to realize the goal of the *DOSB*.

The “BLSV’s - Bayerischer Landes-Sportverband”³ program animated older people to do sports in sports clubs. They developed a program that involved local sports clubs. The clubs were providing special activities for older people, especially for those who had not been active in sports before. The BLSV set up detailed instructions for the local clubs who participated in the project. The core of the program was a cooperation between the local clubs and physicians. The physicians as health experts introduced the topic to the interested audience, the instructors then presented the courses. The provided courses were tailored for the target group: Easy sports such as dancing or Nordic Walking were on the schedules as well as special courses for strengthening the back bone functionality. [108]

Today providing special courses, fitness or wellness programs is not only a part of local operating non-profit organizations but also a growing field in fitness clubs and companies⁴.

3.2.1.2 Mental Training Services

Older people usually do not only care about their physical but also mental fitness. When illness causes an old person to be dependent on a carer, the cared for might not yet be mentally disabled.

Service providers offer older people the possibility to become mentally engaged beyond cross word quizzes. Older people can book special courses for mental training. Common models are offered by adult education centers. They offer courses in brain training for older people to help them stay mentally active in age. For example, the Munich “VHS - Volkshochschule”⁵ has three centers for older course participants. In each of them they are able to attend a course about mental training and brain jogging to stay fit in age. The customers can register over standardized VHS procedures and have to pay the course fee. [82]

The course program for senior citizens ranges from science to language courses and arts. Although they have totally different contents than the brain training course one could also see the attendance of a language course as brain training session. Learning a language is demanding as well - at the same time the learner does something which he really likes to do. To sum it up, all kinds of mental demanding activities are attractive for the health oriented persons over fifty as the outcome is as effective as a special mental training course.

³Bavarian Sports Association

⁴Various offers:

http://www.sportnavi-koeln.de/kurse.php?menuid=9&sportnavi_kurse_id=996&pos=

http://www.elixia.de/cms/de/public/club_service/kursliste/prevention.jsp

<http://asv-neumarkt.de/hp122/Trainingszeiten.htm>

⁵adult education center

3.2.1.3 Travel Program

Another sector, older people are quite active in, is the travel sector. In 2003 61.3 % of the total consume of travel and hotel was generated by people at the age above 50 and the share is still growing. This is to a great extent due to several facts. First, children have already moved to their own flats which provides less responsibility and more free space for their aging parents. Second, pensioners have less time constraints as they are not dependent on holidays. [106] This background combined with health orientation results in a demand of wellness and cure holidays.

Often older people book wellness trips with individual treatments. During their holidays professional staff will provide treatments on a medical or naturopathic basis. The consumers can choose the focus of the treatment, i.e. which body region should be cared for in a special way.

For instance, in Bad Fuessing the “Muerz Hotel” offers a wellness holiday program with special treatments for older people. They can, for example choose, an anti-aging procedure or a cure program with medical advise and supervision by a physician. The consumers can book their individual package as easy as a holiday trip. [95]

3.2.2 Services for People Dependant on Help and Care at Home

Great awareness in public discussion receive receive “services for people depending on help and care at home”. Service providers in this sector do not aim at prolonging their customers status of being healthy and fit. They rather deliver support to senile and high-maintenance people, who are not longer able to cope with certain situations of daily life on their own. Therefore, transactions in this area differ significantly from the provision of services in other industries as the demanding person betakes itself in a relationship of dependence to the service provider. Consequently, trust plays an important role wherefore it is inappropriate to merely apply the rules of typical consumer markets. [98]

3.2.2.1 Home Support Services

Home support services reach from basic services such as laundry services, meals at home and cleaning services to more sophisticated offerings like alarm connection to a care service center respectively a relative or a neighbor. Provision of protected accommodation or sheltered housing as a whole completes the array of services in this segment. Protected accommodation covers most of the services mentioned previously. Thereby some suppliers offer all the services from one source whereas others are specialized in parts of protected accommodation, for example handicapped accessible modifications. All those

services have in common that they are predominantly engaged by elderly people, who are not necessarily severely dependent but suffer from an age-related decline itself. The services address the safety needs and feelings of insecurity of seniors. [77]

As home support covers a broad range of activities, service providers from many different sectors are involved. For example, players from advisory services [111], housing industry [85] or non-profit organizations [87] are engaged in those services. Despite the stately number of home support service providers, nowadays big parts of everyday work, like cleaning or laundry, are accomplished by family members. [107] As daily living skills are adequate to conduct those tasks the family member carers do not have to be expertly educated.

Besides the stay in the familiar accommodation unit, one main positive aspect of those services is the partial preservation of independence. Leaving as much responsibility as possible with the person concerned is a main goal of protected accommodation or sheltered housing. Elderly people should be assisted to organize their lives in autonomously as this is a way to avoid an accommodation in a residential home for the elderly.

3.2.2.2 Personal Care Services

While the deficit of elderly people deploying home support services are in general comparatively low, people using personal care services are exposed to severe physical constraints. “Most of the cared-for in Germany are moderately or severely dependent, which means that they can hardly manage any activities of daily living, e.g. feeding themselves or going to the toilet, and cannot cope with more complex activities”. [77] Therefore, personal care services include for example medical care, toileting, defecation, incontinence and catheter care, personal hygiene, like washing or bathing, bedsore-prevention, feeding, dressing and undressing, getting in or out of bed. These tasks cannot completely be conducted by the family members. Hence care expertise is needed. [102]

Providers of professional care services in Germany are for the most part private and non-profit. Care services are only infrequently provided by state-run organizations. Private players in that market segment are operating with a strikingly small size compared to other institutions. Until now the number of private professional care service providers has increased. Thus it seems that cost-efficient operations have been possible despite the small size of business. [107]

As family carers and the cared-for herself are seriously dependent on medical and personal care services, an equitable access must be established all over Germany. Especially in rural and structurally weak areas a need for action exists. In this respect federal and state authorities are challenged to provide financial incentives for administrative districts and local authorities for setting up that kind of services. [90]

3.2.2.3 Mobility Services

Mobility services are all services related to supply and social infrastructure. They are one of the the key factors for the elder persons claiming support or care, while other needs seem to be less decisive [77]. Mobility services cover more than merely people's need for logistic services like transport services. Mobility in seniority does not only imply quality of life but is an essential element for social interaction and social affiliation. Because an independent lifestyle requires on the one hand supply with groceries and other goods but on the other hand the maintenance of social contacts as well as the participation in social events. [90]

In general service providers approach these mobility problems of elderly people in two ways. One way is setting up transport services, so that old people have the possibility to leave their accommodation and reach local destinations by the time they want. Specialized services are offered by local public transport organizations, taxi businesses and non-profit institutions such as "DRK - Deutsches Rotes Kreuz e.V."⁶. The second way are delivery services - there is no need for leaving home for the seniors anymore. First and foremost pharmacies are offering this service to their customers. But within recent years an increasing number of providers extended their services to elderly people's homes, for example hairdressers or private shopping services.

Generally applies: "the higher the degree of impairment the more services are used". [77] Unlike the services described in it can be observed that transport services were not used more often related to the degree of impairment of the cared-for.

3.2.2.4 Care Management

As stated, huge cost pressure in the inpatient sector lead to a considerable decrease in hospital stay. Patients discharged from hospital at an early stage are reliant on home based and ambulant health care. Thereby priority is given to avoiding the so-called "Drehtüreffekt". This effect describes the immediate re-hospitalization to inpatient treatment because rehabilitation in the home environment could not be provided sufficiently. [91]

Care management, in German also called "Überleitungsmanagement", is a service which accompanies patients on their transition from stationary to home based treatment. Providers of these services benefit from shorter hospital stays. A key element of good care management is a continuous flow of information between hospital, physician in private practice, pharmacy, care service, cared-for and family members. In the process the care management provider takes over the coordination and becomes the main point of contact for all players involved. [97]

⁶German Red Cross

In Germany managed care services are offered both by private as well as public organizations. Especially “TransCare”, a care management service offered by “B. Braun”, one of the world’s leading health care products suppliers, was able to establish on the German market. B. Braun developed an integrated model of care that extends beyond the supply of products and includes support with patient-oriented treatment plans, preparation of documentation components as well as consultation, training and instruction of family members. [103]

TransCare and comparable service models are a contribution to improve structures in the German health and home care market, as they help to clear the hurdles between stationary and home based care.[103]

3.2.3 Market for Backing Family Member Carers

In a 2005 study the ministry for families, senior citizens, women and youth came to the conclusion that home care still is not a commercial service, but rather provided by family members. [69] Older people in their functional age are usually not yet those in need of care, but they are the ones delivering care to their family members or even outsiders. From these people there is a growing service demand, as they need mainly services which enable them to deliver the care to their cared-for, as well as services supporting them while doing this work.

3.2.3.1 Home Care Courses for Non-Professionals

In Germany a great part of patients in need of care is not looked after by professionals but by their relatives. From a total number of 2.13 millions patients in need of care in 2005, 980 000 were cared for by non-professionals at home. [109] Having no education, they lack in the expertise of professional care. Therefore it is up to professionals to give courses.

The DRK provides course programs organized by the local DRK groups to make sure that rural areas are not left out. The courses are offered by DRK professionals. Customers can register for the courses at their local DRK representation. [99] The course fee is paid by the care insurances. In addition to the courses the DRK offers information material and advice for the relatives in charge of caring. [76]

Similar services are provided by most care related organizations, such as insurance companies or private professionals⁷.

⁷Various services:

http://www.aok-gesundheitspartner.de/bundesverband/pflege/bundesverband/pflege/leistungsrecht/leistungen/index_04405.html

<http://www.thema-altenpflege.de/pflegekurse.html>

3.2.3.2 Respite Care Services

People caring for family members are mainly very committed to their task, since patients in need of intensive care have to be supervised all time. The carers have no opportunity to leave their patients alone in case of an illness or any other temporary unavailability. Sometimes carers have to find an appropriate substitute.

The DRK offers a short-time care service for people who temporarily cannot be looked after at home. [75] The service is available to all subjects who otherwise are being cared for by family members or friends, whether they are ill or impaired. If they remain without access to home care services for limited time. An experienced team of trained nurses, professional carers and social service providers are available 24 hours per day, working together with doctors, dentists, ergo-therapists, pedicurists and coiffeurs to provide full range of service.

The care program takes place stationary in centers of the DRK where professional counseling is available from social workers.

3.3 Future Service Models

Within the next five years prospective home and health care service models will be mainly modifications and variations of existing models, which take their bearing from new or altered circumstances of the market. To identify current trends, we will take a look at changes on demand and provider side and then check technological innovations in service processes for their presumable effects on service models.

3.3.1 Trends from Demand Side

Services are characterized by the integration of the external factor X - the consumer. Hence, it occurs meaningful to begin with changes on the demand side. We split the changes into two dimensions. First, we take a look at quantitative changes of the demand for home and health care services due to the socio-demographic change in Germany, and second we determine the effects of the qualitative changes of the demand due to the altered consumer profile of the Generation 50plus.

3.3.1.1 Quantitative Changes of the Demand for Home and Health Care Services

Two aspects of the demographic change are crucial for the quantitative demand of the Generation 50plus for home and health care services. For one thing, people in Germany have an increasing expectation of life, for another thing,

the absolute number of older people keeps rising. [70, 321] Since the nursing risk goes with rising age, it can be assumed that the demand for home and health care services will increase distinctly in the next years.⁸ [68] It can also be noticed that the nursing risk shifts in a higher age parallel to the increasing expectation of life. [94] Therefore, people belonging to the Generation 50plus are much longer active, i.e. in their functional age, and scarcely rely on nursing. [67] This implicates that the demand for services, particularly in the line of wellness and sports as well as housework facilitation and convenience will grow.

The ratio of men in need for care will increase over-proportionally in the next years. [114] So far there is a overhang of aged women, which can be traced back to higher expectation of life and death rate of men in the Second World War. In post-war generation this will diminish since the life expectancy of both genders aligns. According to this, the demand for home and health care services for couples and multi-person households, respectively, will rise.⁹ [80]

In order to the increasing social mobility and work-related stress of relatives, the ratio of attendance allowance receivers¹⁰ will decline onwards. Displaying this development in figures, the increase of people in need for care in nursing homes totaled up 18% between 1999 to 2005, the demand for ambulant nursing services increased about 14% and ratio of attendance allowance receivers declined by 5%. [94] As a result, we can see a clear trend towards professional care services in ambulant nursing services and nursing homes.

3.3.1.2 Qualitative Changes of the Demand for Home and Health Care Services

The present-day Generation 50plus¹¹ differs tremendously from the image of the secluded, rancorous and disengaged pensioner which still exists in the heads of many people.¹² [93] Social, economic and behavioral aspects have influence on the consumer attitude of the Generation 50plus. These effects in turn the style of prospective service models.

⁸There are diverse opinions about the exact coherence of morbidity and mortality and their effect on the demand of home and health care services. Zweifel/Felder/Meier (1996) even have doubts whether the dropping mortality, i.e. the increasing expectation of life, has effect on the demand at all. Through the growing number of old people in absolute terms an increase of the demand can be expected after all.

⁹However, the number of single households will also increase, mainly due to an expected increase of divorces[86].

¹⁰People in need of care receiving attendance allowance for self-procured care according to § 37 SGB XI can generally be assumed to be nursed by relatives.

¹¹The Generation 50plus is a very heterogenic group. A detailed typology goes beyond the scope of this discussion. However, we focus on several tendencies which can be identified throughout whole cohorts.

¹²This stereotyping and prejudice against seniors is called ageism, a term coined by US gerontologist Robert N. Butler [71].

A decisive factor is the increasing purchasing power of the Generation 50plus. [88] The growing affluence and the hedonistic consumption behavior of the Generation 50plus will ask for sophisticated services. [67, 101] We expect a higher demand for premium services in respect of quality and availability in the next five years, for example exclusive meals on wheels services with wholefood products or expensive dinners. The Generation 50plus also becomes more selective, exacting and less brand loyal than in the past. [101] Competing with each other, future service models will have to oblige individual needs and preferences on the demand side.

Furthermore the Generation 50plus has a higher technical expertise than in the past. They appear less technology averse and more willing to make use of information and communication technology. [67] Thus, the comfortable and more specified way to order services, for example by the use of the internet, will set the trend for service models for the Generation 50plus like it could be observed in the market for younger people in the last decade. [110] The Generation 50plus' open-mindedness and the growing need to learn how to use technologic devices will lead to an expansion of service models with didactic components.

Due to their constant activity and mobility plus the increasing desire to socialize, people of the Generation 50plus will set value on portable services which will not bind them at their residence. In addition to that, it can also be expected that, in order to the increasing interest in health and wellness, a conflated service model of health care and tourism services as so-called "Gesundheitsreisen" will take root in the next years. [92, 96]

3.3.2 Trends from Provider Side

Through to the transition from a seller's to a buyer's market in the last years, providers are forced to reconsider current service models. Customization and efficiency-seeking are the impelling factors. Looking at the provider side, we do not only consider established providers, but also include new players without a special focus on the Generation 50plus. These companies and institutions will be spotting this attractive segment soon and bring brisk wind into the service market.

3.3.2.1 Impulse from Established Providers

Due to the economization of public and non-profit health care sector as well as the increasing amount of private providers, there are several aspects having impact on current service models. [64] Their development will be strongly influenced by product political decisions of the providers. The proceeding competition forces providers to differentiate their services from competitors, to focus on target groups with specific yet unfulfilled needs and cooperate with related service providers to offer valuable service-bundles.

For example, the health care market is very scattered with a strong regional or at most national character. More than half of all nursing homes sustain less than 60 people. [66] Efficiency pressure and growing quality demands by customers and government will diminish small sized facilities and foster consolidation, i. e. average business size in the personal care industry will grow. In order to persist, health care providers will orientate their choice of services to peculiar groups in the Generation 50plus. Service differentiation in aspects of culture and religion, like migrant care services, and locality, like rural-urban differing services, are expectable. Because of high costs and required high-qualified personal, there will be providers in particular for most intensive care and occupation needing people. Additionally suppliers will look for synergies by cooperations, coordinations and networks with rehabilitation and hospital facilities in the kind of “integrated health-centres”. [66]

In the market of lifestyle services for the elderly, similar trends can be made out. To skim the consumer surplus, premium services and highly standardized low-cost services will be increasingly offered like already mentioned in . An increasing aspect could also be providers which act like intermediaries between the consumer and the real service performers, a job so far done by local clubs.

3.3.2.2 Influence of New Market Players

Service providers are looking for new opportunities to address the segment of Generation 50plus more individually.

Fitness Programs at Home

The Wellness and fitness sector focuses mainly on the young or mid-age generation and omits on a broad basis the potential costumer group of people above 50. The high potential of satisfying needs in order to make profit, will allure service providers to offer differentiated and special suited programs for the Generation 50plus. Crucial characteristics will be the focus on sustaining health and keeping life quality. The credo implies that older people do not necessarily want to become competitive athletes, they rather seek opportunities to be capable and fit to manage life as long as possible. A possible trend is ambulant wellness and wellness at home. Rehabilitation, fitness programs in nursing homes or at patients’ home could supplement already existing home and health care services.

Travel-affinity of Generation 50plus

Another sector in which older people will become more active is the travel sector. 72% of the total consume of travel and hotel is generated by the over 50-year-olds and the share is still growing. This is to a great extent due to the fact that the children have already moved to their own flats and pensioners have less time constraints. Thus they are able to go on more and longer lasting trips. [106] The destination has to fill criteria like infrastructure, comfort and

also entertainment. Tour operators will extend their service portfolios with offers for that growing segment. First adoption of programmes are conducted. Germany's leading tour operator, "TUI", has recently introduced "TUI Club Elan", a club service which is designed for older people. The club is offered in various hotels in national and international destinations¹³. The club hotels are selected by infrastructure and design for the needs of the target group, e.g. medical care services are available and rooms are especially large and comfortable. Further potential can be identified in aiming at retiree couples. Especially senior couples over the age of 60 tend to travel a lot. Future service models will emphasize on the needs of that specific group. [63, 104]

Living at Home

The costumer wants to stay at her home environment as long as possible, service models need to be developed as a tool to please so. A decrease in family care-giving potentials is recognized and a transition from retirement homes towards residential care homes, living communities of older people or "Generationswohnen", living communities of various generations, is in process. [104] Generationswohnen is considered to be quite unique and innovative. People of different age live like a family beneath one roof in spite of not being related to each other. Trying to simulate a family environment, generations are crossed and isolation as well as anonymity is forestalled - in interest of all parties. On a small and local basis, the "Wabe e.V. Stuttgart"¹⁴ is one of the pioneers promoting that idea.

3.3.3 Process Related Innovations

The interaction in between provider and consumer is about to change. Information and communication technology has already proven to be an effective tool to shape a whole new market: e-business. A similar effect is taking place in the health care sector. E-health has the potential to optimize existing service models, but also offers possibilities to enhance medical quality of service.

3.3.3.1 Value Chain Optimization

Despite the limited financial resources of the public health insurance funds, patients' need for healthcare services is growing. Service providers and the health care fund are expecting a tremendous increase in costs. Cost reduction while providing a high level of service quality is the major concern in the prospective health and home care sector. Cost-effectiveness cannot be achieved by only considering the treatment itself. Instead, the administrative area provides the highest cost-saving potential. [83]

¹³For further information: <http://www.tui-club-elan.de/>

¹⁴For further information: <http://www.wabe-stuttgart.de/>

E-Documentation and Health Care Network

The electronic patient record and health insurance card in Germany on the one hand side is a first approach to standardize medical documents, and furthermore gives patients more control over their own medical documents. The communication between various doctors, physicians, nurses and therapists along patients' therapy processes will be strengthened and optimized. Expensive double checks can be eliminated. The electronic patient record is just one step further towards the "digitalization of health care". Hospitals, therapy practices, and drug stores will increasingly use the advantage of IT to connect and communicate with each other. E-documents like e-mail, e-receipts, or even combined integrated IT systems are most likely to grow in importance. [84] Companies already known from the e-business sector offer solutions to maximize value and minimize costs. An example are the software solution from "SAP". They provide content, tools, and methodologies to design, measure, analyze and improve the value chain.¹⁵ [105]

Telemedicine and Efficiency in the Home Care Sector

Telemedicine defines the use of information and telecommunication technology in the surrounding of health care with special focus on the distance separating the participants. [81] Considering home care, telemedicine offers effective means increasing the efficiency while maintaining high quality of service. Telemedical systems can monitor specific parameters of the patients and her environment. Using internet or phone, those data can be sent to a special team to surveillance patients' functional health status. This facilitates decisions on further treatments. [81, 73] Other possibilities of telemedicine are remote electrocardiogram for stroke patients and high blood pressure supervision. [72, 81] Home care practitioners on the other hand can only consultate a certain amount of patients and per day. Extraordinary cost-savings can be performed by delivering care to home by the use of telemedicine. [78]

3.3.3.2 Telemedicine and Quality of Service

Information and communication technology has the power to improve quality of health care services. Tendencies can be identified on various pilot projects throughout Germany. Electronically supported disease management programs for the most important chronic conditions or the possibility of sharing relevant experience and knowledge amongst health professionals are possible ideas that might become reality in future. Initiatives conducted in the field of telemedicine right now are the the joint project "StrokeNet" carried out by the "Charité, TU Berlin, MEYTEC GmbH, Berlin Firefighters" and the "SMH

¹⁵SAP AG is one of world's leading provider of business software such as supply chain management, customer relationship management, product life-cycle management, and supplier relationship management. Founded in 1972 in Mannheim, SAP has evolved from a small, regional enterprise into a world-class international company.

19221 Krankentransport GmbH” or the “Virtual Campus” and “Telecoaching” as binational pilot projects between Germany and Switzerland.

StrokeNet

Involved institutions developed and tested a mobile communication network for ambulances in order to improve emergency rescue for stroke patients. The optimization of the process line is carried out at the beginning of the pre-diagnostic stage. The system is coordinating the admission in the specific and appropriate hospital, which is prepared best for treating the specific condition of the patient. Rescue forces, stroke units, cooperating clinics as well as the “Telemedizinzentrum” need to have the ability to access the patients data in real time in order to treat him best. [100]

Virtual Campus and Telecoaching

Virtual Campus and Telecoaching have been carried out by the university hospital Basel in Switzerland and the regional hospital Lörrach in Germany since September 2006. Virtual Campus is an online network with a centralized platform¹⁶ intending to increase bilateral knowledge exchange and increase standardization in health care services. The project focuses on quality improvement of health care services. Using the advance of internet communication, Telecoaching bundles professional knowledge of various medical experts around the globe. Despite just being a knowledge exchange portal, it offers web based visual and acoustic interaction. Medical case studies, preparation of operations as well as counseling experts offer new service opportunities to physicians. [79]

3.4 Conclusion

The purpose of this report is to analyze the current and emerging situation of the home and health care service sector in Germany. After describing current service models, significant drivers for possible development are used to draw a picture of the next five years.

Taking a look at the customer of home and health care services, we see two separable types of changes. The quantitative are caused by the sociodemographic change and the qualitative by the altered consumer profile of the Generation 50plus. Increased life expectancy and the longer lasting functional age will increase demand for lifestyle and convenience services. Due to modern family structures there is a significant trend to professional home and health care services like ambulant nursing. Through their growing hedonistic consumer attitude the Generation 50plus will demand for premium services in respect to quality, availability and mobility. Higher technical expertise and affinity enable access to modern service channels like the world wide web.

¹⁶<http://www.ipath.ch>

On the provider side growing efficiency and quality demands will drive small facilities to consolidate and differentiate their services in consideration of particular groups in the segment. A growing market segment can be identified in tourism, fitness programs and living habits of the Generation 50plus. Service models will adopt to or be generated.

Technological advances are increasingly influencing the health sector. The use of information and communication technology has the power to counteract on growing costs by process optimization. By facilitating knowledge sharing among professionals, the quality of health care services will improve.

Due to the rapid development of the service market, there remains a need for future research, as well as constant market observation.

References

- [63] C. Barkholdt, F. Frerichs, J. Hilbert, G. Naegele, and K. Scharfenorth. Das Altern der Gesellschaft und neue Dienstleistungen für Ältere. *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung*, 32:488–498, 1999.
- [64] U. Bauer. Die sozialen Kosten der Oekonomisierung von Gesundheitsdienstleistungen, 2006. URL http://www.bpb.de/publikationen/5QCPG8,0,0,Die_sozialen_Kosten_der_%D6konomisierung_von_Gesundheit.html#art0. Accessed on 21.05.2008.
- [65] H. Behrens, B. Bienzeisler, J. Friedrich, H. Gabriel, H. Gerstlauer, M. Gouthier, C. Kleppel, D. Licht, A. Luhn, J. Mages, T. Meiren, S. Mueck, R. Neumann, K. Rindle, M. Scherrer, G. Sessing, D. Siegel, S. Stein, W. Stoll, D. Straeten, A. von Reden, and B. Walter. Integrierte Versorgung im Gesundheitswesen. *Services Made in Germany - Mit innovativen Dienstleistungen die Zukunft gestalten*, 2005.
- [66] U. Berkermann, J. Eckert-Koemen, A. Heffels, K. Kramer-Huber, and M. Matuschke. Die Gesundheitsbranche: Dynamisches Wachstum im Spannungsfeld von Innovation und Intervention, 2007. URL <http://www.prognos.com/fileadmin/pdf/1182341886.pdf>. Accessed on 21.05.2008.
- [67] G. Bovensiepen. Generation 55+ Chancen für Handel und Konsumgüterindustrie. 2006.
- [68] F. Breyer. Wirtschaftliche Aspekte der Märkte für Gesundheitsdienstleistungen, 2001. URL <http://www.diw.de/sixcms/detail.php/38789>. Accessed on 21.05.2008.
- [69] Senioren und Jugend Bundesministerium fuer Familie, Frauen. Familienunterstuetzende Dienstleistungen - Wachstum, Beschaeftigung, Innovation, 2005. URL <http://www.bosch-stiftung.de/content/language1/>

- downloads/FUD_WachstumBeschaeftigungInnoavtion.pdf. Accessed on 26.05.2008.
- [70] H. Buslei, E. Schulz, and V. Steiner. Auswirkungen des demographischen Wandels auf die private Nachfrage nach Guetern und Dienstleistungen in Deutschland bis 2050. 2007.
- [71] R. Butler. Age-ism: another form of bigotry. *The Gerontologist*, 9: 243–246, 1969.
- [72] W. Cartwright, K.J. Dalton, H. Swindells, S. Rushant, and P. Mooney. Objective measurement of anxiety in hypertensive pregnant women managed in hospital and in the community. *British Journal of Obstetrics and Gynaecology*, 1992.
- [73] B. G. Celler, H. N. Lovell, and D. Chan. The potential impact of home telecare on clinical practice, 1999. URL https://www.mja.com.au/public/issues/171_10_151199/celler/celler.html. Accessed on 20.05.2008.
- [74] Deutscher Olympischer Sportbund. Projekt Richtig fit ab 50. URL <http://www.richtigfitab50.de/rf50/projekte/dosb-projekt-richtig-fit-ab-50/>. Accessed on 23.05.2008.
- [75] Deutsches Rotes Kreuz. Tages- und Kurzzeitpflege. URL <http://www.drk.de/krankenhilfe/kurzzeitpflege.htm>. Accessed on 21.05.2008.
- [76] Deutsches Rotes Kreuz. Entlastende Hilfen für Pflegende, 2008. URL <http://www.drk.de/dls/index.html>. Accessed on 25.05.2008.
- [77] H. Döhner, C. Kofahl, D. Luedecke, and E. Mnich. Services for supporting family carers of older dependent people in europe: Characteristics, coverage and usage - the national survey report for germany, 2007. URL http://www.uke.uni-hamburg.de/eurofamcare/documents/deliverables/nasure_de.pdf. Accessed on 24.05.2008.
- [78] M. Egil. Neue Technologien für Medizin und Gesundheitswesen? *Swiss Medical Informatics*, 2002.
- [79] A. Faller and S. Kaufmann. Telemedizin: Fachwissen weltweit vermitteln. *Managed Care*, 2007.
- [80] J. Gaymu, P. Ekamper, and G. Beets. Future trends in health and marital status: effects on the structure of living arrangements of older europeans in 2030. *European Journal of Aging*, 5:5–17, 2008.
- [81] U. W. Geisthoff, P. A. Federspil, C. Sittel, and P. K. Plinkert. Telemedizin: Interaktionen zwischen Klinik und Praxis. *HNO*, 2002.

- [82] Muenchner Volkshochschule GmbH. Bildung für Aeltere, 2008. URL <http://www.mvhs.de/>. Accessed on 21.05.2008.
- [83] T-Systems Enterprise Service GmbH. White paper healthcare industry in germany, 2008. URL http://download.sczm.t-systems.de/ContentPool/en/StaticPage/29/29/29290_Whitepaper-Healthcare-ps.pdf. Accessed on 19.05.2008.
- [84] U. Hübner, B. Sellemann, and A. Frey. Nutzung gemeinsamer IT Strukturen im Rahmen der Integrierten Versorgung: aktueller Stand und Pläne aus Sicht der deutschen Krankenhäuser. *Sektion Informatik im Gesundheitswesen, Fakultät Wirtschafts- und Sozialwissenschaften der Fachhochschule Osnabrück*, 2006.
- [85] Immobilienscout24. Betreutes Wohnen, 2008. URL http://www.immobilienscout24.de/de/finden/wohnen/seniorenwohnen/senioreinrichtungen/betreutes_wohnen/index.jsp. Accessed on 20.05.2008.
- [86] Infratest Sozialforschung. Hilfe- und Pflegebeduerftige in Privathaushalten in Deutschland 2002, 2003. URL <http://www.tns-infratest-sofo.com/downloads/mug3sb.pdf>. Accessed on 25.05.2008.
- [87] Der Johanniterorden. Betreutes Wohnen - Wohnen mit Service, 2008. URL <http://www.johanniter.de/org/juh/leistungen/zuhause/wohnen/deindex.htm>. Accessed on 21.05.2008.
- [88] R. Kirchmair. Senioren: die sparsame Generation? *Wirtschaftspsychologie aktuell*, 2:53, 2005.
- [89] K. Klein. Sportentwicklungsbericht 2005 und 2006, 2007. URL <http://idw-online.de/pages/de/news212328>. Accessed on 25.05.2008.
- [90] G. Klumpp and N. Roehrich. Zukunftsgestaltung in einer alternenden Gesellschaft, 2008. URL http://www.bagso.de/fileadmin/Aktuell/Publicationen/Zukunftsgestaltung_zweite_Auflage.pdf. Accessed on 21.05.2008.
- [91] T. Kreiss and R. Salzmänn-Zoebeley. Formen der mobilen geriatrischen Rehabilitation - Konzeptionen im Vergleich. Technical report, social invest consult gGmbH, January 2003.
- [92] M. Lohmann and K. Winkler. Gesundheitsreisen - Wellness, Fitness und Kur. 2005.
- [93] V. Marshall. Analyzing social theories of aging. pages 434–455, 1999.

- [94] Statistische Ämter des Bundes und der Länder. Demografischer Wandel in Deutschland: Auswirkungen auf Krankenhausbehandlungen und Pflegebedürftige im Bund und in den Ländern, 2008. URL http://www.statistik-portal.de/Statistik-Portal/demografischer_wandel_heft2.pdf. Accessed on 21.05.2008.
- [95] Wellness Hotel Muerz. Wellness und Kururlaub Angebote Deutschland, Aktuelle Angebote für einen Kururlaub für Junge und Senioren, 2008. URL <http://www.muerz.de/wellnessangebot/kururlaub.html>. Accessed on 25.05.2008.
- [96] G. Naegele. Seniorenwirtschaft in Deutschland: Tourismus & Wellness im Alter.
- [97] G. Naegele and K. Leichsenring. Europäische Strategie zur Langzeitpflege: Das Procure-Projekt und seine konkreten Auswirkungen fuer die EU. *European Care Conference*, 2008.
- [98] W. Neumann. *Herausforderungen einer zukunftsorientierten Unternehmenspolitik*, chapter Unsere Gesellschaft wird älter - Neue Geschäftsmodelle im Gesundheitswesen, pages 153–165. Deutscher Universitäts-Verlag, 2007.
- [99] BRK Neumarkt. Fachstelle fuer pflegende angehörige bei pflege und demenz, 2008. URL <http://www.brk-neumarkt.de/?cat=pflegeangeh>. Accessed on 25.05.2008.
- [100] R. Reichwald, K. M. Möslein, M. Kölling, and K. Neyer. Service im Gesundheitssektor. URL http://innovationsforen.clicresearch.de/fileadmin/user_upload/clicforen/publications/5Service-Gesundheit-fin.pdf. Accessed on 21.05.2008.
- [101] A. Reidl. Neue Wege und Inhalte: Kommunikation mit der Generation Silber, 2005. URL http://www.gfk-verein.de/index.php?article=act_05_06&lang=german&f=congress05. Accessed on 21.05.2008.
- [102] Robert Bosch Stiftung. *Pflege neu denken. Zur Zukunft der Pflegeausbildung*. 2001.
- [103] Roland Berger Strategy Consultants. Trends in european health care. how to create value in a dynamic environment., 2007. URL http://www.rolandberger.com/media/pdf/rb_press/RB_Trends_in_European_healthcare_20070901.pdf. Accessed on 21.05.2008.
- [104] H. Rothgang. *Ziele und Wirkungen der Pflegeversicherung: Eine ökonomische Analyse*. Campus Verlag, 1997.

- [105] SAP. Sap for healthcare. healthcare providers: Industry overview, 2008. URL http://www.ehealthnews.eu/images/stories/pdf/sap_for_healthcare.pdf. Accessed on 19.05.2008.
- [106] S. Schaible, A. Kaul, M. Luehrmann, B. Wiest, and P. Breuer. Wirtschaftsmotor Alter - Endbericht, 2007. URL <http://www.bmfsfj.de/bmfsfj/generator/RedaktionBMFSFJ/Abteilung3/Pdf-Anlagen/endbericht-studie-wirtschaftsmotor-alter,property=pdf,bereich=,sprache=de,rwb=true.pdf>. Accessed on 51.05.2008.
- [107] R. Schnabel. Zukunft der pflege. Technical report, Universität Duisburg Essen, ZEW, May 2007.
- [108] N. Schwarz and G. Miehling. Praxisleitfaden des Bayerischen Landes-Sportverbandes (BLSV) zum Projekt Richtig fit ab 50, 2005. URL http://www.blsv.de/fileadmin/user_upload/pdf/breitensport_richtig_fit_praxisleitfaden.pdf. Accessed on 24.05.2008.
- [109] Statistisches Bundesamt. Pflegestatistik 2005, 2007.
- [110] TNS-Infratest. (N)onliner Atlas 2006, 2007. URL http://www.initiated21.de/fileadmin/files/NOA_Umzug/NOA_Atlanten/NONLINER-Atlas2006.pdf. Accessed on 19.05.2008.
- [111] Silverlife Unternehmensberatung. Silverlife unternehmensberatung, 2008. URL <http://www.silverlifeconcept.de/leistungsspektrum/unternehmensberatung.php>. Accessed on 15.05.2008.
- [112] U.S. Departement of Health and Human Services. Community health representative vocabulary, 2007. URL <http://www.ihs.gov/NonMedicalPrograms/chr/vocab.cfm>. Accessed on 22.05.2008.
- [113] World Health Organization. WHO - Terms Commonly Used, 2006. URL http://www.searo.who.int/en/Section10/Section18/Section356/Section421_1623.htm. Accessed on 14.05.2008.
- [114] ZDWA. Deutschland im demografischen Wandel, 2005. URL http://www.zdwa.de/zdwa/artikel/broschuere/broschuere_gesamt.pdf. Accessed on 18.05.2008.

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Chapter 4

Legal Framework and Standardization in eHealth

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The first aim of this report is describing the status quo of standardization processes including relevant legal framework issues in the European Union and especially Germany. The second aim concentrates on analyzing launching or ongoing trends in this sector till the year 2013.

Due to the Lisbon Strategy, the European Union launched the i2010 program including projects like eInclusion and Ambient Assited Living (AAL) which are funded by the Sixth and the Seventh Framework Program. Aside eHealth describes a social trend realized by the eHealth Action Plan which is aimed to modernize the health care system by using modern ICTs.

The major requirements for securing interoperability in the health care sector are: A health architecture for a information network. Regional and National networks are already existing, international developing. Standardization of IT, data and applications is essential for the interoperability of the systems in use, storage and transmission of medical data and so is operation among the participating stakeholders. However, the reality is, that at present the mentioned points are still under development and can not yet guarantee full interoperability in the eHealth system. Services over eHealth networks despite similar long term goals among the countries vary widely. In the new eHealth model the patient is put in the center and has more responsibility and opportunities to look after his own health care.

With the i2010 program the EU has introduced a overall concept for ICT with the goal of promoting growth and employment in the information society and media industry. Two initiatives of the EU mainly focus on the problem regarding the aging population. The first program AAL aims to improve the quality of life of the aging population by using Information and Communication Technology (ICT). The goal of the second project eInclusion is to bring the benefit of the Internet and related technology into all segments of the population including differences in geography, gender, age, and disabilities.

The lack of physicality that eHealth tools cause is the major reason for the necessity of an enhanced legal framework. Already existent privacy and data protection regulations seem to suffice the requirements of eHealth tools, but are strongly based on the concept of needing the patient's consent for all electronic data processing, which in some cases shows to be to the patient's detriment. For eHealth tools there are no specific data and service liability regulations, current law relying on general specifications. Thus difficult categorization of an eHealth application into the general service provision context invokes legal uncertainty. Same legal uncertainty exists in reference to whether a public undertaking stands under current competition law and due to which criteria it can be excluded. Eliminating legal uncertainty is a key goal for future legal actions.

4.1 Introduction: Demographic Change Affects the Health Sector

According to the Federal Statistical Office, the proportion of the German population aged 65 and above is projected to increase from 24 percent in 2000 to almost 35 percent in 2030. Also the number of people living alone is dramatically increasing and will be more than doubled in 2050 (over 50% in Berlin 2004). In terms of this demographic development in respect of health care, initiatives and projects in Information and Communication Technology have been established by the EU. The future demographic challenge is to guarantee adequate support especially for the growing proportion of elderly people. New ICTs involved in health care has led to various projects and initiatives in order to enhance the quality of the life of elderly people, e.g. in terms of assisted living services. One day all of us will get old and need medical care. These emerging electronic health initiatives provide an all generations including reorientation of the health system with the focus on the patient with its individual needs. They open possibilities for better and border crossing health care services and are thus compatible to deal the rising demand of the future health care. The first part of the report gives an overview over standardization efforts made by the EU. In the following chapter analyzes standardization, interoperability and caused initiatives. A discussion of the legal framework issues follows in chapter 5. The report concludes with different challenges in the EU in contrast to the USA.

4.2 EU Strategies: Developments and Correlations

4.2.1 The Lisbon-Strategy - Turning Europe in the Most Competitive Economy

To comprehend the actual trends in Europe it is important to have a short look at recent efforts for the future launched by the EU.

In March 2000, the Heads of State started the Lisbon Strategy with the purpose of turning the European Union into the most competitive economy in the world and achieving full employment by 2010. This strategy consists of three pillars:

- **Economic Pillar**

Transformation into a more dynamic and knowledge-based economy with main focus on information society and R&D.

- **Social Pillar**

Modernization of the European social model considering human resources and combating social exclusion. The main focus is aimed to be on

education and full employment.

- **Environmental Pillar**

Economic growth without exploitation of natural resources.[124]

4.2.2 The Seventh Framework Programme and the Interrelation of Funded Projects

At the end of 2006 the EU launched the Seventh Framework Programme (FP7) which is the main project for funding research and technology development over the period from 2007 to 2013. This program follows the previous six framework programs, which started with the FP1 in 1984. With modified structure and simplified participation procedures via internet, the FP7 responds to the European Union's policy objectives to foster a competitive and sustainable Europe, initiated by the Lisbon Strategy. Its budget has been greatly increased from 17.5 billion Euro in the FP6 to 53.2 billion Euro in the FP7 and was meant to fulfill the Barcelona objectives to bring investment of 3% of GDP into R&D activities to be comprehensive to the United States with 2.59% of the GDP and Japan with 3.15% of the GDP. Two very important aspects of research supported by the FP7 are the health sector with 11%, i.e. 6.10 billion Euro, and in the ICT with 17%, i.e. 9.05 billion Euro. [123]

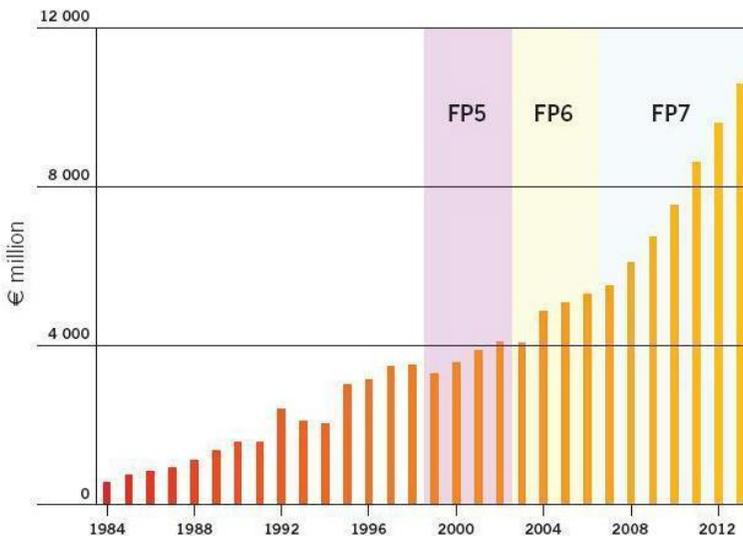


Figure 4.1: Framework programme budget
Source: European Commission [123]

total expenditure on R&D as % of GDP, 2003

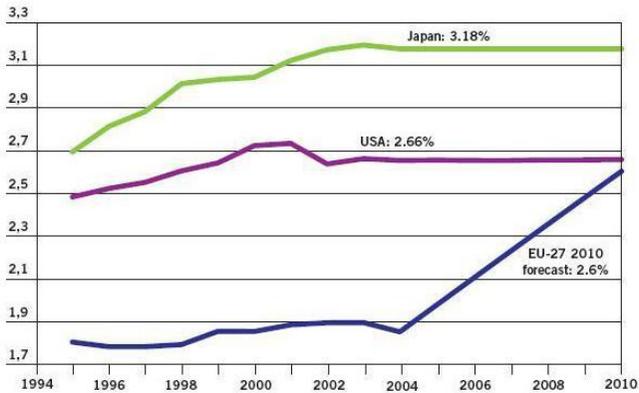


Figure 4.2: Filling the gap
Source: European Commission [123]

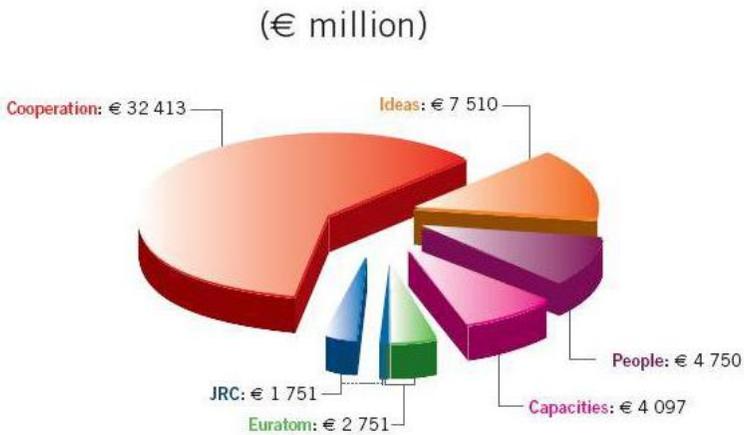


Figure 4.3: The breakdown of FP7
Source: European Commission [123]

By the FP7’s boost of the European research and innovation sector, the i2010 program was launched in June 2005 and scheduled until 2010.

In 2007 the Commission of i2010 presented a major European eInclusion Initiative for 2008. One focus area is the initiative aging Well in the Information Society. This initiative includes an action plan and research funding for

Ambient Assisted Living (AAL). 8.8 billion Euro of the overall innovative ICTs' investment will be spent on services and applications for citizens, e.g. eHealth, eGovernment, eLearning and eInclusion, and on small and medium-sized enterprises (SME), e.g. for eCommerce, networking and education. [125]

4.2.3 eHealth - The Modernization of the Health Sector

4.2.3.1 Definition and Short Explanation of eHealth

“E-Health [...] refers to the delivery of health information, diagnosis treatment and other services or healthcare transactions using information technologies, particularly those utilizing the Web or Internet” [134]

This includes interactions like telemedicine, digital communication and online prescribing. Once implemented, the program will allow patients, doctors and other institutions to retrieve medical information by unfamiliar channels from an almost infinite number of points. Therefore further development of eHealth implies questions in matters of confidentiality and security of patient records for health lawyers and medical professionals. [134]

4.2.3.2 Targets and Milestones of the eHealth Action Plan

Since 1988, the European Commission has supported research and development of eHealth activities for eHealth with about 650 million Euro in approximately 450 projects. At the moment eHealth is one of the main research fields in the FP7 and “Challenge 5 – Sustainable and Personalized Healthcare” in the ICT segment.

In 2004 the eHealth policy is described in the targets of the eHealth Action Plan, which is scheduled until 2010. An i2010 High-Level Group of Member States' representatives has been set up to advice the European Commission on the implementation and development of the i2010 Strategy. The targets of the eHealth Action Plan are:

- **By the end of 2007**

All Member States should have adopted procedures for testing the administration of eHealth tools and services.

- **In 2008**

The Commission concentrates on supporting the integration and extension of wireless broadband, mobile infrastructures and grid-technologies. Also a pan-EU electronic health insurance card should become available and by the end of the year the majority of European health organizations should provide online services, like tele-consultation, ePrescription, eReferral, tele-monitoring and tele-care.

- **By the end of 2009**

The Commission intends to eliminate legal obstacles for distribution of eHealth, to create new liability rules for eHealth products and services and to provide better information concerning the costs of eHealth services.

Each member state is also asked to develop national strategies for eHealth, as there is a need for specified regional eHealth strategies, e.g. in the Alps or on islands. Furthermore the cross-regional and cross-country interoperability of eHealth shall be ensured. [122]

Related policies of the eHealth action plan are, the Competitiveness and Innovation Framework (CIP) and SANCO. The CIP is a policy framework supporting the competitiveness of European companies and SANCO is the European Commission's services framework for dealing with general health policy.

4.3 Developing a Border-Crossing eHealth System

4.3.1 Impulse for a Border-Crossing Health Information System

eHealth pursues the goal of a border-crossing, improved medical care. New and evolving ICTs are about to be adopted by health sectors in Europe and make it possible that despite the increased mobility, the patient doesn't have to worry about his medical care no matter where he is. Information about the last doctor's visit, diagnosis and other medically relevant data shall be available in digital format everywhere, anytime.

4.3.2 Crucial Requirements for eHealth interoperability

The shift to internet-related healthcare activities has a great impact on various affected stakeholders like patients, providers, consumers, hospitals, suppliers' pharmaceutical entities and other entities. For securing interoperability, the seamless integration of heterogeneous systems, fast and correct availability of health related information within these entities is essential and based on three major requirements: health architecture, standardization and cooperation (figure 4.4):

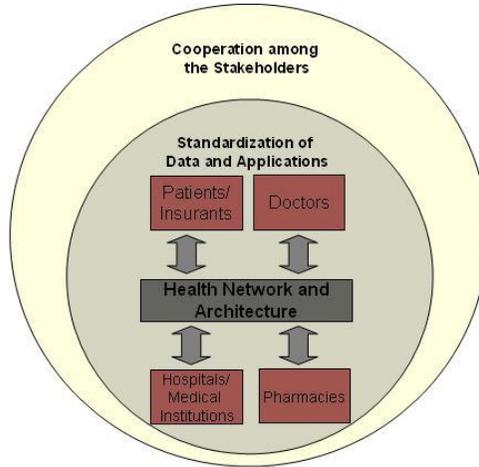


Figure 4.4: Crucial points of the health system
Source: Own Illustration

4.3.2.1 eHealth Architecture and Network

The deployment of a standard “eHealth-architecture, that consists of extranet, intranet and the internet to create a seamless access to data across a number of separate and different systems” [132] creates an information network for a standardized way for management and communication. Status Quo is that regional and national eHealth networks are operational or in planning in the majority of EU countries, and there are trends of expanding to international networks. Virtual Private Networks (VPNs) for public internet networks are a standard tool, like broadband technologies are widely in use in many countries in the healthcare domain and are fast growing in others. [120]

4.3.2.2 Standardization

The standardization is of the following points is fundamental for the interoperability of the systems in use, storage and transmission of medical data.

In some member countries of the EU already existing eHealth standardization initiatives have similarities, but still there are technical and functional differences. The international health standardization must be based on international accepted standards and avoid the creation of national substandard for establishing interoperability. At present all European countries have set interoperability as a high priority and are already working towards integrated and interoperable networks, but in the upcoming years there will be more attention on active deployment. [120]

IT and Data standards

IT based documentation of patients data and standardization of hardware and software is an important issue for more transparency, support of work processes and of the availability of current and relevant information for the treatment. This is done by developing comprehensive it-standards for the design and operation of the communication infrastructure in the health sector. National associations like the national “Verband der Hersteller von IT-Lösungen für das Gesundheitswesen (VhitG) or the Gesellschaft für Telematikanwendungen der Gesundheitskarte mbH (Gematik) work on the interoperability of IT-systems by standardized products and services in cooperation with the industry (e.g. IBM).

Data wise there are various standards developed a few years ago and constantly expanded. These harmonized terms are essential for a reliable interoperability of eHealth systems in the EU, e.g. for the usage of online business platforms for health data interchange or for the emerging eHealth records (EHR): [132]

- Drug Database: In 2003 the European Medicines Agency (EMA) developed a drug database system called EudroPharm for the Europe-wide dealing of pharmaceuticals.
- Health Classification for Global Information Exchange: The WHO established the International Classification of Diseases (ICD) (1994) and International Classification of Functioning, Disability and Health (2001).
- Health Care Data Standards: Clinical Data Interchange Standards Consortium (CDISC), a non-profit organization, develops healthcare data standard that are platform-independent.
- International standards like HL7 (International standard for electronic interchange of clinical, financial, and administrative data in the health care sector) or CDA (a document structure for the transmission of medical content based on HL7) are used e.g. for electronic referral letters. A Danish non-profit organization, SNOMED CT, e.g. works in this field for defining an international health terminology for better communication and interoperability.

Emerging Applications Standards

Electronic health card - standardized solution for individual health data shall replace by the end of 2008 the existing “Krankenversicherungskarte” (health insurance card), introduced 2004 in Germany. [115] Also in other countries there are similar projects for the introduction of eHealth cards with the aim of better transparency, communication and documentation. Among these countries there are two trends: Some concentrate on cards just used for authentication for health care services and others are deploying cards which

can additionally be used for storing the card holder's medical information and history. With these cards the personal health data will then be in the hands of the insurant, instead of being stored centrally. [120]

Electronic patient records (EPRs): At present the deployment state of EPRs still varies but EPRs in general are among the policy priorities of the majority of EU countries. Future development indicates a standardization of the architecture and structure of EPRs among the member countries. EuroRec, the European Institute for health records, is a European non-profit organization providing services to all concerned stakeholders and supports the development and usage of high quality EHR. [118]

ePrescribing: Generation of prescriptions through an automated data-entry process utilizing e-prescribing software and a transmission network which links to participating pharmacies. ePrescriptions are more efficient and less at risk for e.g. hand-writing errors. By the end of 2006 16 states of the EU had some ePrescribing activities. [120]

4.3.2.3 Cooperation of participating stakeholders

The cooperation of the mentioned stakeholders in the eHealth system is crucial. At present almost all European countries are involved in collaboration in terms of policies and exchanging experiences. But cooperation might also be a challenge as resistance to relying on technology and changing relationships with consumers exist or might arise. The future goal is to manage this challenges and expand the cooperation towards practical issues like organizing treatment of patients. Also the extension into the social care and welfare sector is progress. [120]

The architecture, standardization and cooperation are high on the policy agenda of the member countries in the EU. However, the reality is, that at present the mentioned points are still under development and can not yet guarantee full interoperability in the eHealth system. Services over eHealth networks despite similar long term goals among the countries vary widely, as they depend on each countries progress in the health sector. [120] Also further attention in terms of active deployment and standardization is needed.

4.3.3 eHealth Service and Accessibility Standardization

4.3.3.1 Patient driven health care

The new eHealth model puts the patient in the center of the health care system and therefore supports the growing independence of the patient. The mentioned "architecture will enable individuals to take a much more active role in their health care". [132] A large number of patients already exchanges and retrieves health related information via Internet and is better informed than in the past. The patient has more responsibility, flexibility and opportunities for

his own personal health care. Electronic self-service tools in clinics or doctors offices are more and more evolving - for example “kiosk” with touch screens for patient self-registration and education in combination with internet and intranet access. [132] With respect to the aging society the issue of accessibility for everyone evolves, not everyone has the means or skills to access, deal with and new ICT in the health care sectors. Therefore Europe wide initiatives have been developed and shall be presented in the following.

4.3.3.2 Initiatives introduced by the EU

i2010

Initiated by the European Commission in 2005, i2010 is a 5-year strategic framework to establish a uniform European information concept in Europe in cooperation with companies, associations and social groups. [117] It has the overall goal of promoting growth and employment in the information society and media industry and increasing the practical use of ICT. This is approached by promoting innovation and investment in research in the field of ICT, especially for public services, and realization of a information- and media-supported society. Thus it faces challenges like promotion of digital services and contents, expansion of interoperable devices and platforms. Also increasing the speed of broadband services respectively enable accessibility to ICT to allow more people in the member states to make use of it is important. [126] This subtopic, also called eAccessibility, focuses especially on the needs of disabled and elderly people. It deals with the elimination of technical, legal and other barriers which make the use of ICT-based services difficult for these people.

AAL

The European Commission has launched a new funding instrument within the FP6 for Research and Technological Development (R&D): The Article 169 of the EC Treaty of 1997. The Article 169 provides new possibilities of joint R&D activities with shared financial contribution between the European Commission and Member States. Four initiatives have been launched within the FP7. One so-called Article 169 initiative is Ambient Assisted Living and aims to enhance the quality of the life of elderly people and to strengthen the Europe-wide industrial base. [130, 127]

The main idea of the AAL Program consists of:

- Extending the time people can live in their preferred environment by increasing their autonomy, self-confidence and mobility,
- Supporting maintaining health and functional capability of the elderly individuals,
- Promoting a better and healthier lifestyle for individuals at risk,

- Enhancing the security, to prevent social isolation and to support maintaining the multifunctional network around the individual,
- Supporting careers, families and care organizations,
- Increasing the efficiency and productivity of used resources in the aging societies.

The six-year funding program has been started in 2008 and will end in 2013. Its budget is planned to cover an amount of 600 million Euro, consisting of 50% public funding and 50% private funding from the participating organizations. [116]

From 2004 to 2006, the preparation of “AAL” was funded as the Specific Support Action project "Ambient Assisted Living" under the IST (Information Society Technologies) priority within the FP6. Many projects have been launched during this time with focus on “Ambient Assisted Living in the aging Society”. Three out of 13 Europe-wide projects are for example:

- ALADIN (Ambient Lighting Assistance for an aging Population)
- EMERGE (Emergency Monitoring and Prevention)
- HAH (Hearing at Home)

In 2007, 14 European nations founded the legal body of a new AAL Joint Program: The AAL Association. Since then, the number of interested states to participate within this program increased to about 23 European Member States and Associated States (March 2008). The AAL Joint Programme regularly calls for proposals to launch European collaborative projects. These projects consists of a total budget of 1-7 million Euro with a maximum funding from the AAL Joint Program of 3 million Euro. The current topic is “ICT based solutions for Prevention and Management of Chronic Conditions of Elderly People”. The guideline for the projects include a duration between 12 and 36 months and a time-to-market perspective of 2 to 3 years beginning after the project R&D period finished. [116]

Many European countries are faced with an aging population and a rising demand for health care. As a founding member, Germany shows clearly the need of the AAL program: In 2000, the number of elderly people that were treated by one nurse was around nine. According to current predictions by the Federal Statistical Office, this ration will increase to 1 in 15 by 2030. Although the demographic change and aging is considered as a difficult challenge, it also provides new opportunities for citizens, social and healthcare systems. Technical inventions within the AAL Program will open up new European markets for industry and lower future social costs. [133]

eInclusion

eInclusion is an initiative of the European Union to lower the risks of a digital dividing among the population and to establish an inclusive information society. According to an eEurope Advisory Group¹, “e-Inclusion refers to the effective participation of individuals and communities in all dimensions of the knowledge-based society and economy through their access to ICT, made possible by the removal of access and accessibility barriers, and effectively enabled by the willingness and ability to reap social benefits from such access.” [131]

eInclusion aims to bring the benefit of the Internet and related technology into all segments of the population. In 2003, the European Union approached a digital dividing: between one fourth and one third of the EU population did not participate in the IT society development (source: Eurobarometer, June 2003). This situation was caused by transitory and structural gaps, differences and barriers in geography, income and social status, education (a special subset called eCompetences), gender, age (eAging), and disabilities (eAccessibility). eInclusion aims to bridge these gaps. The goals are:

- to enhance the opportunity for both individuals and organizations
- to lower the cost of public service delivery
- to improve society

At EU level, eInclusion is part of the third pillar of the i2010 program, managed by Directorate-General for Information Society and Media of the European Commission.

The eInclusion initiative consists of research projects, which aim to bridge the digital dividing:

- Ask-IT (Ambient intelligence system of agents for knowledge-based and integrated services for mobility impaired users)
- ENABLED (Enhanced network)
- EIAO (European Internet accessibility observatory)

The eInclusion initiative did not achieve its expected results yet. According to the “Measuring progress of eAccessibility in Europe” (MeAC) study (2006-2008), “there is only limited progress towards eAccessibility detected in Europe”. People with disabilities are still confronted with daily barriers regarding ICT products and services (telephony, TV, web and self-service terminals), which are considered as “essential elements of social and economic life”. In comparison to other countries (AU, CA and US), the situation for European people with

¹An eEurope coordination mechanism including experts from Member States and stakeholders

disabilities is “very unfavorably” in terms of the eAccessibility status and eAccessibility policy. It seems more to be a “patchwork” system with many gaps and wide disparities among the Member States. [121]

4.4 Legal Framework

4.4.1 Drivers for a New Legal Framework

Due to its conceptual nature eHealth is at the odds with the traditional structure of health services, providing these services in a nonlinear and non-hierarchical manner. Users detain an infinite number of physical space independent access points to eHealth. [134, 135] It is this lack of physicality that causes a major share of the legal issues in eHealth. [134, 132]

4.4.2 The eHealth Action Plan and the Legally eHealth Project

Together with the establishment of eHealth systems and services, the European Commission had to face the assumption that there were gaps in legislation that required further action. [137]. Keeping in eye Europe’s global economic position and aims to obtain stronger economic power, assuring legal certainty is crucial, as it is a pre-requisite for business to invest in innovation and for users and providers to assimilate new products and services. It is indispensable to know in advance who detains legal responsibility for each aspect of an application and it is the public authorities, i.e. the European Commission, who are entitled to fulfill the task of assuring this certainty. [129]

In order to fill these gaps the eHealth Action Plan was established, striving for an European space of electronic health services. In regards of legal and regulatory issues, the above mentioned action plan pursues, facing content and timeframe, the following goals: until the end of the year 2009 the European Commission together with the member states shall take action in order to set an European minimum standard regarding the qualification to supply online health services, establish a framework to ensure stronger legal certainty in reference to eHealth product and service liability, improve the level of information of patients, health insurance systems and health service providers on the rules for the takeover of costs of online health services and encourage the electronic health services in reducing working and commuting accidents and occupational disease.

Through this action plan, the European Commission called for the Legally eHealth Project, a baseline report on existent EU-wide legislation and it’s impact on eHealth services. As shown in figure 4.5, data protection, product and service liability and trade and competition are the legal issues the above mentioned report focuses on, as they might arise together with the identified

eHealth tools, i.e. hospital information systems (HIS), picture archiving and communications systems (PACS), electronic health records (EHR) or electronic prescribing systems. [135]

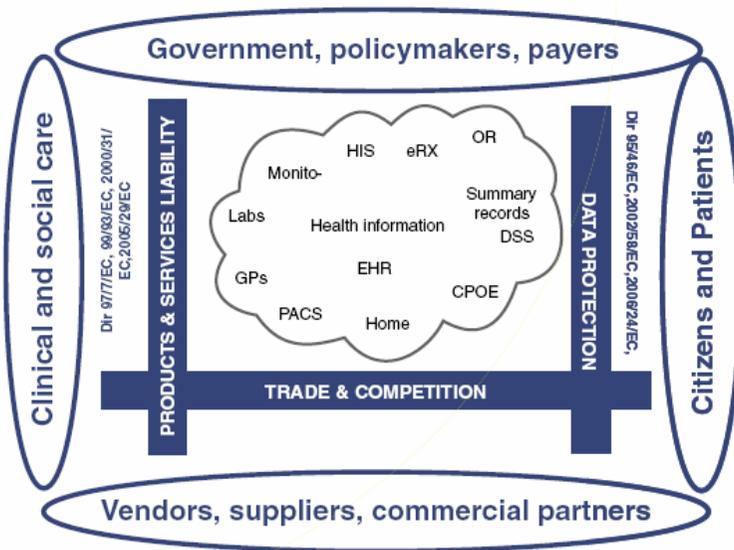


Figure 4.5: Interconnection between health information and eHealth tools, legal issues and relevant stakeholders

Source: Van Doosselaere [136, p. 13]

4.4.2.1 Privacy, Data Protection and Security

In the EU, data protection is a point of relief, as by 2006 it was already implemented by all member states, including Germany. [120] Current data protection directives seem too be sufficient to facilitate the efficient use of eHealth tools, determining what party detains which obligation [276], yet still is rather based on the patient's consent [119, 128], which is difficult to handle, as consent has to be freely given in order to be valid [135] and needs to proceed the data processing. [119] In contradiction to this, if we consider electronic medical records a health care quality improving measure, for a patient not giving his consent on creating an EHR could be to his detriment. [135] The introduction of the Electronic Health Card in Germany in January 2004 is an excellent illustration of this problem. The processing of the data saved on this card requires the patient's consent [128], the absence of this consent can reduce the quality of health care, for example because of former medical issues not being visible.

The adoption of specific rules that facilitate the processing of health information, while still allowing a proper balancing of both patients' and public health interest, by not recurring to the concept of consent, would be a serious improvement. [135] Also measures need to be taken in order to facilitate data protection by EU wide interoperable systems. [136]

4.4.2.2 Product and Service Liability

The EU has already set up general legislation on service and product liability, but which does not particularly address health or eHealth sectors [135]. Only five of the 27 EU member states have such regulation, also included is Germany. [120] In traditional environments, medical liability issues imply two parties: the patient and the health practitioner, in case of malpractice the patient would introduce a civil or criminal lawsuit against the doctor. [135] eHealth tools cause the multiplication of intermediaries between doctor and patient, so that for the patient it becomes difficult to identify on who's side the responsibility lies. [135] Commonly the patient would proceed against the doctor, which himself will proceed against the intermediary. [137] As the current EU law is applied within the general context of service provision and product delivery, it is difficult to attribute the eHealth product to a certain legislation category. [135] Future strategy consists in applying the existing European Medical Device legislation on all eHealth tools that are electronic equipment, medical devices or software packages promoted for medical purpose, excluding all tools used for patient data administration. [135] Already existing regulations on product safety, which require to provide consumers with necessary information, thus enabling assessment and avoidance of inherent risks, need to be stronger monitored by national authorities. [135]

4.4.2.3 Trade and Competition

As seen in previous chapters, economic growth is a key goal of the EU [136], thus the principles of free trade and free competition detain high priority and importance when it comes to supported economic principles. Practices which are related to the usage of market power by companies are prohibited by a complex legal system. [135, 136] Undertakings with antitrust objectives and the abuse of a dominant position are regulated by Articles 81 and 82, also applying the rules on public undertakings, as long as "the application of such rules does not obstruct the performance, in law or in fact, of the particular tasks assigned to them" (as stated in Article 86(2) of the rules applying to firms/undertakings). [135, 136] This means that public institutions can damage the competition exactly in the same way as businesses are capable of. [136]

In the EU many health services are public and financed through direct taxation. [135, 137, 136] eHealth on the other hand is mainly provided by

private enterprises and businesses [135], often being incorporated in healthcare services of public bodies [136], so the question concerning competition between two often difficult to distinguish markets arises - the public and the private market. As these providers seek to ensure functioning within an open market, the role of competition law gain importance. [136] This is enforced by the fact that a growing number of health services are purchased by private individuals, especially referring to long-term elderly care. [136] Ambiguity in current law inhibits a proper evolution of competition, as it is often unclear if a public institution is subject to competition law. [135] If these rules would obstruct the performance of a certain public undertaking, it can be classified as providing Services of General Economic Interest (SGEI). [135, 136] A SGEI usually is a service that: the market does not provide to the extent or quality required by the state and that is of general interest, approaching the public at large. [136] Yet still there is no EU level clarity on the designation of health services, as it is left up to the member states which services they consider an SGEI. [135] Future projects should plan to set out clearly under which circumstances services are a SGEI. These guidelines need to consider the changing nature of health services, as well as the numerous stakeholders ranging from private enterprises to public ones. [135]

4.4.3 eHealth Innovation Inhibited by Current Law

As the EU is not actually entitled to pass legislation with impact on the delivery of health services, the concept of European health law doesn't really exist. [137] All legal issues are regulated by referring to already existent legal frameworks from particular domains as data protection, eCommerce, liability for commercial goods or trade and competition. As the eHealth concept does not always perfectly fit onto these regulations, in the future they will need to be enhanced to deal with particular eHealth issues, in order to eliminate legal uncertainty [136] to promote economic prosperity. Furthermore health services will suffer innovation. Multidirectional communication could be implemented by using a Body Area Network (BAN), containing body parameters submitted to a diagnostic center where multifunctional data processing and therapeutic control of the patient take place. [119] This data could be made use of in case of public emergencies, for instance to control the spreading of an epidemics, having serious implications for privacy, as it presents the issue of involuntary diagnosis. [119] Feeding medical data collections into a web based grid, thus creating multidirectional and multilevel communication, is at present not manageable with current data protection regulations. [119] The use of Nano technology for medical purposes as well requires legal analysis and enhancement. It can bring serious improvement, i.e. earlier detection of disease, less invasive and lower cost treatments. Nevertheless, there are ethical concerns about toxic effects on humans and ecosystems. [135] Fundamental

rights and freedom are crucial EU priorities. Further problems might arise due to data protection, consent and confidentiality priorities. [135] Nano technology is regulated based on different legal contexts, i.e. the regulation of pharmaceuticals or medical devices. [135] Encouraging legal certainty is the key direction current legislative evolution has to take in the near future.

4.5 Conclusion: Different Requirements for EU and USA

In the United States, legal framework and standardization is a different process compared to Europe. Regional or local differences are almost non-existent. There is only one primary language and regulatory variation is minimal across the whole country. In contrast to the United States, Europe has to deal with national differences: cultural diversity, multiple languages, law systems, different aging society and customer needs and often significant regulatory variation. Although the member states of the European Union are aiming more and more to standardize and to establish a legal framework among each other, many differences lasting for decades still exist. It will be an exciting progress, what expected results will be achieved within the next few years through the EU's strong initiatives, strategies and projects, especially in the eHealth sector. Despite all existing and upcoming difficulties, Europe meets the challenge to improve the quality of life of citizens in Europe by developing and observing a legal framework.

References

- [115] Gematik. URL www.gematik.de. Accessed on 20.05.2008.
- [116] AAL-Europe. URL <http://www.aal-europe.eu>. Accessed on 19.05.2008.
- [117] Bundesministerium für Bildung und Forschung. Die Hightech-Strategie für Deutschland, 2006. URL http://www.bmbf.de/pub/bmbf_hts_lang.pdf. Accessed on 24.05.2008.
- [118] G. De Moor. *eHealth Conference 2007 - Infrastructures and Health Services*, chapter EuroTec - Quality Labelling and Certification of Electronic Health Record Systems, page 190. Gesellschaft für Versicherungswirtschaft und -gestaltung e.V. (GVG), Köln, 2008.
- [119] C. Dierks. Legal aspects of cross-border health and ehealth services. In *eHealth Conference 2007 - Policies and Strategies for eHealth across Borders*, pages 227–234, 2007.

- [120] eHealth ERA Team. The european ehealth policy and deployment report 2006, November 2007.
- [121] Empirical Communication and Technology Research Bonn, Work Research Centre Dublin. MeAC study: Assessment of the Status of eAccessibility in Europe, 2006-2008. URL http://ec.europa.eu/information_society/activities/einclusion/docs/meac_study/meac_report_06_11_final.pdf. Accessed on 25.06.2008.
- [122] European Commission. e-health - making healthcare better for european citizens: An action plan for a european e-health area, April 2004. URL <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2004:0356:FIN:EN:PDF>. Accessed on 23.06.2008.
- [123] European Commission. Inside the Seventh Framework Programme. *RTDinfo. Magazine on European Research*, page 36, June 2007.
- [124] European Commission. Treaty of lisbon amending the treaty on european union and the treaty establishing the european community. *Official Journal of the European Union, C 306*, 50, December 2007.
- [125] European Commission. Preparing Europe's digital future. i2010 Mid-Term Review. Volume 2: i2010 - List of actions, April 2008. URL http://ec.europa.eu/information_society/eeurope/i2010/docs/annual_report/2008/sec_2008_470_Vol_2.pdf. Accessed on 22.05.2008.
- [126] European Union. i2010 - Eine europäische Informationsgesellschaft für Wachstum und Beschäftigung, July 2007. URL http://europa.eu/legislation_summaries/employment_and_social_policy/job_creation_measures/c11328_de.htm. Accessed on 22.05.2008.
- [127] A. Henson. Next steps towards article 169 of the europe treaty. 2008.
- [128] J. Holland. Die rechtlichen Herausforderungen in Deutschland für die Erbringung von elektronischen Gesundheitsdiensten aus einer europäischen Perspektive. In *eHealth Conference 2007 - Policies and Strategies for eHealth across Borders*, pages 235–240, 2007.
- [129] L. Hromkova. e-health legal challanges. european integration and healthcare systems, September 2007. URL http://www.ose.be/symposium280907/files/Hromkova_slides280907.pdf. Accessed on 15.05.2008.
- [130] M. Huch and H. Strese. Ambient Assisted Living - Preparing an Artikel 169 Measure. *mst news*, 2005.

- [131] D. Kaplan. e-inclusion: New challenges and policy recommendations. 2005.
- [132] S.K. Sharma, H. Xu, N. Wickramasinghe, and N. Ahmed. Electronic healthcare: Issues and challenges. *International Journal of Electronic Healthcare*, 2(1):50 – 65, 2006.
- [133] H. Steg, J. Hull, and S. Schmidt. Demographic Change in Europe and Industrialised Countries Requires AAL Innovations. *mst news*, 2005.
- [134] N.P. Terry. Structural and legal implications of e-health. *Journal of Health Law*, 33(4):605–614, 2000.
- [135] C. Van Doosselaere, J. Herveg, D. Silber, and P. Wilson. ehealth... but is it legal? *Eurohealth*, 13(2):1–4, 2007.
- [136] C. Van Doosselaere, J. Herveg, D. Silber, and P. Wilson. Legally ehealth. putting ehealth in its europe legal context. legal and regulatory aspects of ehealth, March 2008.
- [137] P. Wilson. Charting the european legal landscape for ehealth. In *eHealth Conference 2007 - Policies and Strategies for eHealth across Borders*, pages 241–247, 2007.

5

Chapter 5

Changes and Challenges in the Social System

Philipp Gutheim, Irene Herranz, Isabella Reichert, Johannes Seiler

The Social Insurance is the core of the German Social System. It consists of five sectors, namely the Unemployment Insurance, the Accident Insurance, the Pension Insurance, the Health Insurance and the Nursing Care Insurance. Each of those sectors has a specific function, is financed in a specific way and provides different benefits. The Social Insurance faces great challenges due to Demographic Change. For each of the five sectors, the implications of the Demographic Change are analyzed. Further, current and future trends such as legal changes, technology development and financing solutions as countermeasures to demographic effects are depicted.

5.1 Introduction

As Demographic Change is an unavoidable trend and has great impact on the German Social System, it is important to develop solutions to keep the social system running and to compensate negative demographic effects. This report depicts the status quo of the social system, explains the influences of demographic change and presents latest trends respectively.

5.2 Principles of the Social State

5.2.1 Social State Germany

5.2.1.1 Definition Social State

A social state is a democratic state, that does not only guarantee basic rights and personal and economical liberties constitutionally, but also takes legal, financial and material measures in order to balance social extremes and frictions up to a certain dimension. It is attached to the constitutional aim of equity and is defined in articles 20 and 28 of the German Basic Law. [190] The most important system of social security is the social insurance which is a compulsory insurance. It offers financial protection against the big risks of life and its effects like sickness, unemployment, aging, working accidents and need of care. It also guarantees a stable standard of living. [139, 172]

5.2.1.2 Principles

The main principles of the German social insurance are solidarity, generation adjustment and income redistribution. It is built up by the principle of autonomy under state supervision. Financing the social insurance is done by contributions. Important characteristics are that the contribution is a percentage part of the income and is paid partly by the employee and partly by the employer. An exception in financing is the accident insurance where the contributions are paid only by employers. Benefits are either the same for everyone (e.g. medical benefits) or are proportional to the income drawn before (pension, unemployment benefit or sick Benefit). [193, 139]

5.2.1.3 Sectors and Supporting Organization

The German social insurance system includes five sectors with different supporting organizations. Sectors are the unemployment insurance, the accident insurance, the pension insurance, the health care insurance and the nursing care insurance. By delegating tasks to supporting organizations the state is released. [190, 173]

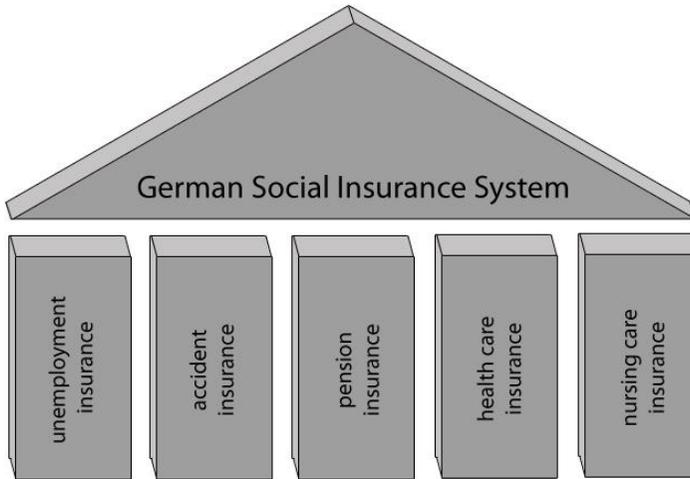


Figure 5.1: The five Sectors of the German Social Insurance System
Source: Deutsche Sozialversicherung [173]

5.2.1.4 Benefits

Benefits can be subdivided into three categories: standard Benefits, which are most of the Benefits and which are regulated directly by law, supererogation which the supporting organizations are allowed to give and Benefits by application which the lawgiver can tell the supporting organizations to give. Benefits given are either financial or service support. In the sectors unemployment insurance and pension insurance financial support, whereas in the sectors health insurance and nursing care insurance service support is dominant. [139]

5.2.2 Influence of Demographic Change on Social Insurance

5.2.2.1 Effects on Number of Contributors

The loads of the social insurance are carried by the number of people in paid work (22 to 65 years) in Germany. The demographic change in Germany will lead to a change in age structure. The percentage part of people in paid work of the total population, which was 50.1 million (2005) will decrease to 48-49 million (2020), to 42.4-44.2 million (2030) and further to 35.5 -39.1 (2050). Also, the German total population of 82,4 million (2005) will shrink to 76-79 million (2030) and to 69-74 million (2050). But in spite of this, the percentage part of people in paid work of the total population will decrease by 22-29% from 2005 to 2050. All in all, there will be less contributors of the social insurance than so far. Thus, maintaining the German social insurance system

will lead to rising contributions. In 2008 the contribution rate is set at 38,9 percent of the income. The biggest parts are the pension insurance (19.9%) and the health insurance (14%). So, biggest parts of the social insurance are sectors which mainly elderly people benefit from. [202, 178, 188]

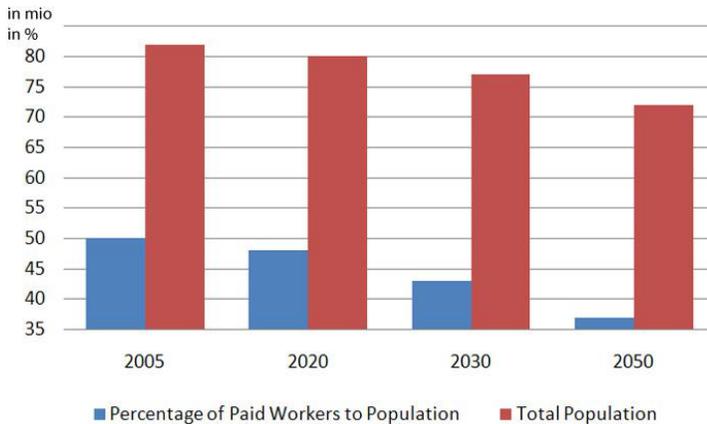


Figure 5.2: Development of total population and percentage of paid workers over time

Source: [202]

5.2.2.2 Effects on Number of Insured People

The biggest effects of the demographic change will occur in pension insurance, health care insurance and nursing care insurance as those are the sectors mainly old people receive most Benefits from. Percentage of old people (older than 65) of the total population will increase from 19% (2005) to 27-30% (2030) and to 33-36% (2050). If and how well today's contributors will receive care in case of sickness and need for care in the future, is dependent on the sum of the "Jugendquotient" and the "Altenquotient", called the "Gesamtquotient". This is the number of no longer or not yet employable persons relating to 100 employable persons. The higher this sum is, the higher is the burden every person in paid work has to carry. It first will decrease from 65 (2005) to 54 (2010) but then rise rapidly over 80 (2030) to 89 (2050). So one person in paid work will have to pay for almost one other person. Even by heightening of the pension age to 67 years the Altenquotient will rise rapidly. What makes things worse is that expectancy of life is also rising. The life expectancy for men born in the year 2005 is about 76 years, for women 82. In the year 2020, the life expectancy will be about 80 years for men and 85 years for women. It will continuously rise to 85.4 years for men and 89.8 years for women in the year 2050. So there will even be more people at a age higher than 65 years

that have to be financed by a decreasing number of people in the age of 20 - 65 years. Consequently, there will be more people taking Benefits from the social insurance and less people paying for it. This leads to the questions how the social insurance will be financed in the future. [202, 178]

5.3 German Social System

5.3.1 Unemployment Insurance

5.3.1.1 Status Quo

Every person that has an income above the insignificance limit has to pay for the compulsory unemployment insurance without respect of his will. Some groups of people do not have to pay unemployment insurance as they are not intended to be covered by this insurance. Examples are civil servants, soldiers and persons older than 65 years. Since February the 2nd 2006, also people caring of relatives, self-employed workers or persons working out of the European Union and associated states are allowed to reinstate voluntarily if they fulfill a certain previous insurance time.

The task of the unemployment insurance is to ensure jobs and to give financial Benefits to unemployed persons in order to reduce the economic effects of unemployment. The supporting organization is the Federal Employment Office ("Bundesanstalt für Arbeit"). [193, 146, 171] Benefits of the unemployment insurance can be subdivided in two sectors: Benefits for unemployed (e.g. unemployment pay, unemployment aid) and arrangements for conservation and creation of jobs (e.g. employment-creation measures). Further Benefits are arrangements of the labor market policy (e.g. reeducation and vocational education). [193] Financing the unemployment insurance is done with contributions of employees, employers and third parties (employment promotion contribution) as well as through allocations, federal funds and other income. Employers and employees each pay half of the employment promotion contribution. [169] Contribution rate is set at 3,3% of the contribution assessment basis which is for usual the employee's assessable income up to a certain contribution assessment ceiling (2008: old Länder 63600 Euro/year, new Länder 54000 Euro/year). Contributions are paid half by the employee and half by the employer. [147, 169] The jobless rate in Germany was 8,1% in April 2008. 5.999.000 employable persons got wage compensations. [144]

5.3.1.2 Trends

The demographic change will also have effects on the unemployment insurance system. The reason for this is that the German population is shrinking and on the one hand there will be more old people who do not work anymore but on the other hand there will be less people at working age. There will not be labor

deficit, but the age structure of the workforce will change. The percentage of old people in paid work is rising. In 2005, the percentage of people in paid work at an age 30 to 49 years was 50%, at an age of 50 to 64 years 30% and at an age of 20 to 29 years 20%. In the years 2020, the first group will count for 42%, the second for 40% and the third for 18%. There is the fear that with an aging labor force the innovative ability of German economy will decrease as less young people enter business and bring up-to-date know-how received from the German education system. The risk for old people to be decapitated is bigger than for young people and the chance of a comeback to the employment market is smaller. In order to make old people more attractive for business and to maintain the innovative ability it is necessary to set up professional development programs and programs for reintegration of elderly people into employment market. Such programs have already been started in some areas of Germany, e.g. the programs 50+ in Thüringen, the program 50 plus by the “Bundesanstalt für Arbeit” and several projects carried by the “Arbeitsmarktfonds” in Bavaria within the so called “Beschäftigungspakt”. [202, 189, 158]

5.3.2 Accident Insurance

5.3.2.1 Status Quo

The institutions for statutory accident insurance and prevention (Berufsgenossenschaften, BGs) provide coverage and assume liability for the consequences of occupational accidents (during the performance of their working activities), occupational diseases (on the way to or from work or when traveling on behalf of the employing company) and commuting accidents (suffered from as a result of their working activity). At present, there are 26 BGs insuring some 3 million German commercial businesses, divided according to the different branches of industry. Due to this, each BG is extremely well aware of the special occupational risks in its own economic sector and has a good know-how respectively. Statutory accident insurance is a compulsory insurance for employers and those insured automatically have full coverage. In 2005, the number of insured persons stated around 40 million. [166, 183, 186, 199]

The three cornerstones underlying the German insurance scheme and representing its Benefits, are the following:

- Prevention: against work-related health hazards to reduce accidents at work, occupational diseases and related risks such as stress and mobbing. The BGs issue regulations by formulating prevention policies and even laws and nearly 2400 experts inspectors give advice to the enterprises and enforce the adequate safety measures.
- Rehabilitation: restoration of health and working capacity through medical treatment and reintegration into professional life and social

environment. For this purpose, the BGs run 11 own hospitals for in-patients and there is a network of nearly 3500 transit physicians (medical experts) for out-patient treatment.

- Compensation: provision of financial Benefits (e.g. pensions) in case the ability to work can not be fully re-established i.e. the earning capacity has been permanently reduced by at least 20 percent. [166, 184, 185, 182, 141, 195, 194]

In regard to financing, in contrast with other obligatory insurances, the costs for accident insurance are exclusively borne by the employer. There is no standardized contribution rate, as there are BGs having low contribution rates (e.g. bank sector) while others having high ones (e.g. mining industry, building trade). Therefore, the contribution rate is higher when the risk of accident for the employees is (statistically) higher. The average contribution rate of all BGs amounts to 1.32 %. [195, 194, 166]

5.3.2.2 Trends

The German accident insurance system is affected by demographic changes in many ways. It has a direct impact mainly due to an aging workforce as the number of younger and middle-aged people in employment will fall dramatically, while the proportion of older people will increase relatively.

It will result in a number of consequences mainly in three respects which outline the trends of this sector as countermeasures to the afore mentioned demographic change effects. In addition, this measures follow as well the current principle of the accident insurance scheme in which it is given precedence to prevention over rehabilitation over pensions as the goal is to reintegrate workers into the work process as quickly and fully as possible by means of effective prevention and rehabilitation measures. These consequences mainly fall into three respects:

- Targeted prevention measures for older employees: emphasize the prevention measures with preventive accident policies specially conceived for old people in employment.
- Reform of the structure and quality of care associated with the increased requirement of older people for medical care.
- Efficient rehabilitation measures: such as “return-to-work” programmes to keep the overall shrinking potential number of people capable of employment (even in the case of reduced physical capacity) in employment. [141, 195, 194]

From all above it can be concluded, that in order to achieve a financial sustainability of the system, an optimal approach towards meeting the effects

of demographic change will be the adoption of measures based in promoting prevention and rehabilitation procedures with a great special focus on old-workers whose will remain increasing active.

Techniques based in disability management, consisting in preventive and rehabilitative measures for the retention of the performance of employed individuals and the avoidance of unemployment and early retirement and professional reintegration procedures will be key objectives of tomorrow's accident insurance system. [141, 187]

5.3.3 Pension Insurance

5.3.3.1 Status Quo

The German Pension Fund (Deutsche Rentenversicherung) is the organization which runs the German Statutory Pension System. Pension insurance is compulsory for employees as it is linked to gainful employment. In 2006 around 51.7 million persons were insured under this scheme. The German pension system is based on three pillars: state pension insurance, company pension plans and private provisions for retirement. The first scheme, known as the pay-as-you-go-system, covers around 80% of the employed population in Germany (i.e. 33 million people). The other two are supplementary private pensions. [168, 175, 165]

Pensions are granted mainly for three reasons. First, the old-age pension allows every insured person to retire from active working life upon reaching a certain age and having paid contributions for a minimum qualifying period and to receive an adequate pension on which to live. Secondly stands the disability pension on account of reduced earning capacity in case the insured person is unable to perform a 5-day work week. Finally, there is a survivors pension on account of the insured persons death i.e. widow/widowers and orphans pension. [168, 164]

The system is financed based on the pay-as-you-go principle, as an inter-generation contract in which the working insured contributions finance the pension of those who are already retired. It is financed through mutual contributions of employers and employees. At present, the contribution rate stands at 19.9% of the gross wage, paid in equal shares by employers and employees.

For each year of contributions, "earnings points" are awarded depending on the individual income position in relation to the average income. These points represent the insured person's claim for a pension. The sum of earning points is then multiplied by its value which is adjusted annually in order to ensure adaptation to the economic growth measured by the changing salaries and cost of living index. [175, 206]

5.3.3.2 Trends

The German pension system is facing serious challenges as consequence of the unfavorable demographic change. The major effect is the population aging due to an increasing life expectancy. The size of the older population is growing at a faster rate than the working population and the old-age dependency ratio raising rapidly. In 2005 it was 31% and the previsions for 2050 set it around 58%. The pay-as-you-go system has reached its limits and the cuts in Benefits are already a fact. [177, 180, 205]

As countermeasure to this effects, the German government initiated a reform path in 1990 by means of a series of reforms in order to keep adequacy of pensions and financial sustainability. One of the major focal points of this reforms is prolonging working lives. Germany is terminating early retirements and gradually raising the retirement age as well as promoting employment of older people. This is reflected in the 2007 reform in which the statutory retirement age was increased from 65 to 67 and the “Initiative 50plus” presented. [175, 180, 192] The other major focal point is to lower the growth of public pension spending. Such a reduction should be balanced by the development of additional private pension schemes. This transition to a multipillar system was carried out by means of the Riester reform of 2001. Its key was to encourage people to invest in the supplementary schemes i.e second and third pillars through incentives such as tax reduction and deduction. [142, 143, 192]

This trend of introducing privately funded pensions may outline a future transition to a fully capital-funded pension system as the solution to long-term financing of the state pension system. Under this scheme, a stock of capital is built up with the contributions and it is invested at a permanently good rate of return. Thus, the productivity of the capital makes it possible to increase the pension Benefits without changing the contributions. Moreover, the higher transparency makes gaps in provisions more transparent for the individual, and enables him to react more quickly by taking additional measures for provisions. [206, 142, 143, 174]

5.3.4 Health Insurance

5.3.4.1 Statutory Health Insurances

The statutory health insurances (Gesetzliche Krankenversicherung, GKV) are regulated by the fifth book of the Social Security Code (Sozialgesetzbuch). The purpose of this health insurance system is to obtain, recover or improve the state of health of the insured persons. The GKV are organized as independent public corporations. That means, they carry out certain functions for the state and are regulated by legal frameworks. One can distinguish between seven different types of health insurances, which have their origins in former organization of the insurance according to occupation groups. Within these

types, there were 218 insurances in April 2008. Since 1996, the insured people can largely choose at which of them they want to be insured. In general, employees whose yearly salary is not more than 48,150 Euro per year are statutory members of the GKV. Furthermore, pensioners, unemployed and some minor groups are obliged to insure themselves through the GKV. Others can participate voluntarily if they meet different requirements. Also, family members of GKV-insured can be co-insured for free if they do not have an own income above 355 Euro per month. In April 2008, 70,216,211 people were insured in the GKV, of which 73% were directly insured and 27% co-insured family members; 58% of the directly insured were statutory members. [159, 161, 155, 167, 154]

The GKV is financed through the members' and their employers' contributions which are charged depending on their earnings up to an upper limit (43,200 Euro in 2008). Each insurance defines its own rate of contribution. In 2007, the average rate was 13.89%. Contributions were shared half-half between employee and employer till 2005, since then the employed pays another 0,9% alone. Hence, the financing is carried out on an income-based system with the principle of sharing the contributions between employees/employers and respectively pensioners/pension funds or unemployed/unemployment funds. This implies, as services are accessed according to needs, a reallocation from well- to less earning, from healthy to unhealthy insured, from insured without children to those with children and from young to old insured. As people at working age need less health care and pay for more contributions than the youngest and the oldest groups of GKV members, the so-called inter-generation contract is based. Hence, those who pay during their working live obtain the claim to be supported by the following generation of insured when they are old themselves. Almost all payment for services is carried out by the GKV, not by the receiving person, to ensure a health care according to the needs and not to the monetary status of the insured. [170, 156, 162, 160]

5.3.4.2 Private Health Insurances

Private Health insurances (Private Krankenversicherung, PKV) are institutions with legal forms AG or VVaG. In 2007, there were 48 private health insurances united under one alliance (Gemeinschaft Privater Versicherungsunternehmen), which counted for almost all business in Germany's private health insurance sector. The PKV mainly offer three types of insurances: a full health insurance as alternative to GKV, additional health insurances for statutory GKV members and nursing care insurances. Fully insured members of the private health insurances are those who are no statutory members of the GKV, thus mainly civil servants, self-employed and employees with incomes above 48,150 Euro/ year. 8,489,100 people had full-coverage private insurances and contributed 20,509,600 Euro (2006). Moreover, 18,400,500 GKV insured held

additional health insurances to enrich the services of their GKV insurance and paid total contributions of 5,493,900 Euro. Other than those for GKV, PKV contributions are not income-based, but calculated on the basis of a personal risk analysis including factors such as sex, age, health status and the scope of services the insured person wants to receive. This contribution rate is supposed to be constant during the whole time one is insured, and only changed for reasons like an overall increase of costs. To make sure one's contributions are sufficient till the end of his life, the rate that a privately insured person pays is higher than his health expenses among the early years of his insurance but lower than his expected costs during the last years. With the surplus gained in early years, a reserve for later years is built. So, in contrast to the inter-generation contract system of financing the GKV, the private health insurances work according to a funding principle, in which everyone pays for his own expected costs. Since 2007, private health insurances are obliged to offer a basic tariff with benefits such as granted in the GKV without risk-based extra pay and a contribution only as high as the GKV maximum. [204, 151]

5.3.4.3 Trends

Change is required in the German health insurance system, as due to demographical change more old people will need health care and related services. Then again, less working population will be available to pay for the emerging costs. This scenario calls as well for efficient organization support as for new approaches of financing the health insurance system. Concerning the financing, several approaches are discussed in German policies- without clear results so far. Trend setting for further financing solutions are two concepts promoted by different political alliances: CDU, CSU vs. SPD, Grüne. The first mentioned propagandize a so-called health premium model (Gesundheitsprämie). That implies contributions that are independent from the income of the insured but are the same for everyone. This system is supposed to cause positive effects on employment figures, as the current direct load on income would drop out. The reallocation effects caused by the present statutory health insurance system e.g. from well-earning to less earning insured would not exist anymore, but tax rates would probably be changed accordingly for compensation. The model recommended by the other parties is aimed to comprise all citizens with all their incomes up to an upper limit in statutory health insurances (Bürgerversicherung). The involvement of all incomes, not only those directly from employment, should emphasize the fundamental idea of the social security system of contributing according to one's ability-to-pay. As the inter-generation contract financing is definitely not able to deal with the upcoming demographic changes, the funding principles of the PKV are discussed as financing system for GKV as well, either exclusively or partly. [196]

Besides the mentioned legal changes about financing the health insurance system, there surely will be changes in organizing information management. A rapid development is forecasted in the fields of information and communication technologies (ICT) for the following years, as high potential for cost-saving and increases in efficiency lies in the fields of administration. Using ICT systematically would improve internal and external data flow, avoid redundancies and increase quality and efficiency at all points of contact between different institutions such as patient, insurances, hospitals, doctors and pharmacies. The costs that can be saved that way are estimated to sum up to 20%. Especially for health insurance companies, which will more and more coordinate all those institutions' cooperations, the increased use of ICT will have great impact on efficiency, quality and costs. One special trend within the fields of information management is the planned release of the Electronic Health Card (EHC), which was decided to be realized within the health care reform of 2004. Purpose and framework of the EHC are stated in the Social Security Code (291 a SGB V). Introduction, maintenance process and further development lie within the responsibility of Gematik (Gesellschaft für Telematikanwendungen der Gesundheitskarte mbH), an organization founded only for this purpose. The EHC belongs to the field of telematics, thus to the intersection of consolidating, processing and transmitting data. The card is supposed to improve communication and documentation of all administrative and medical data concerning one patient. Hence, a plus of quality and efficiency is expected to be achieved, as the flow of information between the different institutions, is managed quickly, personalized and without any media disruption. The EHC was planned to be in use since 2006 on a regular basis by all insured persons, but till now it is still in test stage with some thousand participants only. Still under discussion are issues like data security and privacy, as any possible misuse of the confidential data must be eliminated. Different solutions regarding security issues, such as coding and allocation of rights, are developed and still modified by several institutions such as the Fraunhofer Gesellschaft, all under the guidance of Gematik. Regarding the costs and Benefits of the EHC introduction, different statements have been made. The Federal Ministry of Health estimates the costs for introducing the EHC to be around 1.4bn Euro. Another cost-benefit analysis approximated the upcoming costs for investment, operations and the cards themselves of about 6 billion Euro. In a ten-year forecast, the expenses for the EHC would sum up to 13,6bn Euro. Crucial for this amount are costs for optimizing and harmonizing processes, regarding new components but also integrating existing IT structures. However, Benefits will appear in the long run, after 5 years of use first involved groups as the insurance companies might profit from the EHC and in a ten-year run, benefits of at 14,1bn Euro are probable. [203, 138, 149, 157, 153, 152, 163, 198]

5.3.5 Nursing Care Insurance

5.3.5.1 Status Quo

As a response to the modern family pattern, the federal government introduced the nursing care insurance as one of the five pillars of the German social system. As described in section 5.2.1.2 this pay-as-you-go financing insurance consists of a contribution paid two thirds by the employee and one third by the employer. Financial and service support is independent of the contribution in case of need for care. [176, §1] Statutory insured persons automatically are members of the social nursing care insurance which covers just a limited amount of support. Privately insured persons have to cover a private nursing care insurance. The current rate every statutory insured person has to pay is 1.95% of his income. 2008 is the first year in which the rate as well as the financial and service support were raised since the establishment in 1995. [150]

At the moment more than 2 million people are supported by the nursing care insurance, whereas about two thirds of the insureds receive home care and one third lives in nursing homes. The number of people in need of care will continue to rise¹ from 2,13 million (2005) over 2,40 (2010) and 2,91 (2020) to 3,36 (2030) while the population is decreasing. [201] Except in 2006, current statistics shows that the revenue has become smaller than expenditures since 1999. The total costs for 2005 add up to about 17,86 bn Euro, the revenue to about 17,49 bn Euro. [197, 199f]

The home care sector is differentiated in ambulatory and non-ambulatory home care. The nursing care insurance supports non-ambulatory home care by providing a specific amount of financial support to the one in need. This amount depends on the degree of severity of disablement. Ambulatory home care goes with nursing service support. The nursing care insurance follows two main principles which are “prevention and rehabilitation before nursing services” and “ambulatory support before nursing homes”. Nursing homes are between two and five times² more expensive than prevention, rehabilitation and non-ambulatory financial support. [197, 176]

5.3.5.2 Trends

The trend within the nursing care insurance is leading towards an avoidance of non-ambulant home care but to nursing services and nursing homes as a result of the overstraining responsibility of handling work, family and care. [145] Therefore, the federal government already started to reorganize the social services according to rationalization and economization due to the current and prospective lack of liquidity. [140] In order to live up to the modern family

¹status-quo-scenario

²This rounded calculation depends on the degree of severity of disablement

pattern and to countervail the trend towards avoidance of non-ambulant home care, the government also focuses on reform efforts the experts recommend:

- At first, they advice to implement a dynamic and inflation adapted payoff system to ensure a constant value of financial and service support. Furthermore, politicians should establish a care budget system, as well as a local case management and an improvement of coordination between the care services in order to focus on individualized support services for the insurants who are in the need of care. [181]

Due to this recommendations, the federal government and the German Labor Union (Deutscher Gewerkschafts Bund, DGB) already worked out a reform effort in 2007 which consists of three main steps (Dreistufenplan). At first, there is a reform program which will be implemented directly (Sofortprogramm) and consists of the case management and a stronger focus on rehabilitation amongst others. In the second step, the financial and service support will be expanded and the third phase will standardize the nursing care insurance for all the insured persons. [200]

- The second aspect the experts aver on is a political reorientation towards a “pro family policy” which focuses not only on economic aspects and principles but more on the physical and psychological overstraining situation many families are facing. In their eyes, caring families needs an adequate “background knowledge, competence in caring, skills in reflecting and an integration of care within personal living conditions”. They recommend, that the value of home care done by family members should be supported by the government and should raise public awareness. [179] Thus, the “Sofortprogramm” of the “Dreistufenplan” contains a proposal for “more flexible and permeable types of services between non-ambulatory, ambulatory and nursing homes support to ensure a demand-oriented network of care services done by professionals, families and volunteers”. This should improve the compatibility of home care and career. [200] The federal government also established a so called “Multi-Generation-House” which should improve the bonds between the generations. [148]

The general trend within the nursing care insurance is leading towards an individualized case management. This implies a differentiated list of criteria which evaluates the exact need of support and will ensure a personal orientated, professional and a well-coordinated care between the different care services. These reforms are meant to facilitate the non-ambulatory home care done by family members and countervail the trend towards the expensive nursing homes.

5.3.5.3 Ambulatory and Non-Ambulatory Home Care

The ambulatory and non-ambulatory care sector has to focus even more on individualization, emotionalization and flexibility in order to compensate its decreasing share compared to the nursing homes.

Therefore, the experts recommend an obligated care management which is distinguished by three main steps.

First of all they advice to establish care stations in order to ensure an individualized, demand-oriented and professional home care. An interdisciplinary assessment to evaluate the needed degree of support should be implemented next. [181] In the last step an overview of regional health and care services should therewith be provided in order to avoid badly coordinated and misdirected care services.

Implementing those efforts within the Dreistufenplan the government has to cope with a current lack of funds. [191]

5.4 Conclusion

The Demographic Change is a fact. At the moment we are at a very early stage, however, there is an increasing awareness and it is already forecasted that the effects within the next 50 years will be extreme and affect every sector of the Social Insurance. Financing the Social System as it is so far will be problematic and statutory schemes have reached their limits. Thus, there is a need to adapt new schemes in to ensure financial sustainability. The discussed trends might be good approaches but will probably need accompanying measures to cope with the emerging challenges.

References

- [138] Accenture. Gesundheitsmarkt im Umbruch, 2002. URL http://www.accenture.com/NR/rdonlyres/3011BA1B-CE42-4A6E-8194-43391CC11110/0/eight_trends.pdf. Accessed on 22.05.2008.
- [139] R. Bartlsperger, H. Boldt, and D.C. Umbach. *Wie funktioniert das? Der moderne Staat*. Bibliographisches Institut AG, 1979.
- [140] A. Bauer. Die sozialen Kosten der Ökonomisierung von Gesundheit. *Aus Politik und Zeitgeschichte*, 8-9:17f, 2006.
- [141] J. Breuer. Current international trends in accident insurance. *Paper for the 7th International Congress on Work Injuries Prevention, Rehabilitation and Compensation with the Labour Department*, 2006.

- [142] A. Börsch-Supan and C. Wilke. The german social security system: How it was and how it will be. *NBER Working Paper No. 10525*, Cambridge, Mass., and *MRRC-Working Paper*, University of Michigan, 2003.
- [143] A. Börsch-Supan and C. Wilke. Reforming the german public pension system. *Paper for the 2004 General Assembly of the Japan Pension Research Council*, 2004.
- [144] Bundesagentur für Arbeit. *Der Arbeits- und Ausbildungsmarkt in Deutschland*. 2008.
- [145] Bundesinstitut für Bevölkerungsforschung. Bevölkerung - Daten, Fakten, Trends zum demografischen Wandel in Deutschland, 2008. URL http://www.bib-demografie.de/cdn_099/nn_750456/SharedDocs/Publikationen/DE/Download/Broschueren/bev3__2008,templateId=raw,property=publicationFile.pdf/bev3_2008.pdf. Accessed on 25.06.2008.
- [146] Bundesministerium für Arbeit und Soziales. Soziale Sicherung im Überblick, 2008.
- [147] Bundesministerium für Arbeit und Soziales. Sozialversicherungs-Rechengrößenverordnung, 2008. URL http://www.bmas.de/portal/21310/property=pdf/sozialversicherungsrechengroessenverordnung__2008.pdf. Accessed on 25.05.2008.
- [148] Bundesministerium für Familie, Senioren, Frauen und Jugend. Familie zwischen Flexibilität und Verlässlichkeit, 2006. URL http://www.bmfsfj.de/doku/familienbericht/download/familienbericht_gesamt.pdf. Accessed on 20.05.2008.
- [149] Bundesministerium für Gesundheit. Gesundheitsreform 2004, 2004. URL http://www.die-gesundheitsreform.de/gesetze_meilensteine/gesetze/gesundheitsreform_2004/index.html. Accessed on 17.05.2008.
- [150] Bundesministerium für Gesundheit. Vierter Bericht über die Entwicklung der Pflegeversicherung, 2007. URL http://www.bmg.bund.de/SharedDocs/Downloads/DE/Standardartikel/P/Glossar-Pflegeversicherung/Berichte-Zur-Entwicklung-der-Pflegeversicherung__4._20Bericht,templateId=raw,property=publicationFile.pdf/Berichte-Zur-Entwicklung-der-Pflegeversicherung_4.pdf. Accessed on 21.05.2008.
- [151] Bundesministerium für Gesundheit. Die neue Gesundheitsversicherung, 2007. 3. Edition.

- [152] Bundesministerium für Gesundheit. Meine Daten - Mit Sicherheit, 2007. URL http://www.die-gesundheitskarte.de/gesundheitskarte_aktuell/datensicherheit/index.html. Accessed on 17.05.2008.
- [153] Bundesministerium für Gesundheit. Planung und Testphase, 2007. URL http://www.die-gesundheitskarte.de/grundinformationen/planungen_und_testphase/index.html. Accessed on 17.05.2008.
- [154] Bundesministerium für Gesundheit. Gesetzliche Krankenversicherung: Mitglieder, mitversicherte Angehörige, Beitragssätze und Krankenstand, Monatswerte Januar-April 2008, 2008.
- [155] Bundesministerium für Gesundheit. Informationen zur gesetzlichen Krankenversicherung, 2008. URL [http://www.bmg.bund.de/cln_040/nm_605038/DE/Themenschwerpunkte/Gesundheit/Gesetzliche-Krankenversicherung/gesetzliche-krankenversicherung-node,param=Links.html__nnn=true"RAUTE"doc616820bodyText8](http://www.bmg.bund.de/cln_040/nm_605038/DE/Themenschwerpunkte/Gesundheit/Gesetzliche-Krankenversicherung/gesetzliche-krankenversicherung-node,param=Links.html__nnn=true). Accessed on 18.05.2008.
- [156] Bundesministerium für Gesundheit. Informationen zur gesetzlichen Krankenversicherung, 2008. URL [http://www.bmg.bund.de/cln_040/nm_605038/DE/Themenschwerpunkte/Gesundheit/Gesetzliche-Krankenversicherung/gesetzliche-krankenversicherung-node,param=Links.html__nnn=true"RAUTE"doc616820bodyText3](http://www.bmg.bund.de/cln_040/nm_605038/DE/Themenschwerpunkte/Gesundheit/Gesetzliche-Krankenversicherung/gesetzliche-krankenversicherung-node,param=Links.html__nnn=true). Accessed on 16.05.2008.
- [157] Bundesministerium für Gesundheit. Ziele der Gesundheitskarte, 2008. URL <http://www.die-gesundheitskarte.de/grundinformationen/ziele/index.html>. Accessed on 16.05.2008.
- [158] Bundesministerium für politische Bildung. Ältere: Gesellschaftliches Potential. *Aus Politik und Zeitgeschichte*, 2008.
- [159] Bundeszentrale für politische Bildung. Die gesetzlichen Krankenversicherungen (GKV) im System der sozialen Sicherung, 2007. URL http://www.bpb.de/themen/WZDR7I,0,Gesundheitspolitik_Lernobjekt.html?lt=AAA739&guid=AAA740. Accessed on 18.05.2008.
- [160] Bundeszentrale für politische Bildung. Sachleistungsprinzip, Kostenerstattung und die neue Patientenquittung, 2007. URL http://www.bpb.de/themen/WZDR7I,0,Gesundheitspolitik_Lernobjekt.html?lt=AAA739&guid=AAA02. Accessed on 18.05.2008.
- [161] Bundeszentrale für politische Bildung. Die gegliederte Krankenversicherung, 2008. URL http://www.bpb.de/themen/WZDR7I,0,Gesundheitspolitik_Lernobjekt.html?lt=AAA739&guid=AAA741. Accessed on 22.05.2008.

- [162] Bundeszentrale für politische Bildung. Die Umlagefinanzierung, 2008. URL http://www.bpb.de/themen/WZDR7I,0,Gesundheitspolitik_Lernobjekt.html?lt=AAA088&guid=AAA162. Accessed on 17.05.2008.
- [163] J. Caumanns, H. Weber, A. Fellien, H. Kurrek, O. Boehm, J. Neuhaus, J. Kunsmann, and B. Struif. Die eGK-Lösungsarchitektur. *Informatik-Spektrum*, 29, 2006.
- [164] Deutsche Rentenversicherung. Benefits, 2008. URL http://www.deutsche-rentenversicherung.de/nn_96750/DRV/en/Navigation/03__Leistungen__node.html__nnn=true. Accessed on 19.05.2008.
- [165] Deutsche Rentenversicherung. Insurance, 2008. URL http://www.deutsche-rentenversicherung.de/nn_96750/DRV/en/Navigation/02__Versicherung__node.html__nnn=true. Accessed on 19.05.2008.
- [166] Deutsche Sozialversicherung. Accident Insurance, 2006. URL <http://www.deutschesozialversicherung.de/en/accident/index.html>. Accessed on 19.05.2008.
- [167] Deutsche Sozialversicherung. Versicherte der Sozialversicherung, 2007. URL <http://www.deutsche-sozialversicherung.de/de/krankenversicherung/versicherte.html>. Accessed on 18.05.2008.
- [168] Deutsche Sozialversicherung. Retirement Pension Insurance, 2007. URL <http://www.deutschesozialversicherung.de/en/pension/index.html>. Accessed on 19.05.2008.
- [169] Deutsche Sozialversicherung. Finanzierung, 2007. URL <http://www.deutsche-sozialversicherung.de/de/arbeitslosenversicherung/finanzierung.html>. Accessed on 19.05.2008.
- [170] Deutsche Sozialversicherung. Finanzierung der Sozialversicherung, 2008. URL <http://www.deutsche-sozialversicherung.de/de/krankenversicherung/finanzierung.html>. Accessed on 19.05.2008.
- [171] Deutsche Sozialversicherung. Arbeitslosenversicherung, 2008. URL <http://www.deutsche-sozialversicherung.de/de/arbeitslosenversicherung/index.html>. Accessed on 17.05.2008.
- [172] Deutsche Sozialversicherung. Grundprinzipien im Überblick, 2008. URL <http://www.deutsche-sozialversicherung.de/de/wegweiser/grundprinzipien.html>. Accessed on 19.05.2008.

- [173] Deutsche Sozialversicherung. Sparten der Sozialversicherung, 2008. URL <http://www.deutsche-sozialversicherung.de/de/wegweiser/saeulen.html>. Accessed on 20.05.2008.
- [174] S. Drobnic, B. Beham, and R. Verwiebe. *Socio-economic Trends and Welfare Policies*. National Report Germany, University of Hamburg. Quality Research Innovation Project, European Commission, Citizens and Governance in a Knowledge-based Society, 2006.
- [175] European Commission. *Germany, synthesis report on adequate and sustainable pensions*. European Commission, Employment and Social Affairs, Social Protection and Inclusion, 2006.
- [176] Federal Ministry of Justice. SGB XI.
- [177] Finanzplatz e.V. *The pension system in Germany*. Report of the Deutsches Aktieninstitut e.V. and Finanzplatz e.V. Frankfurt, 1998.
- [178] Gesprächskreis Sozialpolitik Gesprächskreis Arbeit und Qualifizierung. Wiso-Diskurs: Zukunft des Sozialstaats - Sozialpolitik. *Friedrich Ebert Stiftung*, 2007.
- [179] K. Gröning. Der demografische Wandel und die Bildung der Generationen. *Sozialer Fortschritt*, 2:27f, 2007.
- [180] K. Haker. The reform process of the german pension system. *In Presentation for the International Forum on Pension Reform. Bled, Slovenia, June 2007. Federal Ministry of Labour and Social Affairs*, 2007.
- [181] Hamdorf, S. et al. Experten fordern Dynamisierung bei Leistungen und eine erweiterte Definition von Pflegebedürftigkeit. *Soziale Sicherheit*, 2: pages 58ff, 2007.
- [182] Hauptverband der gewerblichen Berufsgenossenschaften. Compensation, 2008. URL <http://www.hvbg.de/e/pages/entsch/index.html>. Accessed on 19.05.2008.
- [183] Hauptverband der gewerblichen Berufsgenossenschaften. Insurance coverage, 2008. URL <http://www.hvbg.de/e/pages/versich/index.html>. Accessed on 20.05.2008.
- [184] Hauptverband der gewerblichen Berufsgenossenschaften. Prevention, 2008. URL <http://www.hvbg.de/e/pages/praev/index.html>. Accessed on 20.05.2008.
- [185] Hauptverband der gewerblichen Berufsgenossenschaften. Rehabilitation, 2008. URL <http://www.hvbg.de/e/pages/reha/index.html>. Accessed on 21.05.2008.

- [186] Hauptverband der gewerblichen Berufsgenossenschaften. Statistics, 2008. URL <http://www.hvbg.de/e/pages/statist/index.html>. Accessed on 22.05.2008.
- [187] H.A. Hunt and R.V. Habeck. The michigan disability prevention study: Research highlights. *Michigan State University Upjohn Institute for Employment Research, State Working Paper*, 1993.
- [188] Institut für Soziologie Universität Duisburg Essen. Beitragssätze, Versicherungspflicht- und Beitragsbemessungsgrenzen, Rentenanpassung für das Jahr 2008, 2008. URL <http://www.sozialpolitik-aktuell.de/datensammlung/3/tab/tabIII15.pdf>. Accessed on 24.05.2008.
- [189] E. Kistler and M. Hilpert. Auswirkungen des demographischen Wandels auf Arbeit und Arbeitslosigkeit. *Aus Politik und Zeitgeschichte*, 2001.
- [190] M. Klein and K. Schubert. *Das Politiklexikon*. Dietz, Bonn, 2006.
- [191] A. Lang. Eine neue Form der wohnortnahen Beratung und Versorgung. *Soziale Sicherheit*, 10:pages 330ff, 2007.
- [192] D. Natali. Germany, the reformed pension system. *Research Project of the European Social Observatory, supported by the Federal Public Service Social Security*, 2004.
- [193] J.M. Polzin, A. Pollert, and B. Kirchner. *Das Lexikon der Wirtschaft. Grundlegendes Wissen von A bis Z*. Bibliographisches Institut & F.A. Brockhaus, 2004.
- [194] U. Raschke. Actual and future challenges in the german statutory accident insurance. *Paper of the Hauptverband der gewerblichen Berufsgenossenschaften (HVBG)*, 2002.
- [195] U. Raschke. Tasks of the german statutory accident insurance. *In Presentation of the Hauptverband der gewerblichen Berufsgenossenschaften (HVBG)*, 2002.
- [196] W.F. Richter. Gesundheitsprämie oder Bürgerversicherung? *Wirtschaftsdienst*, 11, 2005.
- [197] Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung. Die geplante Pflegereform 2008: Kein weiter Wurf. 2008.
- [198] H. Schellhase. Rechnet sich die Karte? *Gesundheit und Gesellschaft*, 2, 2007.

- [199] G. Schmeisser. The system of the german berufgenossenschaften from the aspect of prevention of accidents at work and occupational diseases. *Article of the Hauptverband der gewerblichen Berufsgenossenschaften (HVBG) for Safety Science Monitor*, 1997.
- [200] P. Sendler. DGB-Anforderungen an eine geänderte Pflegeversicherung. *Soziale Sicherheit*, Vol 5:pages 165ff, 2007.
- [201] Statistische Ämter des Bundes und der Länder. Auswirkungen auf Krankenhausbehandlungen und Pflegebedürftige im Bund und in den Ländern. *Demografischer Wandel in Deutschland*, Vol 28:pages 22ff, 2008.
- [202] Statistisches Bundesamt. Bevölkerung Deutschlands bis 2050, 11. koordinierte Bevölkerungsvorausberechnung, 2006. URL <http://destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Presse/pk/2006/Bevoelkerungsentwicklung/bevoelkerungsprojektion2050,property=file.pdf>. Accessed on 19.05.2008.
- [203] T-Systems Enterprise Services GmbH. White Paper Health Care Industry in Germany. 2003.
- [204] Verband der privaten Krankenversicherung e.V. Zahlenbericht der privaten Krankenversicherung 2006/07. 2007.
- [205] H. Werding and H. Blau. The impact of demographic change on public finances: Projections for the german public pension schemes. *Institute for Economic Research, study commissioned by the Federal Ministry of Finance*, 2000.
- [206] J. Wesenberg. Preparing our pension systems for the future: The case of germany. In *Deutsche Rentenversicherung Bund, Berlin. Presentation for the International Seminar for Experts in the series Great Debates, organised by the Cicero Foundation, Pension Reform in the European Union*, 2007.

Part II

Scenarios and Business Ideas

6

Chapter 6

VITI - Vital Monitoring Device

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This trend report describes a possible vital monitoring device in 2020. Through a scenario building process, we identified a realistic scenario for 2020, that is characterized by a relatively cautious and moderate attitude towards privacy issues and technological acceptance among the Generation 50plus. Expected standardization in data formats and interfaces, advancement in sensor and communication technology make it possible for innovations in products and services within the lifestyle and healthcare segments. We conceptualized an innovative vital monitor, the Viti, to tackle the challenges in healthcare deliverance for the Generation 50plus. It provides a user-friendly interface in the form of a weighing scale, intelligent softwares, cutting edge sensor technology and connectivity to external online communities to provide value-added services to the user. The Viti fulfills the constant necessity for being informed about users current body health and fitness status without time consuming appointments with general practitioners. Additionally, it is able to measure non invasively basic body functions such as the cholesterol and glucose level, body fat, hydration level as well as weight in order to display the users well-being. By evaluating gathered data, our vital monitor does not only generate a user specific Fitness Index, it is also intelligent and has the ability to decide and give advices on best fitting sport and nutrition programs. A major advantage of the Viti is the possibility to interact with surrounding technologies such as Ambient Assisted Living or the Intelligent

Home. Collected additional information from those technologies around our device can be used to verify existing values and enables new opportunities and functionality.

The Viti is our approach to satisfy the changing needs of the Generation 50plus in 2020. Considering the chosen scenario will come true in 2020, our vital monitoring device is a competitive consumer good in the lifestyle sector and will convince by its functionality and user friendliness.

6.1 Introduction

With an unavoidable trend towards an aging society, Germany will be confronted with a wide array of problems related to the deliverance of health care services to the elderly in the year 2020. The trend research conducted by our team is aimed at analyzing the drivers that are pushing the frontier of technological usage by the Generation 50plus forward from now until 2020. The purpose of the analyzing the drivers is so that the major and key drivers can be identified and eventually be used as the backbone of our scenario analysis in 2020. By projecting different possible trajectories of the identified key drivers into the future and subsequently analyzing the trajectories for correlations, we are able to come up with multiple scenarios for our trend research. Eventually, using matrix computation, we manage to select the most likely scenario from the group of projected scenarios that we believe will materialize in the year 2020. With that, the first part of our trend research, which is to identify the most likely scenario in 2020 is completed.

The second and perhaps most interesting part of our group's trend research is coming up with a product idea based on our selected scenario in 2020. The product should address the issues related to vital monitoring of an elderly person's parameters. The first part of our trend research then serves as the framework, on which our product is derived from.

Our trend report is divided into the following sections: In section one, we will look at the multiple drivers that our group identified. The drivers are then divided according to their importance and relevance into stable and key drivers. In the following section, we shall then touch on the scenario building process before introducing the three different scenarios that our team came up with based on our key drivers analysis. Following that, we will talk about the scenario that we believe will most likely come true in the year 2020. Eventually we will come to the product part of our trend report. Under the product section, we will introduce our intelligent and smart product, the Viti, together with its multitude of different functionality, the hardware and software technology behind it, the human machine interfaces and interaction possibilities with external environments and also the possibilities on functionality extensions. We will also analyze the market our product is in as well as the different players that might be present in the market. In the second last section, we will then look at the value chain of our product before finally finishing off this part of our trend report with issues related to the positioning of our product relative to the whole value chain.

The ultimate noble goal of the trend research and our report is to eventually come up with a viable product preposition, which can be exploited to improve and enhance the lifestyle and health condition of the Generation 50plus in the year 2020. This product preposition while serving a noble goal should also be commercially viable and attractive to possible investors.

6.2 Driver Analysis

6.2.1 Importance of a Driver Analysis

For a vital monitoring device, as well as for any other new product, there are some specific characteristics that have to be considered. Therefore we analyzed the current trends and identified several drivers that will influence the market for such a device in 2020. These drivers can be differentiated concerning their certainty and importance. While the certainty of a driver is defined by the predictability of its development within the next 10-15 years, the importance is related to how big the impact on the market environment is, our vital monitoring device will be in. Taking these to parameters in account, the important drivers (unimportant drivers will not be discussed) are dividable in two groups: stable drivers and key drivers.

As the development of stable drivers is rather certain, key drivers are characterized by there relatively high degree of uncertainty. Thus, the stable drivers form the underlying for possible future scenarios, whereas the key drivers distinguish different possible developments from each other.

6.2.2 Analysis of Stable Drivers

6.2.2.1 Legal Entrance Barriers

The first important driver we identified for products entering the market are legal entrance barriers. Every product that is launched in Germany has to fulfill certain statutory criteria. Especially for products in the health care sector there are various regulations on their characteristics. Although the overall trend is to ease the entrance for applications in the health care sector, limitations concerning the characteristics of a product will not change significantly until 2020. What is going to change within that development are the regulations related to privacy issues of personal data. Due to the implementation of the electronic health card and the electronic health record, there will be several changes in the so called eHealth-sector. EHealth describes the exchange of data related to the health status of a person through information technologies. As existing legislation is not sufficient enough to deal with the upcoming issues concerning data protection and privacy, there will be new regulations implemented. On a supra-national level, also the European Commission seeks to establish revised regulations in order to eliminate legal obstacles for new market entries.

As all of these developments are either very predictable or rather certain, legal entrance barriers are taken into account as a stable driver. It is therefore one of the factors that form the underlying for the different scenarios in section 6.3.

6.2.2.2 Customers

One of the most important drivers for future market entries is the development of the customer itself. As people belonging to the Generation 50plus in 2020 are already 38 years or older now and influencing factors such as rising life expectancy are quite stable assumptions that experts widely agree on, the total number of people in the German population who are older than 50 years can be expected to be relatively well predictable. According to the forecast of the *Statistisches Bundesamt* the group of interest will amount to about 38 million people (own calculation based on Federal Statistical Office [211]) in 2020, with estimations varying negligibly due to different assumptions on expected net migration. While the total market size is thus relatively certain, other characteristics of change in demand are of critical importance as well, when thinking about a vital monitoring device for elderly people.

On the one hand a successful offer must match the spending power and willingness of the target group. Changes in the social system towards more private responsibilities for retirement provisions indicate a broadened gap between wealthy and relatively poor elderly people by 2020, though they will on average still be quite well-off. Nevertheless, cost effectiveness and the decision on the proper customer group will certainly be parameters to keep in mind when designing a product in order to assure acceptance and diffusion. There will be a significant group of elderly people in 2020 who managed to save a certain amount of their income for their retirement phase, but also a growing number of those who were not able to do so and thus depend on a decreasing statutory pension. The former will probably be quite consumption oriented and strongly demand for convenient cutting edge health and lifestyle products and services while for the latter cheap alternatives for costly human-based care services will be of central importance. The question who might be adequate cost bearers for different health and lifestyle products is strongly linked to that issue and will therefore be discussed later.

On the other hand, anticipated changes in customer needs are critical to identify the right opportunities. A trend that can already be observed is, that consumption, activity and leisure oriented people are entering the Generation 50plus. The significant increase in spending on recreational activities and health care products by 2020 reveals an increased health consciousness as one result of that trend. In the future people will be actively influence their health condition and therefore demand lifestyle products that help them to stay as healthy and as mobile as possible during their lifetime. As a consequence of an increasing life expectancy there will also be more impaired elderly people in need of care. They will mainly ask for products that increase the simplicity of an independent life.

Additionally, these developments are highly correlated with the trend that the people have to take more responsibilities concerning their health treatment. Especially the time spent in hospitals after surgery will constantly decrease

in the next couple of years. This leads to an increased demand in ambulant care services and technologies that support the recreational process or enable doctors to look after their patients on a remote basis.

Today, there are already many indicators that the customer will develop as discussed above. Thus, it is referred to as a stable driver.

6.2.2.3 Technological Advance

Also the technological advance is one of the most important drivers. For the specific requirements of a vital monitoring device, especially the developments in the fields of energy technologies, communication technology and medical measurement technologies are crucial.

Due to the limited lifespan of batteries which power most electronic devices, the energy supply is a critical factor. As current energy technologies are able to power for example implanted pacemakers for 7-8 years, this would already be sufficient enough for a vital monitoring device [216]. However, it will be necessary to improve this technology, in order to be able to fully integrate all new technological possibilities which will come up in the next 10 years. There has been increased research over the last couple of years to find alternative sources of energy supply. One exemplary technology would be fuel cells. Another possible innovation would be devices, that can gain their energy supply out of the human body (especially interesting for implanted devices). Nevertheless, we do not expect these technologies to be mature enough in 2020 to supply energy to very small devices. Additionally, there will also be an improvement in energy sources, based on technologies that are already in the market. Therefore the future is very predictable, as the current level of technology would be sufficient to ensure the power supply of a vital monitoring device and its sensors.

Another parameter that has to be considered is the development of mobile communication technologies. These technologies allow data transfer over short and long distances and provide at the same time a secure and error-free transport for single data packages. Crucial key points of the future development of mobile communication are a higher rate of data transmission, expanding operation range, less power consumption and less complexity. Prominent examples like IEEE 802.15 TG4 (ZigBee) and the Medical Implant Communication Service (MICS) are chartered to suit those requirements today. Another standard that dominate the wireless transmission market could be WiMAX. It is expected to replace the existing WLAN standard in 2011 [214], since it is capable of expanding the operation range up to several tens of kilometers. In 2020 the WiMAX might be either a general standard, or will even be replaced by new technology which also compete on the basis of the previously mentioned technological key points. As these new technologies almost marketable today, we perceive the development of mobile communication technologies as a certain

parameter. Thus, it will be ensured that in 2020, a vital monitoring device will be able to exchange all necessary data sufficiently.

The most important technological aspect for a vital monitoring device is the development of the medical measurement technology. Sensory devices that accompany the elderly people should optimally pose minimal hindrance to their day-to-day activities while collecting important information about their health conditions, locomotive patterns or other vital parameters. Currently, many sensory devices are available in the market that measure an individual's health parameters like heart rate, blood pressure or blood glucose level. Until 2020, we expect a lot of innovations in the field of medical measurement technology. As there are already for example implanted pacemakers that allow a doctor to monitor a patient's heart beat pattern on a remote basis, there will be a lot of new sensors coming up in the next 10 years that allow to monitor vital parameters through an external device. This trend becomes also noticeable in other areas of medical measurement like a new generation of blood glucose meters that measure the glucose level through an external sensor, without the need to actually provide some blood. The technology is already available today but is still relatively new. The analysis of waves behavior when passing through the human body founds is used for the purpose. [207] Basically, there will be two areas of innovation until 2020: invasive and non-invasive measurement. Given the current development, we expect that in 2020 the collection of vital parameters will be possible in these two ways. On the one hand, there will be invasive sensors that measure the vital parameters constantly from the inside of the body. On the other hand, non-invasive devices will allow the external measurement of the vital parameter. The sensors are therefore embedded into the daily environment of an elderly person. This means that they are for example integrated in necklaces, watches or even the walls of a person's living room.

Although there will certainly be some disruptive technological innovations within fields of energy technologies, communication technology and medical measurement technologies in the next 10 years, until 2020 these innovations will not be marketable and on that account, they will not be available for the data collection of a vital monitoring device. The recent developments in the three important fields of technology draw, in our point of view, a good picture of situation in 2020 and therefore technological advance is considered as another stable driver.

6.2.2.4 Cost Bearers

The question concerning the cost bearers of a product is also a fundamental driver that has to be discussed. As we are talking mainly about the health care sector, some special characteristics have to be considered. As a possible cost bearer for health care products, there is not only the end-user, but also his/her

insurance company. The insurer might fund a percentage of the price of a health care product or even the total, if there is a significantly positive impact on the customers' health condition. Due to the rising amount of costs that evolves through the demographic change, insurers will look for 'sustainable' investments in their customers. In 2020, therefore insurance companies will even be more interested in the prevention of illnesses.

As prospective Generations 50plus will have an increased health consciousness, they might also benefit from a vital monitoring device and therefore be an addressable customer group. Concerning the end-user as a possible customer group, it will mainly depend on how he can benefit from a vital monitoring device.

Overall, a product has to be demanded by the market. The benefit for the end-user as well as for the insurance companies must always exceed the costs by far. This logic determines the 'cost bearers' as a stable driver, because the needs of the potential customer always have to be satisfied.

6.2.2.5 Infrastructure

Finally, we identified the infrastructure as a stable driver for our scenarios. Infrastructure is here defined as the existence of surrounding technologies. Smart homes or various internet tools like online shopping and socializing platforms might be able to interact with external devices and therefore form the infrastructure for our vital monitoring device. Ambient Assisted Living (AAL) and internet tools are the two major categories we identified, which will have an impact in 2020.

It is already perceivable, that AAL will play a major role in 2020. Various ongoing research activities [213] lead towards the conclusion that AAL will offer concepts, products and services that interlink and improve new technologies and social systems. Aiming at supporting and enhancing the quality of life for people in all stages of their lives, AAL focuses development in four areas. In *health and homecare* an increasing number of single and elderly people will use the intelligence of systems for assistance. Also the need to enhance prevention and rehabilitation at home draw attention to new technologies. Additionally, AAL actively promotes the development of new *safety systems* for the domestic infrastructure. They will exceed already existing technologies like alarm systems in the form of automatic call systems or access authorization systems for buildings. Furthermore, the support in *everyday household* activities such as the coordination of the daily timetable will tremendously grow. In the field of *social environment* assistance, systems will be developed to enrich social life of elderly people. In 2020, surrounding technologies like Ambient Assisted Living will be part and parcel of the everyday life and therefore, the opportunities to mutually enhance functionality between vital monitoring and AAL have to be used.

Until 2020, also the Internet will emerge into an inherent part of life for the Generation 50plus. Web2.0, social networking sites, wikis, blogs, virtual maps and peer-to-peer sharing technologies already allow today's user to highly collaborate and interact in a virtual world [219]. The upcoming development of those internet platforms bring vast communication and interaction potential along. It is not only possible to share data among internet users, but also to verbally connect people with each other via VoIP (Voice-over-Internet Protocol). Thus, there will be a lot of integrated solutions in the future.

Tendencies to include external devices like wireless sensors are already ongoing [220] and will grow in importance in 2020. Therefore, the infrastructure for vital monitoring devices is a stable driver and completes the underlying for the following scenario analysis.

6.2.3 Analysis of Key Drivers

6.2.3.1 Attitude towards Privacy

As especially the exchange and storage of private data causes some concerns among the Generation 50plus, this is a critical and highly uncertain factor regarding the demand for technological products such as a vital monitoring device and thus one of the key drivers. By now, people are very cautious about privacy issues and especially older people are afraid of misuse of their data. [215] Therefore they tend to refuse to adapt to new technologies. As this attitude might be linked to a lack of experience and knowledge about the underlying technology, it might possibly change within the next decades as elderly people become more used to the Internet, wireless data transmission and eHealth services in general.

Several developments of this key driver are imaginable. In a very progressive development, legal deregulation and standardization efforts may foster a very liberal situation for eHealth providers. By the legally forced introduction of e.g. the "Gesundheitskarte" people might experience the benefit they themselves derive from sharing their data with doctors, pharmacies, hospitals etc. If a broad range of additional products and services with good value proposition was available in 2020, elderly people might decide to transmit their data voluntarily to the providers of those offers. It would be relatively easy for new products in that situation to gain the customers' trust.

If people's attitude develops more cautiously, they majority of elderly people might want to decide case-by-case on the amount of data they want to disclose and keep active control over their private health information. In that case, they would probably prefer solutions where only the minimum of data needed to perform a task properly would have to be transferred to external institutions. Providers might need to consider thoroughly on how to select necessary from unnecessary data, e.g. by using intelligent agent systems. Products and services that do not cope with users privacy concerns properly will have

considerable problems to succeed in the market then.

The most conservative conceivable development assumes people to refuse to submit any health related data they are not legally obliged to. That might happen if people do not consider transmission and storage technologies safe enough or providers reliable enough or do value their privacy risk higher than the benefit they expect from eHealth offers. It is especially notably that those evaluations are strongly subjective and influenced by various factors such as value perception changes in society, personal experiences, media or technology anxiety and are therefore hard to predict and highly uncertain.

Taking all into consideration, it becomes obvious that users' attitude towards privacy issues is strongly cross-linked with our technological key drivers. Therefore people's adoption of technologies which reveal very private data such as vital parameter monitoring is likely to depend substantially on the perceived safety risk they assign to their behavior compared to the perceived benefit they expect.

6.2.3.2 Technology Acceptance

In addition to the attitude towards privacy issues, technology acceptance is the key driver from a customer point of view that determines his/her usage behavior of different technologies. We define technology acceptance for our purpose as the degree of diffusion of technologies related to eHealth among the Generation 50plus and the open mindedness of these people towards new technologies.

Technology acceptance among the majority of the elderly people can either be quite high in 2020, similar to the attitude of much younger people nowadays or keep hanging behind substantially. As more and more older people, who had intensive contact with information technologies during their working life are entering the Generation 50plus, the attitude towards technology is quite likely to change among these people. Though, when it comes to technologies that are not widespread at all by now and seem scary to people of all age groups such as intelligent self-acting housing equipment might be adopted with even less enthusiasm by older people than by the average population as elderly people tend to become more settled in their mind-set, more conservative and in some cases even incapable of adopting to big changes in their environment, e.g. if they suffer from diseases such as dementia. In the worst case, eHealth technologies may have to fight strong resistances from many potential customers and might even lose competition against traditional human based services and low-technology solutions, though this development seems quite unlikely given the necessity to cope with an upcoming shortness of caregivers and increasing cost pressure.

Elderly people will probably form a very heterogeneous group with technology acceptance reaching from very low to substantially high, depending on personal

characteristics. However, the composition and relative size of different segments in 2020 is still uncertain and highly important for targeted offers, that will be accepted by the customer and should thus be the basis for different scenarios.

Technology acceptance comprises a variety of influencing variables and motivational concepts. Knowing those can help to focus on the important issues when designing a suitable product in a given scenario. According to Davis the attitude towards the use of a technology depends mainly on two factors: perceived ease of use and perceived usefulness [209]. The former proposes that technology must be perceived as simple and easily usable without extensive effort. In the context of older people this points for example at easy-to-use interfaces, well designed intuitive devices that deal with age related constraints and at special support services as critical issues. The latter concept should remind eHealth providers though that the elderly user must be able to clearly identify an extra benefit when using the technology. Thus, acceptance is likely to stay low if customer needs are not met in the right way, no matter how easy a device or service might be to use.

6.2.3.3 Standardization in Data

Another important key driver for our scenario building is the standardization in data. As a basis for exchange and intelligent processing, data need to be standardized. Systems like Ambient Assisted Living (AAL), intelligent home, technologies in cars or at work-place are partners having the potential to communicate and understand each other only on the basis of having one common language. A standard spoken and understandable by all systems can meet this requirement. Enhancement of existing technological opportunities and new functions for users are a possible. We identified three possible branches of the development in 2020 that will characterize our scenario.

First of all, in 2020 the semantic of data could be standardized. A broad and well known agreement between various companies exists, and a common and open standard will be developed and constantly maintained. Companies producing products or offering services for eHealth, AAL, intelligent home or various other technologies will use the common agreed standard as a basis to store and maintain data. Subsequently, systems are easily able to interpret sets of data being produced or coming from other systems such as Ambient Assisted Living, intelligent home or various other devices. Thereby a transfer of data into understandable knowledge enhances existing functions and offers new opportunities for various products and services.

Another possible development could be, that one common standard of data semantic does not exist. Rather some standards from diverse companies circulate in the market. Systems have problems to offer the entire range of standards in their products or services and converting files is not necessarily flawless. Inaccurate conversion could lead to misinterpretation and faulty

results. Nevertheless, data exchange between different devices would still be possible by for example applying the standard of the market leader to a new device.

Furthermore, the standardization of data could be totally lacking in 2020. This would lead to limited functionality of system devices. Each company uses their own semantic of data and files. Conversion from one data file to another is a hazard due to restricted information of the file standard and the proprietary idea of storing data. No external information about surrounding devices or systems are provided or can be used. The hazard of various proprietary communication standards based on different semantic languages will not be solved.

6.2.3.4 Degree of Technological Intelligence

The last key driver we identified is the degree of technological intelligence of systems and devices, because it significantly shapes a vital monitoring device in 2020. Knowledge based systems, neuronal networks or fuzzy logic are just some ongoing research examples that still lack in broad usage in industry. At that point of view we need to consider how far artificial intelligence will be evolved until 2020. We think there exist two possible developments.

On the one hand, it is possible, that in 2020 there will be intelligent systems. The technology of artificial intelligence is far enough developed to be used in applications and devices in the context of medical and lifestyle measurement technology. Smart agents as an example will have the ability not only to cooperate between each other, but also to broaden their knowledge by learning new things. Knowledge acquisition and automatically interpretation of data is possible and offers devices the ability to decide automatically. The intelligence goes beyond configuration files, or set ups of parameters. The system is able to adapt respectively change parameters throughout learning. Intelligence offers new ways of interpretation of data and knowledge by recognizing similarities or ties in between data that have not been able to detect by the programmer before. Smart agents or intelligent and adaptive systems can also better suit the needs of users by analyzing and consequently adapting to the necessities of the situation.

On the other hand, the development of artificial intelligence could be evolved not far enough in 2020 to actual step out of research lab. Neither medical nor lifestyle products will use any technique of artificial intelligence. Entities or systems rather focus on configuration files or user-set parameters as a basis to check, filter data or decide on specific problems. Therefore it is not possible that a system adapts and reacts to its environment.

6.3 Scenario Building

6.3.1 Process of Scenario Building

In order to be able to adapt the vital monitoring device to the future market environment, it is necessary to bundle all drivers into different possible scenarios that build an image of the situation in 2020. As mentioned above, the stable drivers serve as an underlying and will have the same development in every scenario. In contrast to that, each key driver can have different characteristics, dependent on the assumptions of the specific scenario. This scenario building process also reveals strong correlation between some of the key drivers and shows how they influence each other.

Within our scenario building process, we selected three different scenarios. While the two bounding scenarios show the overall framework of possible developments, the third one is the most realistic one and therefore the one, where the vital monitoring device will be designed for.

6.3.2 Different Possible Scenarios

6.3.2.1 Scenario 1 - Conservative Estimation

In this scenario, we foresee a generally conservative approach towards the developments of the key drivers we have identified earlier. We will first describe the key drivers and their course of development in the year 2020 and then we will go on to explain some correlations between the different key drivers in this scenario.

Firstly, in terms of the attitude towards privacy, the Generation 50plus will be unwilling and apprehensive about giving out personal data to health care service providers or other institutions other than the ones that they are legally obliged to. The personal data might be health related or lifestyle related. In a similar way, the technology acceptance level in this particular age group is expected to be very low. They are sceptically towards all new technology and innovations and generally prefer the traditional service model of human to human interactions. Therefore, the Generation 50plus lags behind the rest of the society in terms of technology utilization in their daily lives due to fear and skeptic towards anything new. Thirdly, concerning the standardization of data exchanges, there will be no means of data exchange between different devices made by different vendors in this scenario in 2020. The majority of monitoring devices are stand alone devices and each vendor uses a different data format that is readable by devices developed by that particular vendor only. Furthermore, the degree of intelligence in built into these devices are minimal. This means that the devices do not possess smart decision making capabilities that add value to a user by helping them make informed decisions about their health or lifestyle. The devices are sole used to read data of a

particular parameter and nothing else.

Although we have described the key drivers and their predicted course of development in 2020 individually and independently of one another, we see that there are indeed strong correlations between some of them. For instance, The correlation between attitude towards privacy and technology acceptance is relatively high because a skeptical and fearful approach towards technology among the Generation 50plus is likely to spawn a distrust in the ability of new technology to safekeep and manage data properly. This in turns affects their attitude towards privacy in a significant manner. Due to the perceived lack of safeguards towards data abuse, the Generation 50plus will not voluntarily give out their personal health and lifestyle data away. On the other hand, we see that the correlation between standardization of data exchange and level of technology acceptance is rather low. This is because in the first place, if people are unwillingly to adopt new technology in their daily lives, the need for a standardized data format to facilitate data exchange becomes irrelevant.

If in 10 years time, the technological advancement in the field of sensor and mircosystem technology do not demonstrate a trend towards intelligent systems and applications, there is a high possibility that this "conservative" scenario will take place in the year 2020. Similarly, with a huge number of different standards available and developed by different product vendors in the market currently, a lack of change in this condition in 10 years time will also give us a good indication that this scenario might indeed become reality in 2020. The attitude towards privacy and the level of technology acceptance are dependable of the above two key drivers. Studies and surveys should be carried out in 10 years time to access and evaluate these two "soft" key drivers so that we might have a better picture of how they develop to help us determine the likelihood of this "conservative" scenario materializing in 2020.

6.3.2.2 Scenario 2 - Optimistic Estimation

Taking a closer look on the identified key drivers reveals, that their development could also lead in a totally different direction. Therefore, the upcoming paragraphs describe an optimistic estimation for the situation in 2020. This means, that in next 10 to 15 years the individual key drivers will show a vast development.

Considering the attitude towards privacy, people are willing to provide their specific personal data without any questions to systems and services like electronic health card or record. The perceived benefits of using new technologies is very high and exceeds any concerns. The majority of the population embraces new functionality and possibilities of health related products and do not contemplate any danger or personal confines by providing personal data. The Generation 50plus is open-minded towards any kind of new technology. The familiarity with Internet and mobile technologies

arouse trust and confidence in new applications and systems. Danger or any kind of fear are non-existent. Similarities can be seen to the younger generation today. Considering the standardization of data, an open data format is established as a wide spread standard in e-health and other surrounding technologies like Ambient Assisted Living. Medical or health related products will unanimously use this standard in order to store and maintain data, information and knowledge. Furthermore products will be intelligent. By having the ability to acquire new knowledge, learn and autonomously decide on problems, new opportunities and functionality can be provided to suit the users needs better.

Centering on correlations between the above displayed characteristics, we can see positive interference between the standardization of data and the degree of intelligence. Standardization does promote the development of intelligent systems. By having a higher amount and more diversified set of data, teaching phase can be carried out much more intense and effective. The quality of the ability to learn and subsequently intelligence will increase. Furthermore, the use of different sources gathering data from, the check and verification throughout redundancy is possible and increases the quality basis for the decision process of artificial intelligent systems. Technology acceptance influences technological driven drivers. The introduction and wide acceptance of a standard in storing data can be pulled by the market, especially the customer needs. Customers will have a general very positive attitude towards the use and advance of technology. Thereby standardization in order to interact between different technologies serves as a key purchase requirement and imposes direct constraints on the provider side. The influence of technology acceptance of customers on the degree of intelligence is quite similar. Artificial intelligent systems will be much more accepted and requested by the customer. Contemplating the vast opportunities by artificial intelligent systems, development and wide range implementation of respective technologies will be widely supported.

The optimistic point of view assumes the potentially best circumstances in order to develop a product and will only come true when people accept technology nearly without any question or concerns. Due to that fact, we rather believe that our most likely scenario, being described later on, will carve reality in 2020.

6.3.2.3 Scenario 3 - Most Likely

As we saw before, the future environment of a vital monitoring device can take every development from really conservative to quite progressive and innovative. We already discussed that the key drivers are highly correlated and thus a scenario that accounts for the most likely of these interdependencies seems to be necessary. The assumption, that elderly people are in general more settled and resistant to changes leads to the conclusion that technology acceptance

and attitude towards privacy are probably the limiting factors to adoption of eHealth products and services. Thus, a cautious attitude towards privacy is likely to be widespread among the Generation 50plus in 2020. People will then closely compare the perceived risk from giving away their private data to the benefit they expect from the eHealth product or service. Case by case, they will selectively choose those offers they perceive safe and useful enough. Technology acceptance is also expected to improve until 2020, but will still be on a moderate level compared to the average population. The Internet and mobile communication technologies as well as forms of eHealth and Ambient Assisted Living are likely to be used by a substantial part of the elderly people and will be well accepted for the convenience they provide. Providers might though be faced with some resistancies in adoption, if products are perceived as too complex or performing in their own will instead of the user's. User needs, simplicity, design and support are thus critical to pay attention to in the cautious and demanding customer group of the elderly.

We assume these customer related key drivers occur in combination with a rather progressive development of technology. This scenario is characterized by widely standardized data formats and data transfer interfaces. Providers of different products that are relevant for the environment of a vital monitoring device such as e.g. AAL, eHealth platforms and services, medical remote monitoring use and provide data with one industry-wide standard. The implementation of one central system as such as the Gesundheitskarte and the awareness of the usefulness of combining various health related data sources and services might foster this development. The degree of intelligence of eHealth products and applications is expected to be considerably high in this case as well. The application can then provide more personalized benefits, as health related needs are strongly individual. Furthermore, it can selectively store and transmit data.

The need for this ability is strongly related to the customers' attitude towards privacy, as decentralized storage and selective transmission allow safer handling of critical data. Both standardization and degree of intelligence may boost technology acceptance, as they make more advanced, useful, interconnected and "thinking" products possible that provide value to the user without requiring too much complex personal effort. On the other hand growing technology acceptance leads to an opening of the market for new providers of innovative solutions who once again profit from standardized data and interfaces.

If as a consequence, firms succeed within the next years to have a substantial amount of elderly people as active users of basic technologies such as internet communities, mobile communication applications or AAL components, the situation in 2020 will probably develop as described above. Those people will then likely want to control their vital parameters themselves, with the help of technology which will be available in their surrounding.

6.3.3 Consequences of the Scenarios for a Vital Monitoring Device

Depending on different scenarios, technological and market potentials may vary substantially and therefore a suitable vital monitoring device could look very different in each scenario for 2020 as "vital monitor" is still a broad term. As discussed before, a conservative development could limit technological possibilities in terms of standardization and intelligence. In addition, a lack in customer acceptance and will to share private data defines a conservative market. In such a scenario, a vital monitor may be most successful as a stand-alone device that does not rely on external data sources or service providers. It would either have to be a medical monitoring device where the medical necessity should foster acceptance as they are already used partially e.g. in modern pacemakers. Then, all necessary precise bio-sensors must be part of the product, but the medical purpose could allow the price to be higher and insurances could be made responsible as cost bearers in addition to the users. Alternatively, a very low technology easy-to-use device, comparable to already available basic vital parameter meters such as "Nike+" , but customized for elderly users may find a market as long as it does not scare the cautious elderly people off and is cheap enough to be a lifestyle product [217].

A progressive, optimistic scenario on the other hand would demand for very different solutions. Sorts of eHealth applications which might find a market niche in more conservative scenarios, might be broad standard in the optimistic case in 2020. A vital monitoring device would have to exceed pure data measurement and display by far in such a situation. As high technology acceptance and liberal attitude towards privacy are key factors then, a vital monitor would need to include cutting-edge technology to address the customers demand and could assume a higher degree of customer expertise when designing the product. Additionally, technology-affine elderly users would like their vital monitor to be extensively linked to the variety of other data sources and eHealth services they would be using.

Consequently in the third scenario, ease-of-use is not as important as it was for completely inexperienced elderly people, but must be addressed more carefully than in the optimistic scenario. This poses certain tasks on the human-machine interface and support services. Standardization can be assumed and therefore not all data collection has to be conducted by sensors that are delivered with the device. That enables the use of valuable data from expensive implanted sensors without designing a medical product if the customer already has those sensors implanted for medical purposes. Based on our underlying assumptions, various sensors within and in the surrounding of elderly people will be available in 2020, as well as vital monitors for purely medical purposes such as remote monitoring by the doctor. An innovative vital monitor in this scenario thus optimally is a lifestyle product for the elderly person herself that

can deal with external data sources and adds some easy-to-understand extra value to the pure data evaluation.

6.3.4 Selection of the Third Scenario

We chose the third scenario described just above as the most likely and also the most interesting one as the basis for a vital monitoring device for several reasons. First of all, we can conclude the likelihood of the development of the key drivers to some extent from the underlying stable drivers we identified. Legal developments supporting the eHealth trend, privacy regulation and standardization issues on an international level will probably motivate a variety of new players to enter the eHealth market as well as it will mitigate customers' concerns about their private data. Moreover those elderly customers are definitely growing in numbers, but are also likely to become more and more interested in health issues. They will also become more responsible for their own health status for the reasons of both higher costs, which insurances are not able to take, and the will of more and more active elderly to stay independent. Those demographic and legal trends suggest the key drivers technology acceptance and attitude towards privacy to develop in a slow but positive way, as assumed in the selected scenario. Furthermore, the rapid technological advance points at huge opportunities for eHealth providers. Advanced sensor technologies, progress in energy supply and intelligent agents are just some examples for technologies that are even now already marketable and are being improved constantly or are going to be so until 2020. Whenever the market potential increases through higher technology acceptance and changed needs, more products and services in eHealth and related businesses will come up, using those technologies. Thus, in 2020, a broad fraction of elderly people are most likely to live in a more high tech surrounding than they are nowadays. Ambient Assisted Living or remote monitoring through invasive or non-invasive microsystems reporting directly to the doctor can than be part of many elderly people's lives. As many different providers will probably be active, eHealth is a very broad branch and customer value can be increased substantially if all those systems are compatible, agreed-on data standards as a key driver are likely to evolve. The system of the electronic health record can even become a factor that works as a platform to enforce standardization. As human bodies and thus health related issues are highly individual, every person has different illnesses and characteristics and reacts differently to treatments, smart agents are assumed to be of key value to eHealth. In addition, they are of advantage concerning decentralized storage and selective transmission and will therefore most likely become important parts of eHealth products such as a vital monitor. Taking all into consideration, we come to the conclusion that this scenario is very likely to occur as stable drivers provide a favorable framework for it. As a consequence, the described set of key drivers have one

most probable combination of occurrence as they are highly interrelated.

The scenario we want to design our vital monitor for is not only the most likely, but also a very interesting one concerning product opportunities. On the one hand, it allows us access to a broad technological basis of e.g. sensor technologies, communication technologies and intelligent data procession. The assumption of various external data sources for standardized data enlarges the range of potential applications, as well as the growing number of market partners for collaborations. On the other hand, and most importantly, variables of demographic change and growing technology acceptance open a substantial market of elderly customers, which nevertheless has to be targeted carefully with a focus on usefulness and simplicity. A suggestion for a vital monitoring device that can be able to meet those challenges will be presented in the following section.

6.4 Viti - The Vital Monitor in 2020

6.4.1 Product and Service

6.4.1.1 Challenge in 2020

The awareness and affinity towards health and fitness of the generation 50plus will grow until 2020. The costumer wants to know more about her body and fitness level. The obstacle to go to the doctor for checking blood pressure or cholesterol level in your body and getting respective interpretation of its data need to be resolved. Costumers seek an easy way to check how the body is doing without complicated analysis of each body value or specific consult of a doctor at the office. This constant interest for the costumers well-being needs to be addressed by innovative products as well as services in 2020.

6.4.1.2 Viti - The Solution

Taking the need of the costumers in 2020 into account, our vital monitor device will measure necessary body functions in order to generate an easy understandable picture of the costumers well-being. The technological advance until 2020 enables various methods to measure body values like cholesterol level, pulse or blood pressure without drawing blood or any other invasive technique. The device convinces by an intuitive usability and good visualization of statistical body development information over the past days or month. Having connection to surrounding technologies like Ambient Assited Living or the Intelligent Home (iHome) as well as the Internet, information and statistics can be gathered to enhance the quality of service and submitted to a doctor or internet community to compare and evaluate. The vital monitor device of 2020 will be intelligent and able to give individual sport and nutrition advices.



Figure 6.1: Real Life Mockup of the Viti
 Souce: Own Illustration

6.4.1.3 Overview and Structure of the Viti

Basically our product is divided into three major parts. First our product has to gather data by using measurement technologies. Following up, the Viti transforms data into knowledge by storing, evaluating and at the end making decisions as well as advices. Finally knowledge and decisions need to be displayed to the user by a specific human-machine-interface. Figure beneath displays a structural overview.

The process of gathering data is displayed in the picture by both internal and external measurement modules. Internal modules are already integrated into our product and can be used right from the start. By standard, they measure cholesterol level, body fat, weight, pulse and glucose level of the user. External modules instead are additional and may already exist in another context or have to be bought additionally to add value. Both types of modules represent the interface towards the user and pursue to measure body function data. The heart of the system is the data process unit, which stores, evaluates data in order to make intelligent decisions and advices such as proposing individual and user-adopted sport programs or nutrition information. At the end advices need to be displayed to the user. The human-machine-interface does not only take the visualization of statistics and information into account but also provides interaction with the user by touch screen and voice control. Major characteristics of the human-machine-interface are user friendliness,

simple and easy manageability and adaptability to the needs of the user. The Viti can also communicate with surrounding technologies such various internet platforms, iHome or Ambient Assisted Living. The communication is bidirectional, which means by standardization in data storage the Viti can gather and submit information from and to surrounding technology.

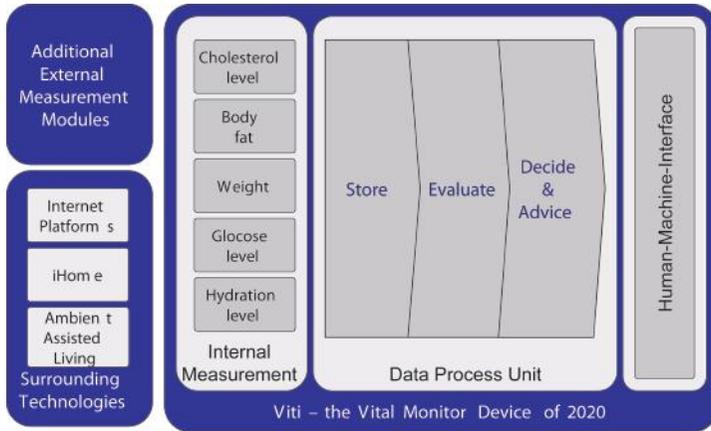


Figure 6.2: Structural Overview
Source: Own Illustration

6.4.1.4 Sensor Technology in the Viti

The sensors that will be used in the Viti are non-invasive and non-wearable sensors. These sensors are capable of measuring the parameters identified earlier relatively easily and most importantly, they do not pose excessive discomfort to the user as the other types of sensors presently do.

For measuring blood substances, non-invasive sensing technology that makes use of different waveforms to identify, analyze and detect substances in the blood will become commercially available in 2020. As the waves pass through different substances, they experience different phenomena which changes the waves behavior and characteristics. By detecting such changes, the substances can be identified. Such sensors will then form the backbone of the sensor systems in the Viti. Parameters like the blood glucose content and cholesterol level can be measured using such technology. As compared to most commercial sensor technology available today, the primary advantage of such sensors lie in their non-invasive nature which ensures that minimal discomforts are posed to the users. Furthermore, no body fluids are required for the measurement setup which means that the hygiene and maintenance level associated with the sensors through repeated usage will be substantially better than what we have today. We believe that by 2020, such non-invasive technology will become

mature and common. Through mass production, the price will therefore drop considerably to make it feasible for integration into the Viti.

For measuring the body weight, existing technology for this purpose can be employed and integrated into the Viti framework. Such technology typically makes use of the piezoelectric effect of piezosensitive materials. Since this technology is already rather advance today, they are highly reliable and dependable. Furthermore, it is expected that existing weight measuring technology will improve in their accuracy by 2020. On the same note, special highly sensitive piezosensitive materials exploiting the piezoelectric effect will be implemented as blood flow and pulse rate sensors in the Viti. However, these sensors are add-on products for the Viti to provide extended functionality to the users and they can either be purchased together or separately with the Viti.

Other parameters that the Viti measures are the body fats, muscle content and hydration level in the body. These information can already be measured today. The sensor concept behind the measurement of body fats are based on the flow of electrical signals through the body in the form of total body resistance or impedance. Using electrodes, such electrical signals can be captured and analyzed as they are passed through the body. Coupled with the weight measurement, the body fats sensors can be used to help a person gain a picture of his or her body fat composition. In the Viti, such a technology can be miniaturized and integrated into the the Viti sensor framework without much problem by 2020. Employing similar kind of sensor technology, the muscle make-up and hydration level of a person can also be measured. We expect that the accuracy of such sensor technology will also improve significantly by 2020 so that the user can be provided with an even more dependable and reliable data set.

Generally, as we expect sensor technology in 2020 to be more advance and accurate than what we have today in the market, it is therefore possible for the Viti to provide an integrated approach to measurement that provides a relatively accurate picture of a user's health based on the data collected. Hence, the sensor technology in the Viti can be relied upon to provide a framework on which peripherals like the intelligent and smart software in the device can work on to provide informed and useful lifestyle and health related advice and recommendations to the elderly user.

6.4.1.5 Intelligent Software to Process Data

The Viti stands out by its software architecture. The main task lies in bringing components such as sensor systems together in order to process data. Therefore, gathered data need to be stored on an internal hardware device. Storage of data from various components and devices will be done in a database. Furthermore, data coming from contemplating the behavior of the user will

also be stored on the same basis. Having all important and required data by hand in combination with the high intelligent level of our device, the software part of the Viti can evaluate data in order to make decisions. That means, that the Viti judges the health and fitness state of its users and communicates those to its users. Finding correlations in the set of data enhances the quality of the decision process. The software does not only have the ability to store and evaluate gathered knowledge about the user, it also needs to store data on nutrition, sports and other health related topics in his or her repertoire of possible and appropriate recommendations. The actual intelligence in our device lies in connecting those two data piles. Knowledge from the process of evaluation of the users health as well as fitness level has to be linked intelligently to the proper and individual lifestyle recommendation. Possible examples could be if the Viti detects a high cholesterol level, it advises the user to may be quit smoking or get some daily exercises such as knee bending or starter kit in jogging. In case the Viti detects severe changes or actual exceeding of minimum or maximum boundaries defined by medical standards, the Viti construes this as an emergency and notifies the respective general practitioner. This functionality ensures a general check of body functions by the use of a medical knowledge database. The Viti also wants to visualize data easy and understandable. Therefore, it calculates one value, the so called Fitness Index (FI), to show a consolidation of all gathered values, which are in the basic version pulse, weight, body fat, cholesterol and glucose level in the blood stream. Additional sensor systems as well as information from the iHome or AAL can enhance the quality and accuracy of that value. In order to compute the FI, the Viti uses a mathematical function mainly based on weighted and normalized single values. Additionally, it provides and submits data to surrounding technologies such as the iHome or AAL. Internet web applications like signed up health or fitness portals have the ability to connect to our device.

6.4.1.6 Human Machine Interface of the Viti

The Viti takes the form of a device that we are all very familiar with because almost every household has one: The weighing scale. The weighing scale is a piece of equipment that traditionally measures our body weight. Current models of weighing scales available on the market today are capable of measuring not only the weight of a person, but it can also be used to measure the body fats, muscle content and distribution and body hydration of a person while also taking into account the gender and age of the user. However, the collected parameters are still not extremely accurate and are also prone to errors. With advancement in technology, the accuracy of data measured by sensors in the Viti is expected to significantly surpass current levels. The popularity of a common household weighing scale stems from the fact that it is extremely

user-friendly and it requires minimal technological know-how to operate it. Hence this interface is optimal for the Viti as our targeted user group, the Generation 50plus, is expected to demand a product in 2020 that is familiar to them, uncomplicated, easy to operate and which does not require a large storage space.

Conventionally, a weighing scale has a small display that shows a user their weight. Such a display traditionally comes in the form of an analogue scale. Today, with developments in digital technology, such displays also come in digital forms and is capable of displaying multiple parameters of the user. This display is usually located on the weighing scale itself and does not provide an easy way of reading the data for the user. For an elderly user, such a small display will hinder them from reading the data as he or she needs to either bend down to read the display or pick up the scale in order to read the information on it. Furthermore, this problem is further accentuated by the fact that the eyesight of an elderly user tends to worsen as they grow older.



Figure 6.3: User Interface Prototype of the Viti
Sourc: Own Illustration

The Viti goes around this problem by having a huge display in the form of a LCD flat screen display that are available in the consumer electronics market today. Such displays are expected to drop in price by 2020 such that it can be integrated into the Viti without necessarily pushing production cost too high. This display can then be mounted at eye-level to the user. Furthermore, it receives information from the on-board computer in the Viti and displays the information transmitted to it to the user. In addition, it is also possible integrate a touch screen display into the Viti such that a user can also interface directly with the screen. Additionally, speakers and microphones can be fitted and into the display set up to provide users with poor eye sights the option of having a voice-activated command interaction with the Viti's software. In such

a way, it offers the user a better visual interface and also a more interactive experience as compared to the conventional weighing scales of today.

6.4.1.7 External Communication Interface of the Viti

The Viti has the capability of interacting with external devices or with an external smart environment like a smart home or to a computer via wireless technology. One of the technology that might come into play here is the Bluetooth standards that are already available today. Developments in Bluetooth technology look promising and by 2020, it should become a mature technological standard that is capable of satisfying the needs of high speed and high volume data transfer without significant data losses. Therefore, Bluetooth technology can be integrated into the Viti with relative ease. Another reason for choosing Bluetooth is because the technology is designed in such a way that fulfills the requirements of the Viti for low power and short range communication. Furthermore, it seems like Bluetooth is going to become a major standard in the field of consumer electronics based on low cost transceiver microchips in 2020. With a built-in sender unit, the Viti is then able to transmit data to external components and environment as long as the communicating partner is fitted with the necessary Bluetooth adapter. The transmitted data could be the vital parameters of the user whenever the user stands on the Viti, which essentially comes in the form of a conventional weighing scale but fitted with much more functionality and on-board computing power. The received data can come in the form of sensor data from the smart home or from other external devices. The Viti can then make use of them to enhance its own "intelligence" and eventually provide as output to the user a clearer and more accurate picture of his/her health and lifestyle patterns and conditions.

For connection to the Internet and the health platform, the Viti makes use of WLAN technology. With a built-in WLAN adapter, it can effectively connect itself to the health and social platforms on the Internet via an access point located at home so that firmware updates can be automatically downloaded and the latest and most relevant information can be accessed. These information can then be subsequently used to train the smart software in the Viti to provide better advice and knowledge to the user. The WLAN technology makes use of different modulation technology on radio waves and can be employed to connect devices in a restricted but broad coverage area. This technology is already in use today and by 2020, it is expected to provide us with the means of accommodating higher data volume and faster data transfer rate.

The ability to interact with other devices and connect itself to an external network like the Internet is what makes the Viti so interactive and special. Without technology like the Bluetooth and WLAN, such communication would not be possible and the "intelligent" aspect of the Viti would not exist. Hence, the connectivity of the Viti to the "outside" world is a major and important

product characteristic.

6.4.1.8 New Possibilities through New Technologies and Value Added Services

The possibility of standardized data and the open connection towards other systems enables possible connection to new technologies such as later on developed add-ons. This enables the Viti to act as an interface for different sensors and surrounding technologies offering many possibilities to create additional devices, that add value for the user. New devices and value added services will therefore extend the functionality. The measurement of blood pressure or hemoglobin are just some possibilities to mention. We also think that the evaluation of the user can be carried out much more precise and deep by additional technology that might already be used in another context like Ambient Assisted Living or the iHome. The communication with surrounding technologies does not only offer redundant check of existing data, it is also possible to enhance our device by extra functionality. The Internet offers a wide range of possibilities. Taking the example of a restaurant guide into account, the Viti can give recommendations on where to eat best in context of the user's fitness and health situation. Imagine the Viti could give a user with a high cholesterol level in his or her blood stream an overview of today's low fat dishes of nearby restaurants. It could also, in consent with the user, make reservations and or even order food in advance. Another example might be the possibility to order corresponding to the health situation of the user food from the supermarket. By using additional information from the iHome, the Viti could buy low fat and fitness products. Another value added service could be an internet community, in order to exchange data with other community members or to compete against others. Therefore the data collected through the Viti could also be shared within a social health community.

Additional devices serving as extensions of the Viti could also be a nice way to add value for the customer. We can imagine that our vital monitor is for example equipped with a portal and wearable measurement device. Some more simple sensors could be embedded in a watch or a necklace. Through that comfortably wearable technology, the Viti Portable can measure vital parameters much more often in comparison to the stationary version of the Viti device. The constant surveillance of body functions and values renders possibilities not only a more precise Fitness Index, but also the ability to individual sport training programs and medical analysis. This enables the user to adjust his or her training scheme exactly to the specific needs of his or her body and therefore the efficiency of training sessions will be significantly increased. The Viti Portable will be the first step towards permanent fitness and health check of the users body.

Due to the focus of this report on the actual product, this is probably an

rather incomplete list of possible value added services, but it certainly gives a good overview, what to expect on services and products, surrounding the Viti.

6.4.2 Value Chain

6.4.2.1 Value Creation

For the efficient production of a vital monitor, it is necessary to know which part of value creation is optimally carried out in-house and which parts can benefit from out-sourcing to specialized suppliers or from co-operations with market partners. For our concrete case, we found out in the driver analysis, that customer acceptance of the product and thus keeping the customer needs in mind is critical for market success. Furthermore, the cost structure of a lifestyle product as we are designing must be reasonable related to the benefits the vital monitor provides. Another task for the value chain is to provide an integrated system that successfully matches internal data sources, which are bought with the product with those that are existing in the customers environment. For the measurement of vital parameters, advanced sensor technologies are necessary, which must nevertheless be produced cheap enough to allow the application not only in medical applications, but also in our lifestyle product. How these targets can be met within the value chain will be addressed in the following sections, ordered by the positions of the different involved actors in the process.

6.4.2.2 Upstream Processes

The vital monitor can be seen as consisting of different levels of aggregation. First of all, it consists of a system of measurement sensors, that provide data which is then interpreted by an intelligent software within the device. The derived values are then used to visualize a "fitness factor" for the user and give immediate advises for improving this factor. So, in addition to the sensors, a processing unit, the software and the casing, a display is needed for the vital monitor. Whereas the software and integration mechanisms are core characteristics of the product and will thus be discussed later on as ideal fields for in-house design, sensors are considerably generic in their application, especially as we assume data standardization in our scenario.

Thus, sensor and other measurement components, such as weight, blood glucose, fat, cholesterol, pulse, blood pressure meters can be bought from external suppliers. Firms which are specialized on those technologies may be able to take advantage from their expertise, economies of scale and scope and synergies in their cost structure from selling to more than one customer. If measurement components with sufficient quality and precision are available on the market or through co-operations for a lower price than could be achieved by in-house production, external sourcing should be preferred. The same decision

is necessary for the display, which must fulfill certain criteria of ease-of-use, e.g. a touch-pad interface or a sufficient size for elderly people who might be visually impaired, but do not necessarily have to be produced by the end product producer.

For the development and production of the "vital monitor base station" a collaboration with a producer of weighing machines might be a good solution, as the base station is more or less a weighing machine with extended features. Thus, a weighing machine producer could either be an appropriate upstream partner or could himself offer a product as the vital monitor, to enlarge the product spectrum for more demanding customers.

6.4.2.3 Internal Value Creation

We identified the intelligence and integrative capacity of the Viti as the features which distinguish this product from others. Thus, internal value creation should focus on the data processing software. This software has to be able to deal with vital parameter information from various sources within and outside the Viti. It has to be flexible enough to be useful on the one hand for the basic configuration of the Viti, with just the base station as a data source, but also for users who want their intelligent home or invasive medical sensors to be used as additional data sources. The software's main task is to translate huge amounts of health data into easy-to-understand values and graphics and additionally give personalized advises to improve the FI. Intelligence adds extra value, as the system is able to compare past and present values, learn from the users behavior and improve the quality of its advises. The human-machine interface, such as the way of displaying results or voice-based advises, is another core competence in addition to the computing software. It should ideally be part of the internal value chain, as it will be a critical factor for customer acceptance as we discussed in the key driver analysis. Furthermore, the producer of the Viti is responsible for the assembly of the base station, that means the integration of sensors, processing unit, energy supply and packaging it with the flatscreen display. Add-ons as the portable vital parameter meter in form of a watch can be offered by this supplier as an extra component to further enhance the Viti's usefulness for customers who want to include data from e.g. sports activities in their FI calculation. The Viti producer is also the one to ensure data protection, a key need of cautious elderly customers. Unintentional miss use must be credibly prevented, to make customers accept the Viti. Last but not least, quality control must be a key part of the production process. Components derived from external suppliers must be controlled regularly for their reliability and precision. Especially the measurement technologies used must be secure, as the user himself can not control the functionality of the sensors and has to rely on the displayed results. If incorrect information is provided, the customer

might either use his or her confidence with the product or even take actions according to wrong advises, which might in the worst case negatively influence his or her health state. Quality control is thus especially important regarding the proximity of the Viti to a medical product. Support services for the setup at home or the introduction of new customers to the use of the Viti may also be necessary, especially for technology averse elderly people and can either be provided by the producer itself or a downstream partner, which should be discussed in the following.

6.4.2.4 Downstream Processes

Getting the Viti to the elderly customers' homes is a crucial issue, as we found out that the majority of elderly people is not as keen on trying out new things just for the sake of having cutting edge technology but first want to be convinced of the usefulness and ease-of-use of an application. Thus, it seems an advantageous strategy to co-operate with downstream partners for the marketing and distribution of the Viti. Possible partners could be for example AAL providers who might propose the Viti as part of a complete intelligent home system. As technological linkages are integral part of the Viti product concept, market collaborations are obviously beneficial for all actors. On the other hand, health care providers, insurances and especially doctors can act as partners. As they know best about the individual needs of their patients and which parameters are necessarily monitored, they could encourage elderly people to use the Viti to actively participate in the control of their health state and work on its improvement. Importantly, people most often rely on the advises of professionals and might think about the new technology more open-minded. If co-operations with health communities and service providers can be established, the value of the Viti can even be increased. On the one hand, Viti users can then share their values with others and compare them and on the other hand primary users of the community may become aware of the usefulness of the Viti and start using it themselves. Service providers, such as Internet shops of supermarkets or sport course providers can build on the data and advises the Viti users can transmit voluntarily and serve them with individualized offers. Additionally, high quality sports shops will be a major partner within the distribution of the Viti to the customers. As it focuses on health conscious people, the Viti perfectly suits the product range of shops, that offer professional sports equipment. Taking all into consideration, we see downstream alliances as advantageous both for fostering the diffusion of the Viti among potential customers as well as for enlarging its value through additional services on its platform.

6.4.3 Market and Players

6.4.3.1 Methodology of a Market Analysis

The most important aspect in product development is to identify the customers needs. The product must clearly offer a value proposition to the customer. Therefore it is indispensable to take closer look at the prevailing market conditions in 2020. This is not an easy thing to do, as the Viti combines a medical device with a fitness product and is thus able to compete in both markets. During the scenario analysis, we identified a realistic scenario for 2020, that describes the technological possibilities and the customers' attitude towards technology at that point of time. In order to fulfill all market requirements with the Viti, there a detailed market analysis has to be performed. A useful tool to do so, is to adhere to the scheme Michael E. Porter identified. He developed the concept of five driving forces within the market: Suppliers, Customers, New Entrants, Substitute Products and Competitive Rivalry within the Industry. As all of them are interconnected, they are shaping the competitive landscape within a market segment. A detailed analysis of these driving forces reveals the opportunities and challenges a new market player has to face.

6.4.3.2 Analysis of the Driving Forces

First of all, we take a closer look at the suppliers. Within the globalized world, it is very easy to outsource the manufacturing of a product. The critical issue by doing that are dependencies, that will be created. In detail, these are hardly predictable, because it mainly depends on the negotiation concerning the contracts with the suppliers. Therefore, we will have to decide in 2020, to what degree outsourcing is reasonable. However, it is necessary to consider this factor, as we plan to enter the market of vital monitoring devices not as a hardware manufacturer, but as a supplier for an integrated solution to health related problems within the Generation 50plus.

In order to successfully launch a product, there needs to be a clear description of what the customers look like. For the Viti, it is not possible to describe the average customer. Although this sounds like a horror message to marketing people, it is in fact the biggest advantage of the product. The Generation 50plus, which is the addressed customer group, is very heterogeneous. Therefore, it is very hard to create a product, that suits the needs of people with totally different lifestyles. In fact, the Viti can add value for every customer, even though in different ways for different customers.

On the one hand, there are people within the Generation 50plus, who are in need of care or suffer from severe problems concerning their health condition. With our vital monitoring device, these people would be able to constantly check the vital parameters, which are most critical for elderly people, such as the level of cholesterol or the glucose level within the blood. As the usage

of the Viti does only require the customer to stand on it, it is also suitable for people where usually a nurse would have to do that kind of measurement. Therefore it enables the people who have to be aware these parameters to live a more independent life. Additionally, the product enables a doctor to increase the efficiency of therapies where special nutritional requirements or the fitness is involved. Through historical values and daily measurement, the diet of a person can be effectively adjusted to its individual needs. This follows a trend of an increased awareness of the impact of nutrition in medical treatment. As high cholesterol and body fat levels significantly increase the probability of a heart attack, the Viti could serve for doctors as a tool, that enables the monitoring of these parameters on a remote basis and therefore it could be an essential part in preventive actions for persons at risk.

On the other hand, the Viti does not only address people who are ill or in need of care. In 2020, by far the higher percentage of the people within the Generation 50plus will be very healthy. This will be due to improved treatment of diseases, but mainly to an increased health consciousness which is also manifesting in an increased spending on health care products. These people will form the biggest customer group of the Viti, as they are interested in constantly monitoring and improving their health condition. In addition to that, they would be addressable for our value added services. As the people of the Generation 50plus are a very heterogeneous group, the attractiveness of the Viti is not limited to a certain age. It could either be a 53 year old marathon runner organizing his/her training more efficiently or a 85 year old man controlling his or her vital parameters in order to prevent a heart attack. Due to an increased risk of heart attacks and apoplexy, especially women, who are doing a hormone therapy during their menopause, need to constantly keep their cholesterol and their body fat on a low level [218]. The purpose of usage only depends on the user itself, while there is no doubt about the need for a vital monitoring device in general. There are plenty of possible situations, where a in other respects very healthy person would need a vital monitoring device in order to improve the quality of life.

Taking all these different areas of application into account, the Viti is a product, that perfectly suits the needs of the Generation 50plus. It will be a must-have product for people who have to keep their blood glucose or cholesterol level tracked. Furthermore, our product is the perfect solution for anyone, who is interested to improve and maintain the health condition.

Additionally, new entrants are a considerable factor. As the Viti is competing on the health care market as well as on the fitness market, new market entries are expected from both sides. Within the health care market, our product competes with other medical measurement technologies. The distinctive characteristics of the Viti are the specially to the needs of elderly people adjusted user interface and the combination of several measurement functions. This is not a trend right now, as most of the well established companies

focus on the improvement of single devices. In contrast to that, the Viti offers an integrated solution. This qualifies it also for the fitness market. As current vital monitors do not exceed plain pulse measurement, an integrated solution offers many more possibilities. With our device it is also possible to track the impact of training on important vital parameters or to adjust the nutrition in accordance to the training schedule. Therefore our product is very distinguishable from the others that will mainly focus on the measurement of parameters that do not allow to actively influence a person's health condition.

Although the Viti differs a lot from other products, it is likely, that, as it is the case with any other successful product, incumbents of both markets will try to establish similar devices. So far, there is no comparable product which could serve as a substitute. As discussed above, the Viti addresses especially the needs of people among the Generation 50plus. Therefore, a substituting product is likely to be launched by a supplier of medical technology as they are more focused on elderly people. Also the legal entrance barriers for devices that can be used medically (e.g. to support a certain therapy) are relatively high in Germany. Due to the lack of experience and the therefore related transaction costs, this aspect can deter many companies out of the fitness market to launch new products that are competing within the health care sector. Nevertheless, there will be substitutes at one point of time. Then the functionality and the value added services will distinguish the Viti from its competitors.

All the driving forces discussed above, are shaping the competitive rivalry within the industry. In 2020, there will be a lot of competition on the Generation 50plus, serving as the most valuable customer group. Many companies will be specialized in addressing the people above the age of 50 as customers. Also there will be a lot of new devices that support elderly people and enable them to live a more independent life. In that environment it is most important to offer the highest value proposition and functionality to the customer. The Viti will take a unique position within the health care sector, as it is likely to become an inherent part of most households.

6.4.3.3 Market size

The market for medical technology is often referred to as the emerging market of the future. In 2006, the global market volume was EUR 200 billion, compared to EUR 16 billion in Germany. Although the market is already huge, it will continue to grow significantly faster than the German economy in the next couple of years. [210] Additionally, German fitness and wellness market have to be taken into account. Today, it makes up EUR 73 billion facing promising growth rates for the near future [212]. The trend towards an increased health consciousness will even accelerate this growth until 2020. It becomes obvious, that in at that point of time, there will be a vast market for a product like

the Viti.

According to a recent study conducted by the Deutsches Institut für Wirtschaftsforschung, in 2020 the spending on products related to a person's health condition will make up EUR 31,9 billion within the Generation 50plus [208]. As the Viti addresses especially this customer group, it will perfectly suit the market conditions, where a boosting demand meets an increased willingness to pay.

6.4.4 Positioning of the Product

In general, the Viti is designed to improve or maintain the health condition by giving the user the necessary information to influence his or her lifestyle. On the one hand, it can be considered as a medical product. In that sense, the Viti will be established as an inherent part within the therapy of diabetes or for mitigation of patients at high risk after they had a heart attack. On the other hand, it will be positioned as a useful tool for anyone who likes to improve the lifestyle in terms of healthiness. Additionally, the Viti serves as a very useful tool for ambitious amateur athletes. It enables them to monitor the impact of the training on their vital parameters in order to optimize the training's effects by adjusting the nutrition to the training schedule. As our product shall be appealing to all of the potential customers, we have to position it in the right way within the market environment. The Viti shall be perceived as a useful tool for every health conscious person, whereupon, due to its high quality and functionality, it can also be used in medical treatment.

In order to establish the Viti in the way we want, it is necessary that rather the usefulness for everyone and not the medical aspect is in the spotlight. Regarding the customers, there is a need for an "ageless" marketing as in 2020 the "feel age" of will be much more important than the real age. Although the targeted customer group is the Generation 50plus, it is most important that the Viti is positioned as a product that could also be bought by younger people. Therefore the product should mainly be available in electrical specialist shops or even in sports shops, offered as a high end device for vital monitoring. Additionally, it would also be possible to label the Viti as a wellness product in order to benefit from this ongoing trend. Taking all these different aspects into account, the Viti will be positioned as a product within the lifestyle sector, while being competitive in the field of medical technology as well.

6.5 Conclusion

Our trend report for 2020 shows a possible development in form of a most likely scenario. Due to the long period of 12 years, future is not entirely predictable by the current situation and the need for applying the scenario method cannot be evaded. By merging the characteristics of key drivers in the

context of the stable predicted development lead to our chosen scenario, which is characterized by a high level of technological intelligence, a broad standard of data storage in conjunction with a high acceptance towards technology. The scenario as a basis has been used to develop the idea of the Viti, a health and fitness product to suit the requirements of the Generation 50plus in about 12 years.

The Viti fulfills the constant necessity for being informed about your current body health and fitness status without time consuming appointments with general practitioners. As easy to handle as a bathroom scale, the Viti can measure non invasive basic body functions and convinces by evaluating gathered data and intelligent advices on sport and nutrition programs fitting best for the users situation. The possibility to interact with surrounding technologies leads to additional information and increases quality of existing values and enables new opportunities and functionality.

Due to future is not written in stone yet, our scenario and its characteristics might not become true until 2020. Limits such as the hazard of standardization have to be resolved, in order to enable data exchange between technologies. The acceptance towards technology cannot surely assumed on a qualitative level. Questions like: Is technology acceptance and functionality of our product high enough to overcome potential costs of the product? Can measurement technologies of blood cholesterol and glucose level jump out of research state? How much will it cost if it enters consumer market? The lack of financial calculation and potential costs of components could not be estimated, but have to be taken into account in 2020.

Nevertheless, the Viti is a innovative device to suit potential needs of prospective Generations 50plus. Persuading in functionality and user friendliness, we believe the Viti is a competitive consumer product in the future lifestyle sector.

References

- [207] Glucose. URL <http://www.orsense.com/Glucose>. Accessed on 02.07.2008.
- [208] H. Buslei, E. Schulz, and V. Steiner. *Auswirkungen des demographischen Wandels auf die private Nachfrage nach Gütern und Dienstleistungen in Deutschland bis 2050*. Deutsches Institut für Wirtschaftsforschung, 2007.
- [209] F.D. Davis. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, pages 319–340, September 1989.

- [210] Federal Ministry of Health. Medizinprodukte. URL http://www.bmg.bund.de/DE/Themenschwerpunkte/Gesundheit/Medizinprodukte/medizinprodukte-nodeparam=Links.html__nnn=tru. Accessed on 01.07.2008.
- [211] Federal Statistical Office. 11. Koordinierte Bevölkerungsvorausberechnung, November 2006. URL <http://destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Presse/pk/2006/Bevoelkerungsentwicklung/bevoelkerungsprojektion2050,property=file.pdf>. Accessed on 30.06.2008.
- [212] Finanznachrichten. Eröffnungsbericht / WELLNESS PLUS wächst um mehr als 60 Prozent / Wellness-Markt profitiert von Gesundheitsprävention, January 2006. URL <http://www.finanznachrichten.de/nachrichten-2006-01/artikel-5829800.asp>. Accessed on 01.07.2008.
- [213] G. Finking. Ambient Assisted Living. Technical report, Federal Ministry of Education and Research Germany, 2006.
- [214] Gartner Group. Predicts 2008: Mobile and wireless set new directions in devices and networking. Technical report, 2007.
- [215] C. Gscheidle and M. Fisch. Onliner 2007: Das Mitmach-Netz im Breitbandzeitalter. *Media Perspektiven*, 8:403, 2007.
- [216] Lifespan. Pacemaker. URL <http://www.lifespan.org/adam/healthillustratedencyclopedia/1/007070.html>. Accessed on 01.07.2008.
- [217] Nike. NikePlus. URL <http://nikeplus.nike.com/nikeplus/>. Accessed on 03.07.2008.
- [218] M. Tapparo. Wechseljahre. URL <http://www.netdokter.de/ratschlaege/fakten/wechseljahre.htm>. Accessed on 01.07.2008.
- [219] Tim O'Reilly. What is web 2.0, 2005. URL <http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html>. Accessed on 01.07.2008.
- [220] TinyOS.net. Mission statement, 2004. URL <http://www.tinyos.net/special/mission>. Accessed on 02.07.2008.

7

Chapter 7

PROCURA - A Platform for Management of Real-Time Vital Parameters

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By 2020 the electronic health card will be realized successfully, the complete telematics infrastructure will be implemented and besides administrative data and e-Prescription, the power over one's medical record still underlies the patient oneself. Data privacy perception will be bipolarly split and development of intelligence systems will approach a level a capability to analyze data automatically. Individual health insurance contributions depend on one's income and basic health care services are paid with these reallocated means. Value-adding services must be paid on a private basis. Economically, the health care market will state 442 Billion Euro with a 3.3% growth per year, the e-health market itself will have a even steeper growth.

Procura is a vital data platform, which aggregates all of the administrative data of every citizen in Germany and integrated voluntarily provided medical records. It conjoins real-time monitoring data and uses intelligent technologies for automatic diagnosis. Involving third party providers, Procura enables innovative value-added services. Procura is supervised by a state-founded, self-governend organization, which's revenue model aims only to compensate the running costs. Due to the legal framework hospitals, phamacies, insurance companies and empircal researchers will all be involved into the project,

therefore Procura will be the backbone of the e-Health sector. It enables better patient treatments due to an improved communication among involved institutions. Cost reduction up to 30% in the complete health care sector due to standardization of workflow processes and lowering complexity of the system can be achieved.

The platform will be divided into application layer, a business logic layer and database layer. Binary and textual databases with medical data are administered and financed by the insurance companies as well as by the hospitals. The business logic layer implements service-oriented architecture, which enables the platform to be flexible to changing market structures and customer demands. The application layer represents an unified role-based interface and serves as single point of access to the platform. The business logic and the application layer are run by a state-founded, self-governed institution. Other subplatforms can be attached to the Health Data Platform, such as a remote monitoring, or a hospital one.

7.1 Introduction

Nowadays, patient medical data is stored partly in paper form and partly digitalized. It is saved in heterogenous systems and in varying formats. As nowadays more and more health data is gathered and processed due to new digital technologies and the increasing demand for health care service caused by demographical change, enormous data floods evolve. That causes considerable costs for data transfer and transformation, which most often leads to unused positives of the vast data amount and does not improve the quality of healthcare as it is supposed to do. Furthermore, the financing problems of the German social and health system call for efficient, cost-saving data management without impairing the quality of health care services. Seeing this challenge, the state, medical institutions and health insurances must seek for inter-institutional solutions. In order to do so, Procura, a central platform for health data management is presented and discussed in the following work.

7.2 Trend and Driver Analysis

7.2.1 Definition

In the following, trends will be considered as major tendencies, which are already noticeable and important at present. As trends have impact on the present world, they are probable to influence also the future to some extent. Occurrences that definitely will have great impact on the future in some predictable specification we define as drivers. In the following, we discuss those trends and drivers, which are based on past and current tendencies and cause certain effects in the future.

7.2.2 Demographical and Social

7.2.2.1 Aging Population

Due to a decreasing birth rate and longer life expectancy, the average age of the German population increases permanently. From averaging 39 years in 1990 to 42 years in 2005, this trend has been visible for many years and is probable to be continued to an average age of 47 years in 2020 given constant birth rates of 1,4 children per woman and a slight increase in life expectancies. [233] This development is outstandingly important, as it changes characteristics, abilities and needs of an entire society.

7.2.2.2 Decreasing Population

Furthermore, death cases increase because the age groups where most Germans belong to get old. Moreover, the birth rate per woman shows a continuous

trend of decrease from 2,0 to 1,3 within the last 30 years. [234] Together with the falling balance of migrations, these occurrences lead to a decreasing total population. Even with optimistic approximations of future birth rate and migrations of plus 100 or 200 millions, the decrease of the German population is inevitable and expected to decrease from current 83 million inhabitants to 69 million in 2050 and thus will be well-noticeable even in 2020. [233] A smaller people influences infrastructural requirements as well as needed services and products and states an inevitable challenge that must be met in the future.

7.2.2.3 Single-Person Households

Due to changing ideas of how to plan and live one's life, the number of people living together will decrease and the amount of single-person households will increase. Until 2025, the number of single-person households is estimated to increase by 11% to 16,7 million, and the number of households consisting of three or more persons will decrease by 21% to 8,8 million. The composition of households might be 41% single-person households, 37% two-person households and 22% households of three or more inhabitants. [236] This trend will have major impact on social behavior patterns as well as on infrastructure design topics or products and services needed by the solitary living persons.

7.2.2.4 Mobile Lifestyle

The lifestyle of the German population shows the trend of becoming mobile in many aspects. Travelling as leisure activity, moving often and changing jobs several times during the working life are only examples of this phenomenon visible in today's society. This leads to increasingly individual life designs but is only possible with adequately flexible and capable technical and service support. Thus, the mobilization of individual lifestyles will be dependent on but also influencing these areas to great extent until 2020.

7.2.2.5 Increasing Use of Mobile High Tech Devices

Clearly linked with the more and more mobile lifestyles in a reciprocal causality, the increasing use of mobile high tech devices states one of the most compelling trends noticeable throughout the last years. It possibly can be demonstrated best by the example of mobile phones. Since the fast moving introduction to a broad base of private users not more than a decade ago, now more than 80% of private German households possess at least one mobile phone. This number increased by more than 50% from 2000 to 2006. [235] The fact that almost everyone carries a portable device with himself opens up various opportunities of extending the features of nowadays' devices. That would enable totally new product and service models which again would influence the behavior and lifestyle of the users as depicted above.

7.2.2.6 Increasing Acceptance of Technology among the Elderly

Elderly people increasingly use technology. This is a visible trend since several years, but is also sure to have major impact on future consumer behavior, service models and products as well. The utilization of the Internet, for instance increased most among people between 40 and 49 with 5,6% to 78,2% being online during the last seven years. Those, as well as the following generations with even much higher quotas of Internet-users, will become part of Generation 50plus by 2020 or afterwards respectively. [275] Then, these Internet-experienced elderly people will present customers who have basic knowledge for using the Internet. This trend works as a strong driver for introducing Internet-based or -supported services to the Generation 50plus until 2020.

7.2.2.7 Relocation of Everyday Activities to Virtual Places

The relocation of everyday activities from real to virtual places is visible in numerous areas of life. Relocating meetings from face-to-face get-togethers to Internet phone calls or video conferences, shopping online instead of purchasing in real shops and searching for advice using online search engines instead of seeking out experts such as doctors are just some out of many examples, which show the ongoing relocation of actions to virtual places using the Internet. This occurrence is a strong driver for future developments, as the evolving readiness and willingness of customers is the basis for completely new forms of communication and organization. Also in the content of health care, this relocation will have major impact, as the patients will be extremely informed through online research and information exchange with others. The deciding question to estimate the impact on a 2020-scenario is, which activities will start to be virtualized in between. This question correlates strongly with topics such as machine reasoning, trust in online services and technical data protection possibilities.

7.2.2.8 Virtual Networks

Participating in virtual communities and networks became a trend during the last years and is a prime example for the trend discussed above. This movement covers several different user groups and purposes of networking. Whereas privately oriented communities such as studivz, facebook or lokalisten appeal to mostly young people and are designed to communicate with friends, to get informed about social events with sometimes regional focus, business oriented networks such as Xing focus on maintaining or establishing business relationships. Xing, as a prime example for a whole branch, could realize growth rates of 170% within 2007/08 with an ongoing trend. [277] This is an important driver because it shifts interpersonal communication to virtual

places and states new problems concerning data security or privacy but also evokes net business models based on the simplified way of communicating and networking. As the continuous trend of more and more digitalizing communication and networking activities from classical mail to email and finally to personalized networks, this development direction is most likely to last permanently and even develop more convenient forms until 2020.

7.2.2.9 Increasing Privacy Awareness

Doubtlessly linked to the increasing participation in personalized online communities and services, the awareness of the consumers of who is accessing and using their data and on which purpose changed. Reinforced by controversial public discussions, this trend caused on the one hand decreasing interest in some community models like studivz for some time, but also required new general terms and conditions from the community operators.

7.2.2.10 Highly Cooperative Communication between Health Institutions

Resulting from the increasing number of old people and accordingly the need for more health care services, the amount of data will increase noticeably till 2020. To manage this emerging flood of information, the communication between the different involved health institutions must react in becoming efficient in terms of quality, speed and costs. This calls not only for isolated applications within one organization, but will result in inter-institutional ICT-supported systems for communicating, maintaining and storing the patients' administrative and medical data. [272] The final evolution state of such an inter-organizational system in 2020 will have great impact on costs and quality of the medical treatment, as well as on privacy issues concerning the patients' data, which then will be stored and communicated differently.

7.2.3 Economical

7.2.3.1 Purchasing Power of Generation 50plus

As the number of people aged 50+ increases permanently, they state a more and more attractive consumer group. The gain in importance of this consumer group due to its growing size asks for more attention from the market side to profit from their purchasing power. This spending capacity of Generation 50plus is based on money saved during past lifetime on the one hand, and on regular income on the other hand. Nowadays, the group of 56-65 year olds holds the highest net entire property with € 130 000 per capita; the retired still possess more than € 100 000 in average whilst young people under 25 hardly have any considerable possess and slowly gain wealth during their working life. [228] Likely, this phenomenon of wealth concentration within the older

age groups will even become stronger, as the age group where most people belong to, born in the year 1964, will belong to the generation 50 + in 2020, the trend of increasing importance of the older peoples' purchasing power is sure to hold on and scale up the market for adequate products. [252]

7.2.3.2 Bipolar Wealth Distribution

Wealth is defined as the regular income plus the value of all goods. It is not equally distributed among the people, but depends on personal savings and earnings. Since drastic happenings such as WWII, a lot of people had to start from the same very low level of possess; nowadays there is a drift to a more and more bipolar wealth distribution among the German population. Whereas the richest 10% now possess 60% of all wealth, the lowest 70% own only 10%. [228] This trend is expected to go on, despite increasing effort of reallocating means through the social insurance contributions. This phenomenon might create two or even more completely different consumer groups and states huge challenges as well as opportunities for new business models. To which extent the trend of more and more bipolar wealth distribution in Germany will develop until 2020 depends on a complex interaction of legal frameworks e.g. concerning the social insurance contributions, social trends such as buying preferences and the economic development in general e.g. through employment rates.

7.2.4 Political and Legal

7.2.4.1 Reorganization of the German Social State

As the German population ages steadily, the pay-as-you-go principle and the inter-generation contract of the social state are not feasible in the future with assumed stable quality, as less people must pay for higher expenses. To maintain the social system's functionality, reorganization measures are inevitable. This is done through reorganization of the five sectors namely the unemployment, accident, pension, health and nursing insurance on the one hand, and through contribution assignments on the other hand. As at the moment controversial discussions about the future of the German social system and possible financing tactics are held, no certain tendency can be estimated. What is sure is the influence of the final solution on the year 2020-scenarios and especially on health related issues.

7.2.4.2 Financing Health Care

The problem of how to finance the social system, which was explained in the trends and drivers section, has direct impact on how to pay for health services, as health care is - through the health insurances - linked with the financing and reallocation mechanisms of the social system. As at the moment,

totally different models of either integrating everybody into the statutory, income-based health insurance or uncoupling the health insurance contributions from income but charging same fees from everyone are discussed, the future of the statutory health insurance in Germany is absolutely unclear. To overcome the problems affiliated with the inter-generation contract, also the risk-based contribution model of the private health insurances is discussed as an alternative. Depending on the outcome of future legal resolutions, financing health care can be done in very different ways by 2020. The involvement of compulsory insurance and reallocation of contribution means will have influence on the extent to which different income and patient groups can afford health care. This could result in either equally distributed access like today, which would cause higher charges for wealthy citizens; or to health care access more oriented on the personal financial means of each one which would categorically exclude less-earning patients from special costly treatments. Financing health care is discussed as a driver in this section and not in the following part, where drivers with uncertain specification are evaluated, because the German Social Code states the care for deprived people by law. Hence, no matter how health insurance contributions are assigned, the access of all citizens to health care services will be secured but only the exact extent and financing split is uncertain.

7.2.4.3 Data Protection

Over the past years, data protection regulations gained in importance and sequentially began to be established all over the EU. Enabling citizens to decide on the purpose their data is used for by their giving consent has been the aim of these regulations, but facing all the technical trends of our time, data protection increasingly becomes a burden, acting as an inhibitor for innovation. Visions as pooling large amounts of data onto one spot (i.e. for medical research) or monitoring of global phenomena (i.e. the spread of epidemics by vital parameter monitoring) are unsustainable with current data protection regulations. [229, 262] Furthermore, especially regarding the health sector, patients who are not giving their consent on processing their medical data could suffer serious detriments with respect to their treatment.

To facilitate innovation, which is crucial for economic prosperity, the EU and therefore Germany suggests the reorientation towards consent-independent data protection regulations, properly balancing the citizens' as well as the public interest's needs. [276] In other words, a future is desired, where the provision of certain data will become mandatory and regulated by law, the citizen will be denied his decision power. As this EU-vision strongly collides with the trend of increased privacy awareness, it is very little possible for such laws to be successfully implemented by 2020, eventually they will never manage to prevail. Therefore, for the period from now to 2020, data protection

is considered to be a stable driver.

7.2.4.4 EU Expansion

As current economic studies have proven, the expansion of the European Union will bring economic advantages for all its members. Although for states entering the union earlier this will not happen immediately, like for new member states, an overall economic analysis encourages the EU expansion strategy. It will set the stage for better trade and competition conditions and provide the EU a more stable position in the global economy. [227, 251]

7.2.4.5 EU Financial Aid

Since the introduction of the Lisbon Strategy to encourage economic prosperity in the EU and afferent specific health financing strategies from the FP7, the funds allocated have constantly been raising. While FP6 only allocated 17.5 billion Euro, the following FP7 was granted 53.2 billion. As this is a constant trend in the future, it will act as a driver for the financing strategies of the future.

7.2.5 Technological

7.2.5.1 Processor Speed, Data Storage and Network Bandwith

Moore's Law, the guiding principle for the semiconductor industry, says that computer technical infrastructure increases its efficiency and performance by the factor of two every eighteen months. [259, 274] By technical infrastructure one can refer to aspects like processor speed, data storage capacity and network bandwith, which walk hand in hand with current miniaturization trends. Smaller chips with increased number of transistors facilitate highly efficient computing.

Current predictions foresee the medium-long term future of bit-oriented computer technology to reach a fundamental physical limit at about 2020 and will be replaced by a more efficient one. Miniaturization is predicted to reach subatomic scales and, as nowadays nature, at small scales, is described by quantum physics instead of classical physics, the quantum phenomena will have an extreme impact on semiconductors and microchip development, on their performance, size and the materials used for their construction. For the same period of time, first quantum computers are expected to boost the performance of computation. [257] Thus, by 2020, an outperformance of Moore's Law seems more plausible than ever. [222]

7.2.5.2 Attention Shift of HCI towards System Architecture

Human-Computer-Interaction (HCI) can be seen as the science aiming to improve the usability of our tech devices and software by designing proper user interface technologies. [223] According to the contemporary definition of HCI, the range of user interface technologies begins with Graphical User Interfaces and concludes with innovative interaction techniques, e.g. touch screens, sensors, eye movement.

In correlation to other emerging trends, also HCI has to be subject of change. Digital technology coordinates a major part of our key social institutions, i.e. telecommunications, finance, transportation, distribution of goods, high-volume manufacturing and health care, dependence which assuming will become even more pervasive and total in the next twenty years. [243] Thus, by 2020, digital systems and technology, so it seems, will become a constitutive part of our social fabric. As this demands stronger interaction with the specified devices, HCI as well will play a major role in the social fabric of the future. Until now, HCI resumed to surface issues of interface design, leaving the system architecture design to core computer science professionals, but in order to ensure the proper integration of the digital systems into our everyday lives, HCI will have to shift its focus towards all levels of system development. [243]

7.2.5.3 Digitalization

The introduction of digital, bit-oriented data was a turning point for society. It reshaped our lives, empowered us with rapid computing, set the base for globalization and acts as a driver for future development. Digitalization has not yet reached all fields of society, but by 2020 digitalization processes started today, i.e. of radiological imaging or projects as Google's digital library might have reached their peak.

7.2.5.4 Convergence of Telecommunications and the Internet

With every new generation of mobile phones, the expectancy users have from the device rise, they need to support enhanced functions, i.e. for entertainment or organization. Nevertheless, phones still show a clear separation between services provided by wireless communication support and the those using dedicated telecommunication standards.

By 2020, this separation probably no longer will exist. The Internet will be the overall medium for all types of communication - a tendency already noticeable today. [264] We have standards like Voice Over IPs (Internet telephony), providing us with a locally bound phone number, but transferring our speech data through the Internet. We have gateways allowing to call a device located in a GSM network from a VoiP-based device, one can install VoiP software on one's cellular phone and perform Internet calls when connected

to a WLAN. Even if all these devices will not use the same standard for all services, for the end user the transition from one standard to the other will be not perceivable, as data transfer speeds will be aligned with each other. [264]

This evolution encourages the relocation of everyday activity to virtual places and the use of virtual communities, as these will always be accessible through the always-on connection of the mobile phone with the Internet.

7.2.5.5 Wide-Area Wireless Communications

By 2020, contemporary innovative wireless technologies like Wi-Max will not only be implemented, but probably even be able to supply even bigger areas with Internet access. Due to this, the cross-linking of extremely afar systems will no longer be a problem and thus will highly efficient communication, without any limitations of wired connections as we know them today, will be granted.

7.2.5.6 Standardization Efforts

While standardization has always been an important pillar in the study of economics, industrial organizations and regional development, its role has changed over the years. In its early days, standardization was only considered a tool for technical interconnection and regulation, later on gaining relevance for academia and becoming the object of academic disciplines. With the introduction of a new generation of standards, a new market opens up, attracting new players to enter and become its new major players. On the other hand, players of the old market will have to break out of the legacy systems they had invested in. The dynamism of the market, driving economic prosperity, can be given by the standardization of new generation systems. [248] Nowadays and in the future, the role of standardization will be to synchronize disjointed technical innovation into a systemic innovation.

7.2.5.7 Increasing Data Flow and Its Risks

With the digital and web era, sending information from any spot on the globe to another, no matter how far away located one became accessible to everyone. The number of Internet participants is growing all over the world, who feed the Internet with increasing amounts of data. This calls for the proper management of increasing flows of data, requiring faster connections and higher bandwidth and higher data storage capacities. The Internet more and more becomes the major communication channel, inspiring for new content formats. These, in turn, attract more participants and, as the costs for Internet access are sinking [statBundesamt2], by 2020 the Internet will also have reached most of the isolated parts of the world. On the other hand, the tendency of the Internet playing a crucial communication role in social interaction, economics,

regional organization, travel etc. bears considerable risks and increases its vulnerability. We are standing at the beginning of the era of cyber terrorism, which, as evidence has shown, will form an ever-stronger community in the future, as an increasing number of terrorist organizations see technology as a potential tool for carrying out attacks. [237] So called Denial of Service (DoS) attacks on major Internet backbones paralyze the economy by interrupting communication or service provision, causing critical turnover losses. In the year 2000, in a three-week-period, there were over 12.000 DoS attacks on over 5000 different targets, as Amazon, Hotmail or E-Bay. [238] By 2020, net war will reach exorbitant figures, constituting a major threat.

7.2.5.8 Ubiquitous Computing

Ubiquitous Computing comprises all information processing taking place by the use of everyday objects while engaged in common activities, often happening in unawareness of the user. As these computing artifacts, integrated in objects from our real world, will surround us without us even sensing it, sending data from one to another, the critical issue of privacy awareness arises again. [256] Nevertheless how this issue will be solved by 2020, Ubiquitous Computing is an unavoidable trend and will strongly reflect in the respective environment. While today such devices are rather subject of research and only slowly begin to emerge to the consumer market, the vision of context-aware systems will probably be reality in the mid-long-term future, enabling real-time monitoring of vital parameters, i.e. by nano-sized devices woven into clothing.

7.3 Key Driver Analysis

7.3.1 Definition

Key drivers have, like drivers in general, strong impact on the future environment. Different from the definite drivers discussed above, their parameter value direction is not predictable, but uncertain. Several different specifications seem possible right now and these varying key driver specifications make the differences between the several scenarios built in the following section.

7.3.2 Description of the Most Important Key Drivers

7.3.2.1 eGK-Project Realization

The electronic health card (elektronische Gesundheitskarte, eGK) was decided to be realized by law within the health care reform in 2004 and was intended to be used by every insured person starting 2006. [232, §291] The functions of the eGK are separated into mandatory features, namely using the card for administrative data provision and electronic prescription management, and

optional functions such as documenting a patient's received drug therapies and medical treatments. [239] The realization of the eGK is uncertain but will definitely have elementary influence on 2020's frameworks and accordingly to the discussed data platform. Because since the resolution in 2004 no compelling progress concerning the nationwide introduction can be noted and controversial basic discussion still hold on, the realization as well as the possible extent of the whole project are uncertain. One possible specification of this key driver could be the realization according to the yet delayed plan, which means the use of basic and optional additional eHC functions by every patient. Another possible outcome of the eGK project development could be a partial realization with very basic functions or regional limitations only. A third, radical possibility could be the cancellation of the project. The different specifications of the eGK projects realization have great impact on the discussed platform, as a nation-wide frequently used technology would come along with supporting infrastructure and communication standards and thus would fundamentally shape design and use prospects of an inter-organizational platform.

7.3.2.2 Acceptance of Personalized Online Services

The acceptance of personalized online services is uncertain and although of great importance, as the possible alternatives will influence the use of a health platform's services because these would actually be received as online services by the patient. The acceptance, more precisely the interest and the trust in using personalized online services would basically decide about if at all and to which extent the platforms features would be used if use is based on a voluntary basis. The specifications can take shape in either valuation, trust and utilization or in mistrust, disinterest and disuse of those personalized online services. Of course, concerning attitudes such as trust and interest there will never be one single specification covering every German, but a major tendency would have impact on the development and legal embodiment of the discussed health data platform. Depending on the legal situation, there could exist totally different user groups concerning trust, interest and use assuming a optional basis for all services introduced in the context of a health data platform.

7.3.2.3 Increasing Automation and the Intelligence of Systems

Automation, on the one hand, is all about cost and time efficiency, on the other about the human innate desire to enlarge his horizons and enlarge the frontiers of science. As around 2020 new, more powerful computing technology will begin to replace the classical bit-oriented one, eventually breaking down Moore's Law, it might become a period of transaction, enabling humans to fulfill the vision of a self-aware computer system. The degree of intelligence of the systems of 2020 still remains to be discussed in the different scenarios,

as this degree is situated somewhere between the ability to only interpret machine-readable data and intelligent systems being capable of thinking for themselves and learn from former experiences stored in some type of conscious memory.

7.4 Scenario Building

7.4.1 Definition

Scenarios present hypothetical constructs of how the world could probably be shaped in the future taking into account different sets of assumptions. These sets consist of the trends, drivers and key drivers which were discussed previously, as these are the main influences for changes that will occur between the present and the discussed point of time, 2020. Whereas trends are visible and important right now and might also impair the future world, drivers are considered to definitely having strong impact on future change. These two predictors are relevant and more or less constant for all alternative scenarios and set up the following general framework. Key drivers are the factors, which make the difference between the single scenarios. The combination of the key drivers' parameter values, for instance the different possible specifications they could become, create the differences between the scenarios.

7.4.2 General Environment

Regarding the key points discovered in the trends and driver analysis, we can assume a basic environment that is probable to be the same for all different scenarios. In 2020, the environment will differ from the current one. The increasing age will influence equipment in all public and private areas, as it must be understandable and utilizable for the user group of elderly people. Nevertheless, most of the elderly will manage to handle information and communication high tech devices as by then HCI will have a deeper impact on those devices, being involved in the conception of their architecture as well as in the user interfaces. As an increasing number of citizens will live in single-person households, communication will become an even stronger pillar of the social interaction and will widely take place virtually or be mediated by phone. The increasingly mobile lifestyle of most people requires flexibility from services and products. This conduct of life is supported by mobile devices that enable the flexible conducting of tasks that were formerly bound to specific places, boosting the relocation of everyday activities to virtual places; e.g. online banking via mobile phone from abroad. Whether telecommunications will use a dedicated infrastructure as medium, or will recur on the Internet for transmitting data, it is sure that mobile phones will offer unrestricted access both to online as to telephony services through smart

phone devices. These smart phones will be well-developed, relatively affordable due to mass production and customer-friendly due to increased competition among global providers and HCI research in 2020. What comes along with increased use of personalized online services is the issue of data security and privacy. The awareness itself will be huge, as much more services will be used and thus more data will be required to be submitted by the customer in 2020. The specific attitude of individual customers is not predictable and will be discussed in the specific scenarios. Data protection regulations will still require consent. Furthermore, the Internet will be an omnipotent communication and trade channel, highly exposed to risks as hacking and Denial of Service attacks. Nevertheless, required security measures will have been implemented in order to overcome potential risks, a better network infrastructure will have been established, more backup-servers will exist and encryption will be more powerful. On the other hand, computing possibilities might improve in the following years, as 2020 will represent the early beginnings of a new computing era. No longer bit-oriented but atom-oriented first quantum computing systems might already have been developed and will be used by researchers. Currently known data transmission mediums will be replaced by much faster ones. New materials, e.g. for semi-conductors, will boost data storage capacity and processor speeds might be faster by factor 4000 than today. [243] Storing, retrieving and sending data will no longer be a limiting issue. Wide-area wireless technology will furthermore make the cross-linking of at high distance located systems possible, overcoming limitations imposed by wired systems. Thanks to the strong interconnectedness of systems and the easy information exchange, remote monitoring and controlling will be applied in all fields, from the by ubiquitous computing devices enhanced home to far-distance medical diagnosis on the basis of real-time submitted patient data. The accurateness of this data will be stunningly high, as ubiquitous computing will enhance the data with context-aware information. Processing of this and other available data will be possible through machine reasoning, yet still the extent is uncertain due to the development degree of intelligent systems, which shall be discussed in particular for each scenario. A huge part of the change that is visible in 2020 compared to nowadays is facilitated by the increasing purchasing power of the Generation 50plus, as most of the change serves adjusting environmental shape to their needs. Nevertheless, not everyone will profit to the same amount from the possibilities given in 2020, as a more bipolar wealth distribution leads to rich customer groups who use, and poor groups who do not use the emerging technologies, services and infrastructures to the same extent. Thus, there will be a considerable market for value added services suiting the newly profiling customer groups.

7.4.3 Scenario 1 - Emerging Market of Privately Managed Health Platforms

In the first possible scenario, the eGK project is realized only partly and there is no state- or health insurance-supported health data platform. The eGK is mandatory used by everyone, but only compulsive basic functions like administration and electronic prescription management are possible. The fractional realization of the eGK project is due to technical and organizational failures, uncertain legal frameworks and ongoing abstractions by different interest groups like doctors, health insurances and patients. Due to this lack of centrally arranged data platform development, a new market of private health data management providers evolved. These private providers store and maintain the patient's data on their servers and offer according services such as information, consultation and real-time vital parameter monitoring. Due to the strong competition in this new market, many providers developed their own sophisticated intelligent systems helping to analyze and use the stored and real-time incoming data. The patient's attitude towards private health-related service providers is trustful in general, but yet there are patients who do not at all occupy these private health services. According to the certain provider's offer, there can be a more or less intense cooperation with doctors, hospitals or other health-related institutions. As the new market consists of many players and even shows international dimensions, in the following years a heavy consolidation will take place and standards will be set in technological terms concerning the supporting technologies such as for real-time viral parameter monitoring and intelligent data processing. Laws regulating the whole business will follow soon after, to provide for privacy and data security.

7.4.4 Scenario 2 - Local Platform Networks between Hospitals and Research Centers

In the second presumed scenario, the whole eGK project is not realized at all and neither does a centrally managed data platform exist. This is due to mistrust and refusal to use by patients and a revised legal framework because of strong obstruction by several interest groups such as doctors, pharmacists and others who either fear high financial burdens connected with the eGK and platform introduction, or see potential danger in being prosecuted for mistakes due to the increased transparency and documentation of doctors' operations. People do not trust personalized online services, as some scandals of data abuse made headline and destroyed any basis for trusting and using services related to sensitive data. Hence, the me existing private service providers who offer storage, maintenance and analysis of health data are rarely frequented and no big market emerges. Instead, different health institutions such as hospitals, medical practitioners and research facilities build local networks

which gather, store and use patients' data for research purposes rather than for individual patient treatment. As the data is handled anonymously, the patient is not involved of this data processing at all. The intelligence of systems is not developed on a significantly high level in general, but depending on the networks' research purposes only used for very specific analyses.

7.4.5 Scenario 3 - Health Insurance-Managed Data Platforms and Value-Adding Services

In a third assumed scenario, a platform managed by the health insurances exists and the eGK project is well-proceeded. Drivers which advanced the eGK and as well the platform project are the financial benefits for the health insurances and strong political guidelines. The eGK basic functions such as authentication, administrative data submission and electronic prescriptions are used by everyone as stated by law. Optional functions like the creation, documentation and maintenance are used by some patients, depending on their individual will. This is due to the liberal legal framework which still divides the eGK's features into mandatory and optional ones. But we face a period of change: in politics the compulsive use of several so far optional features such as the electronic patients records are discussed and passed by law. The platform is maintained by the health insurances, who are in charge of the overall administrative coordination of the health treatments one receives. The data that is saved on the platform is used for the individual patient's treatment on the one hand, but also for inter-institutional research purposes. Medical and administrative data is stored separately to guarantee data security and the patients' privacy. Intelligent systems processing the data are well-developed and support the analysis and decision-making concerning the medical data. There is a nation-wide infrastructure enabling the use of the eGK and connecting health related institutions such as hospitals, doctors, health insurances with the patient and each other. Optional services offered by third parties,, e.g. real time vital parameter monitoring, enlarge the platform-related service roster. Due to the bipolar distributed attitude towards personalized online services among the Germans, these services are frequently used by some patients, but totally neglected by other groups. As the value-added services must be paid privately by the receiving patient, another factor limits their use to special patient segments. However, all basic health services will be paid with income-based health insurance contributions for also providing health care to deprived citizens through the according reallocation of means.

7.4.6 Evaluation and Further Specification of the Most Probable Scenario

From the three above developed scenarios, that are set to be encapsulated in the general framework, the most plausible to happen has been evaluated to be scenario number three, where health insurances manage the data platforms. The electronic health card features will be used to different extents and certain population groups will choose to also take advantage of the one or other value added service provided by a third party. The successful realization of the eGK project seems most plausible, regarding current efforts of the German state. Although there surely might have been protests against the eGK from several interest groups, for example doctors associations fearing higher legal liability or evolving costs, the quality and efficiency benefits of the project will stand in the focus and constantly promote the introduction of eGK-related legislation. As it is crucial to provide the same high quality medical treatments independent from the patient's location, proper medical documentation, retrievable through the eGK and an existing health data platform, must be available. The amount of data the patient provides still underlies his own decision power, as it is unlikely that consent-independent data protection regulations will already have been implemented by 2020 because of extremely high privacy awareness and mistrust among the population. Nevertheless, it will be a principle objective of the German policy to create a legal framework which states the documentation of medical patient data without his consent. In order to control the quality of health data management, the state itself will execute administrative and standardization actions through a state-founded self-governed organization. Furthermore, the reallocation function of the German system is unlikely to change, although issues of viability due to demographic change are discussed. No matter how the health insurances' financing will be assigned to the different social groups, health service financing will still be done through some kind of reallocation of means through health insurance contribution to ensure a minimum of service provision even to deprived citizens. As the intelligence of systems is permanently evolving, by 2020 there unlikely will be systems implementing artificial intelligence to the extent of self awareness, but will be surely capable to accurately analyse medical data and provide pertinent evaluation and diagnosis. These systems will support doctors and researchers in decision taking and finally providing better medical treatment.

7.5 Procura - the Health Data Platform

7.5.1 Product Description

7.5.1.1 Product Idea

The health data platform integrates all existing health records (a set of documents that describe one's medical history) into a single system, set standard representation of the health records and single point of access for all stakeholders. Furthermore the platform is adaptable to changing needs and provides integration opportunities for innovative technologies on top of it, such as integration of real-time monitoring data of patient's vital parameters.

The "heart" of the platform consists of its business logic, which provides the functionality of the platform. It along with internal databases for administration of the system are a duty of a state-founded, self-governed institution. Hospitals provide databases with the health records of their patients, insurance companies do the same with the health records of their customers generated by GPs. Additionally they run databases with administrative data and file servers containing medical images.

The mandatory data, which must be stored, is patient's insurance data. Optional is all medical data obtained by general practitioners, hospitals, other medical institutions or remote-monitoring, as well as basic health data, such as blood type, allergies, etc. that can be helpful in case of emergency. Pointers to all those data sets are saved on a electronic health card (eGK), which also serves as an authentication tool for the platform. An enterprise portal will be used as an unified graphical user interface for all users of the platform.

Core Functions

Patients can log on to on to the portal to view their electronic health record. Through this interface the patient can set individual access rights for each stakeholder in the medical supply chain and so screen some data sets from his/her health record stored electronically. In order to keep his privacy, the patient is allowed to administer the data. To execute the actions described above one must own an authentication device - the eGK.

The health data platform provides numerous benefits for health professionals and researchers, too. Through the portal they will be able to view all patient's textual, image, sound and video data in a consolidated form. Searching and adding new data, as well as issuing electronic prescriptions will also be possible. Decision support by computers will be enabled by semantic representation of the data and vast anonymous medical data will be there to foster the research. The platform will give the institutions the opportunity to share their research for improvement of the collaboration.

Pharmacists and health insurance companies' employees can view electronic prescriptions, respectively calculate costs for treatment and medicines digitally.

Value Added Services

The platform offers an easy and secure way to add value added services from third party providers. This would not only increase the benefits for the patients, but will also serve as a driver for future innovations. Due to the vast amount of medical data, services like empirical research can be implemented easily through integration of intelligent systems which will enrich the medical knowledge.

An important value-added service is the remote monitoring of elderly or heavily ill patients, or of those just being eager to be aware of their health. For a monthly fee the providers can supply their customers with 24/7 monitoring and emergency call services, thus shifting considerable amount of costs from severe disease treatments to prevention through early disease detection and providing higher quality life at home for the patients. Sharing of the so gathered information represents huge opportunities for scientists and researchers to detect a spreading disease or give a fully comprehensive picture of nation's health status and eventually deduce the reasons for it.

Another great application can grow out of the integration between the health data platform and health networking sites where the patient has a profile. To track and quantify patient's perceptions and integrate them in the platform will give the medical personnel another perspective on which they can base their diagnosis.

Third party software providers can provide access to their latest intelligent decision-support systems or innovative software products like data mining tools, image or symptoms analyzers, etc.

7.5.1.2 Stakeholders, Their Needs and Generated Benefits

In the following the stakeholders of Procura are introduced as well their needs are characterized. An overall need applies to the basic principle of information logistic: the right information, to the right time, in the right amount, at the right place and in the demanded quality. [254, p. 238]

Patients

Every citizen will be considered as patient, since everybody will own an electronic health card and therefore everyone will be a potential user of the platform. Patients will be asked to provide administrative data, but they can also voluntarily provide data about their medical history to complete his or her own medical information. Concerning the platform, information is designed around the citizen, not the organizations, which defines the patient as the main actor.

Throughout the demographic change the growing group of elderly in society have a strong desire to live a light-hearted and free way. Whether going on holidays or actively utilizing their new motorcycle they want to feel safe about their current health status.

Not only the elderly, every citizen has a demand for accessing their complete medical history anytime and anywhere, as well knowing their current status, if they carry a real-time monitoring device. Another important aspect is the data privacy. Even though many patients are willing to provide the system with their information, the full control of each own's medical history has to be respected.

In the end every citizen wants to be provided with the best treatment possible. They want to receive all the information about themselves; they want to know why they are in treatment; they want to get healthy as fast as possible and stay healthy as long as possible. [240]

All these needs can be satisfied with the realization of the vital data platform. The main benefits generated for patients are better medical treatments due to better information flow among doctors and the enablement of real-time monitoring. Especially the elderly will profit, because they will be able to live in their own houses by themselves and experience a more enjoyable and hedonistic way of living even in the later stages of their lives.

Being provided a complete coverage of their medical history as well as their real-time vital data, German citizens can receive these data anytime and anywhere. A better awareness for one's own health can be achieved, which ultimately will lead to longer life expectancies.

Health Insurance Companies

The insurance companies, state or private ones, are very important stakeholder of the platform since every citizen has to be insured by law. These companies finance most of the existing telematic infrastructure. In the light of the eGK, it is stated by the law that the insurance company is in charge of administrating the medical data of their customers, which means that the physical data storage will be run by the insurance company.

The biggest need, to reduce cost throughout the health care process can be achieved by the implementation of the platform. Due to the optimization of their own processes cost reduction up to 30% can be achieved. For example, with the introduction of the e-Prescription up to 300 million euro can be saved, because nowadays paper-based prescription has to be re-scanned due to accounting reasons. [271] With the benefit of ICT and Procura the health insurance companies will be able to provide the customers with better services.

General Practitioners

Germany's medical system consists of many general practitioners who do not have their office at a hospital. These doctors will have implemented the necessary infrastructure related to the health data platform, as well as accepted the penetration of information communication technologies (ICT) in their sector.

General practitioners want to be able to offer the best possible treatment to their patients to satisfy their needs, as well as to lower the risk of a medical

error. Therefore, the doctor's need all available information concerning the patients medical record as well their current health data. Using ICT in their field of occupation, the general practitioners are concerned about their professional status and the danger of the detection of medical wrong decisions, as well as their personal relationship to the patients.

Due to a well rounded information transportation system doctors have a improved communication among themselves and can provide their patients with the best possible treatment. Medical errors can be reduced to a minimum as well as better decisions can be made with the support of automated diagnosis systems. Doctors can resume at the point, where the last doctor stopped his or her treatment. In the end the doctor will still be the decision maker in the treatment process, the automated diagnosis is implemented as a supporting tool for the doctor. The platform will optimize workflow processes in the private practices for the doctor and his or her staff, so time and therefore cost can be saved.

Hospitals

The daily life of such big institutions contains many complex processes, which are time- and money-consuming. Hospitals want to have a better control over these processes as well as to lower their complexities. In the end hospitals want to provide a better treatment to their patients, minimize the length of their stationary stay, as well as minimize the chances of medical error. In 2008 many hospitals already have implemented a hospital information system (HIS), which stores a mass of patient information about the procedures during their stay, but the potentials of the development of new technologies has not been realized. These information will also accessed by the platform to complete the information coverage of the the patient. Besides cost reduction, hospitals want to utilize technology effectively to enhance their medical care, as well as improve patients safety and the outcome of their treatment.

All these needs can satisfied with the implementation of the platform. By reducing the complexity as well standardizing processes in the hospitals, cost can be saved up to 30% cost. [231] Optimized processes does not only reduce cost, but also lowers time for doctors and staff, as well as shorten the stationary stay of the patient. In the end doctors can provide health care services with an increased efficiency and better medical outcomes.

Pharmacies

Pharmacies are the suppliers of the patients medicine and are also obligated to implement the necessary infrastructure concerning mostly the eGK, which makes them a part of the information as well as the value chain. Even though pharmacies do not have a direct impact on the treatment of patients, transaction costs of the whole health sector can be reduced through the potential of ICT. Just like the health insurance companies, pharmacies spend time and money managing paper based prescriptions. This issue will be solved

in the delight of the platform, up to 300 million euro can be saved overall per year. Another important benefit of integrating pharmacies into the information chain will be the reduction of false medication risk.

Third Party Providers

Third party provider will mostly be health organizations or corporate health companies looking for a new distribution channel for their services. After checking the business model due to safety reasons, Procura will grant the service providers access to the platform, where these organizations can offer their services. Especially in the light of enabling new business models and innovative ideas, the platform can offer patients new and secure services, as well as creating new value creating organizations. These organizations can have a impact on the overall economies, especially by creating new employment positions.

Empirical Researchers

Medical researchers play an important role especially in the long-term prevention and cure of diseases. Empirical research can only be done with the data, the more data the more accurate the findings. The platform enables medical researches access to medical data of a whole nation, which will lead to rich medical knowledge to prevent upcoming diseases.

State

The federal government is involved in the platform by initiating the project as well as financing research projects. Being an important stakeholder of Procura, the government introduces a legal framework to enable the basic functionalities of Procura and to grant the security of the date with it authorization.

Main objective is the better overall health situation in the country, as well as lowering the administrative cost of the health sector and reducing operative inefficiency. It is interested in overall knowledge of medical treatment, especially concerned about disease prevention. The lack of comprehensive patient information can filibuster effective public health research. [265]

An overall better health system, as well as a better provision of health services raises the attractiveness of the country itself and the satisfaction of the citizens. Due to the possibilities of empirical research the medical knowledge base will increase vastly to raise to chance of prevention of diseases. [246]Implementing an information systems covering the complete countries sets standards for other countries. In the light of optimized processes administrative and operative cost can be reduced, which is compellingly important regarding the financial problems of the social state. Acting as well as innovation driver, the platform enables a better economical situation.

Supervising Organization

Procura is supervised by a state founded, self-governed organization, which administers the platform itself and it's business logic, but not the data storage.

Due to privacy issues it is necessary to have an independent operator to manage the platform, which retrieves the data from the distributed data storage systems and aggregates them to a unified medical record. Stakeholder of this organization is the federal ministry of health, which supports this organization financially and with legal actions. A major concern of the platform is the interoperability of all the information provision systems as well as the devices. [266]

7.5.1.3 Unique Selling Propositions

Complete Value Chain as Stakeholders

Having every main actor of the medical value chain as stakeholders enables to platform maximize the potential from a informational point of view, as well as displaying trust to the third party providers and to the patient himself.

Flexible Technical Infrastructure

By implementing a flexible technological business logic, it is easy for the platform to react to changing customer demands and to add new services.

Support by Legal Framework

Having the federal government as stakeholder, political actions influences the legal framework in the interest of Procura.

Backbone of the Complete e-Health Sector

Being the basis for health care services, real-time monitoring and the information flow among the involved institutions makes most e-health technologies dependent on Procura.

7.5.2 Market and Competition

7.5.2.1 Market Research

Market Size and Growth

Overall costs for the health care in 2003 have been about 260 Billion Euro, 12.2% of the GDP. This figure will raise up to 70% until 2020, 442 Billion Euro, which will be around 15% of the GDP. The health sector will have a market growth of 3.3% p.a. compared to an average growth of 1.9% p.a. of the GDP until 2020. [258, 250] Medical-technological innovations will be a main factor for growth of the whole GDP in Germany, the market size will be 133 Billion Euro in 2020. [250] In 2006, spending for ICT for medical reasons have been stated around 3.5 Billion Euro with a projected growth of 4% in the year 2007. Relevant technologies or standards like SOA Support and Integration, Semantic Web and Health care or personal health record will still need at least 5 to 10 years until being ready for deployment. [241, 269] Combing the

scenario, that only some of the citizen will be using the voluntary part of the electronic health card with the diffusion theory, which describes the process of introducing and diffusing an innovation into a social system, only a minority of the population has been reached by the technology. Thus the e-health market will still have a continuous growth, if not even exponential growth until the year of 2020. [253]

Market influences

Besides unforeseeable factors like war, terrorism or natural catastrophes important factors influencing the e-health sector especially the medical information system sector, will be the acceptance of technology and privacy concern of the citizens. Naturally, if privacy concerns are very high and a product will not be accepted. Political & judicial agreements will influence the market by setting and changing the legal framework for the market. Break-out technological development concerning telecommunication and information communication technologies can change the complete market and act as disruptive technology. [224]

7.5.2.2 Market Strategy

Due to the legal framework, every citizen is obligated to use the administrative part of the electronic health card, therefore every patient is a targeted customer. According to prior research the elderly will become the biggest part of society, as well as representing almost 60% of the customer group in 2020 (see chapter 2). Spending for health care products of this market segment could rise up to more than 20%, therefore the most targeted group especially for real-time monitoring and value added services are the Generation 50plus.

7.5.2.3 Market Analysis

According to Michael E. Porter, the state of competition in an industry depends on five forces. The collective strength of these forces determines the ultimate potential of an industry. These forces are:

1. Threats of new entrants,
2. Bargaining power of suppliers,
3. Bargaining power of customers,
4. Threats of substitute products of services,
5. Jockeying for position among current competitors. [263]

In the following part, a market analysis according to the five-forces model will be examined.

Threats of New Market Entries

The projected legal framework in 2020 does not obligate the citizen to provide more than the administrative data. Thus new entries as well as current rivals, have the opportunity to enter the market until legal changes have been made that oblige the patients to use Procura and the eGK for formerly voluntary purposes. Since the telematic infrastructure already has been established as well as dwindling costs for data storage and server capacity were realized, important financial factors for entering the market have been diminished in regard of technological development. But, it will still be difficult for corporate companies to enter the medical information system market. Privacy concerns of the citizen play an important role for such products, therefore a lot of marketing thoughts and money has to be spent to create the image of trust, which does not necessarily have to succeed. The special constellation of all the stakeholders in a medical system makes it almost impossible for corporate products to integrate a system on the scope of a whole nation.

Bargaining Power of Suppliers

Suppliers of the e-health market are mostly the IT service vendors, which applies to a large spectrum of companies from big IT provider, consultancy and small companies with a regional target market. In 2020, even more suppliers will be interested in the market due to its growth. This implies, that the supplier industry is widely spread, therefore the medical information system market is independent from one specific supplier. On the other side, for big IT companies providing IT services to the e-Health market is not and will not be their only source of revenue income.

Bargaining Power of Customers

Patients and doctors are the most natural customers of such an vital data platform. For instance, both are bound by law to use the eGK. Even though patients and doctor's do not fully depend on a medical information system or e-health to receive the necessary information, it is the most efficient and time saving way to do so. Doctor's depend heavily on accurate and current medical information of the patient to avoid fatal medical errors and patients might deserve more protection through real-time monitoring for safety reasons.. Using a vital parameter data platform also enables doctors and especially hospitals to save costs by optimizing their processes and lower the complexity of their daily workflow.

Threats of Substitute Products of Services

Technology products can always be substituted by new upcoming products according to the theory of disruptive technologies. [254, p. 55] Disruptive technologies describe new technologies, which replace an established one on the market. This usually leads to the loss of market position by well-run companies. Due to the legal frameworks of the health sector, the process of

entry and implementation of new technologies might be prolonged.

Jockeying for Position among Current Competitors

Main competitors in the e-health sector will be out of the corporate environment. Especially Google Health or Microsoft Health Vault are already evolving as possible competitor. Not being state-run, the approach of these companies is mostly revenue-driven. Their business model is to attract third party services and provide them a business platform. Due to their market presence and market position, Google and Microsoft both are capable of using the economies of scale and their flexibility to provide good data storage and interfaces for third party providers. They have the potential to scale up to cover an even bigger range of health care, as well as attract vendors and patients. [267] Private companies in general are more flexible to react to changing customer demands as well as capable of acting business-oriented without going through a bureaucratic process and thinking about the greater good for society. [242] But, since the government is involved as important stakeholder, it can provide the legal framework to burden these competitors with regulation obstacles.

7.5.3 Organization and Sales

7.5.3.1 Value Chain

The value chain describes the activities that take place in a business or organization and separates them into primary activities, which is concerned with the creation and the delivery of the product and secondary activities, which are not directly involved in the creation of the product, but may increase efficiency. The product in the term of the platform is the information surrounding the patient as well as transmitting these information. Value chain analysis is one of the strategical methods described by M. E. Porter to decide which activities should be outsourced and which should be concentrated on. [249]

Primary Activities

- Aggregation of information through the platform:

By retrieving all the relevant data from the many stakeholders' data storages, one of the most important activities is putting all the information together to display the complete information about a patient's medical history and his status quo.

- Information logistics:

Transmitting the right information in the asked quantity and quality to the right stakeholder at the right time is one of the main value creating activities of Procura.

- Automated diagnosis:

Due to the intelligence technology implemented on the platform, doctors' decision making can be supported through automated diagnosis.

- Real-time monitoring from devices:

Data and information are sent to platform to monitor the health status of the patient. These information are valuable to the automated diagnosis system, as well as the doctor and the patient himself or herself.

- Data security:

Granting secure data storage, as well as transportation is one of the essentials the patients and the doctors expect. The patient has to be able to set a rights to decide which stakeholder is allowed to sight his or her medical data.

Secondary Activities

- IT infrastructure:

The actual procurement and implementation of the IT infrastructure throughout all the health service providers such as general practitioners, hospitals and pharmacies. It is not the hardware and the implementation, which generates the main value, it is the aggregation and processing of patients information.

7.5.3.2 Revenue Model

It's implementation concerns about the greater good for society, therefore the revenue model aims only to equalize the cost for the platform. The basic functionality as well as the infrastructure will and have been financed by insurance companies. The costs are mostly compensated through cost savings by using the platform. For example, the insurance companies expect savings between 300 and 500 Million Euro each year by introducing the e-Recipe. [245] For third parties' value added services a fixed fee can be charged to compensate the costs for administer the platform as well as the running cost of the platform.

7.5.4 Opportunities and Risks

To describe the opportunities and risks of Procura, this paper applies the SWOT-Analysis method, which is a common strategic planning method introduced by Albert Humphery in the 1970s. It evaluates the internal factors Strengths and Weakness of the project and the external factors Opportunities and Threats of the projects environment and enables management to gain a self critical and truthful view about their situation. [225]

7.5.4.1 Strengths

Strengths are considered as attributes of the organization that help to achieve defined goals.

- Wide spectrum of stakeholders:
Procura covers the most important actors in the medical value chain. Especially the government as stakeholder is a special factor, due to authority of political and legal actions. The federal power can be used to accelerate the success of the platform.
- Applying Service Oriented Architecture:
By using SOA as technological business logic, it is easy for the platform to react to changing customer demands and to add new services. Details on SOA will be discussed in the following chapter.

7.5.4.2 Weakness

Weaknesses are considered as attributes of the organization that may obstruct the organization from achieving its goals.

- Many institutional stakeholders:
Due to many stakeholders who tend to have a considerable level of bureaucracy, a high rate of communication might occur, as well as not needed workflow processes.
- No new technologies:
Most deployed technologies are already implemented in the research or even in the business world. The aggregation and integration of established technologies does not set the any new technological standards.

7.5.4.3 Opportunities

Opportunities are considered external factors out of the corporate environment, which can positively influence the goal achievement process.

- Patients self-empowerment:
By providing a way to check on ones own medical record and vital parameter anytime, patients are given the chance to be more aware of their status and mediate in their own health care process. [246]
- Innovative health care business models:
Procura offers an interface for third party providers to offer their services to the citizens. The chance of a high innovation rate can lead to many innovative and useful services enabling a better health treatment for the patients.

7.5.4.4 Threats

Threads are considered as external factors out of the corporate environment which can negatively impair the goal achievement process.

- Competition from oversea:

Global companies, especially from the Unites States, have the potential to enter the market and change the patients behavior concerning e-Health.

- Acceptance problem:

Even though citizen and doctor's are obligated to use the electronic Health card the platform would not be accepted, because of changing privacy status. Therefore, a realization of Procura cannot be completed successfully.

- Disruptive technologies:

Technologies will improve with time, as history has shown. Fast evolving disruptive technologies can replace the platforms.

7.6 Technical Implementation of the Solution

The health data platform consist of core and peripheral sub-platforms. The core of the platform implements the basic functionality such as data storage and business logic and uses unified standards for messaging, medical data representation and medical documents. The peripheral sub-platforms either deliver information to, or consume information from the platform core using its business logic. It does not matter how these sub-platforms are implemented as long as they deploy the standards set by the core in order to communicate with it. In this sub-chapter we are going to present consecutively the platform core, two peripheral sub-platforms - “hospital” and “remote monitoring”.

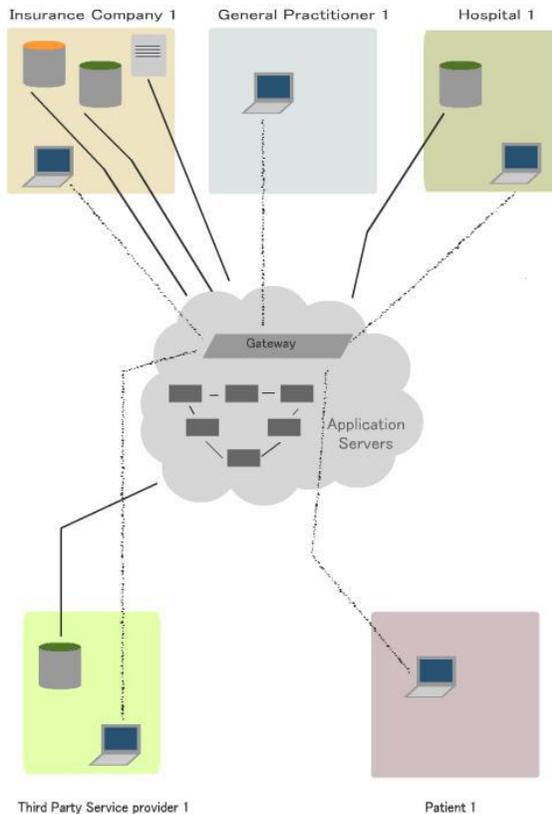


Figure 7.1: Top Spacial View of the Health Data Platform
Source: Own Illustration

7.6.1 Platform Core

The building components of the core of the health data platform are the database, file, application and web servers. Their main goal is to enable the devices connected to the platform, such as PC or mobile devices, operate with patient data through personalized web front end. Furthermore the core should allow communication with external platforms through standardized interfaces which will enable the integration on international level. A significant part of the platform about which decisions must be met is its architecture.

The software architecture of a program or computing system is the structure of the system, which comprises software elements, the externally visible properties of those elements, and the relationships among them. [221, 244] The architecture of the core will consist of three physically separated tiers, which are the database, the business logic and the presentation tiers. Each of those tiers communicates only with the underlying one and uses the functionality provided by it, resulting in three levels of abstraction. Such types of architectures are wide-spread even nowadays, but what we should bear in mind is that the domain of health care is changing very slowly and gradually and the implementation of such a platform would not rely on adventurous new architectural designs in its core. Moreover the most distinctive and important feature of such an architecture must be the capability to integrate new technologies on top of it. Therefore we suggest a three-tier architectural design with an embedded service orientation. A detailed description of service orientation is going to be discussed in the “Business Logic and Service-Oriented Architecture” section.

7.6.1.1 Tier 1 - Textual and Binary Data Storage

All the textual information about a patient will be stored in relational databases, where the data and the relationships among the data are represented by a collections of tables. [270] In this tier 3 types of data will be stored: administrative insurance-relevant information, medical data and data for internal integration needs of the platform. Administrative data is necessary as source for general patient data such as names, address, cell number, insurance number and other insurance-related information. Because of its high confidentiality the medical data must be stored anonymously (as primary identification only anonymous patient health id key will be used, but not his/her name), so that nobody except the patient will be able to match administrative and medical data. To enable patient’s access to his data we need data for internal integration, which will be in form of table that consists of names and patient health id keys, which can be matched. The separation of the data sets is intended for ensuring data privacy and at the same time allowing health professionals and researchers work with the medical data conveniently. Depending on the data that they store the database servers can be divided in three categories:

central mapping database server, database servers for administrative data and database servers for medical data.

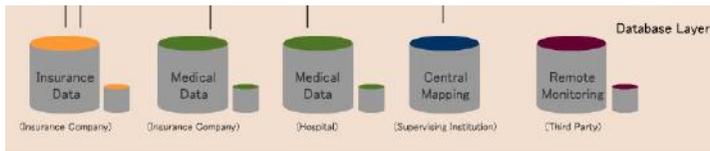


Figure 7.2: The Database Layer
Source: Own Illustration

Insurance data is administered by the health insurance companies and therefore they should be in charge of the database servers with administrative insurance data of their customers. Thus the officers of the company are able to access the corresponding information easily. Health insurance companies will also be responsible for storing their customers' medical data generated by general practitioners or health professionals not employed at hospitals. This would allow reliable data access, clear responsibilities which will be achieved very difficult if in each medical practice runs own database server. For privacy reasons the medical data will be accessible only by physicians and patients (who are permitted to request only their own data) but not by employees of the health insurance company.

Hospitals will contribute to the health data platform by running database servers containing anonymous medical data of the patients treated in the particular hospital. The database will be accessible from both the platform and the hospital, thus allowing hospital's medical personnel to access medical data locally and not through the platform. Such an approach would accelerate the queries to the "experience knowledge base" executed within the hospital. Other medical institutions will be allowed, too, to access the medical data and patients will be able to retrieve their own medical files, but only using the platform. We would like to put an emphasis on the fact that all databases consisting of medical data in the medical institutions as well as in health insurance companies must have the same structure and data types and use unique patient health id keys in order to ensure interoperability. This standardization issue is going to be addressed in sub-chapter "Medical Documents".

The central mapping database server is the binding component between insurance and medical data. Nobody except the patient will be able to log into it and have the possibility to match insurance (personal) with medical data. By using this table issuing new identification devices will be possible in case the patients lose theirs. Such identification device is the patient health cards which will be handled later on.

High-quality CT or X-ray images, ultra-sound movies, speech data, etc. will be part of the medical data. As not all binary files are necessarily needed within

one single medical examination they will only be referenced in the textual medical data and by demand will be transmitted over fast file servers situated similarly to the medical database server in the health insurance companies or in the hospitals. Those files are considerable in size, but it is vital to retrieve them very quickly in case of emergency. That is why such separation in textual and binary data is reasonable.

All file as well as database servers must have a back-up replication and if problems appear they must be able to replace the damaged ones as soon as possible. Data synchronization can take place overnight so that as little as possible data gets lost if defects occur. Having in mind the low prices of data storage devices in 2020, such back-ups will not have a considerable impact on the financial status of the institutions.

7.6.1.2 Tier 2 - Business Logic and Service-Oriented Architecture

The business logic represents the domain-specific algorithms which operate on the data described in the previous two sections. Physical separation of the data and the logic provides flexibility and simplifies the structure of the platform, thus having two clearly distinguishable abstraction “layers” - the lower one serving as data supplier and the one above which implements the functionality for data retrieval, provision and change. The interfaces between the lowest database tier and the middle business logic tier will be provided by database query languages and the interfaces which the middle tier offers to the tier above it are in form of services.

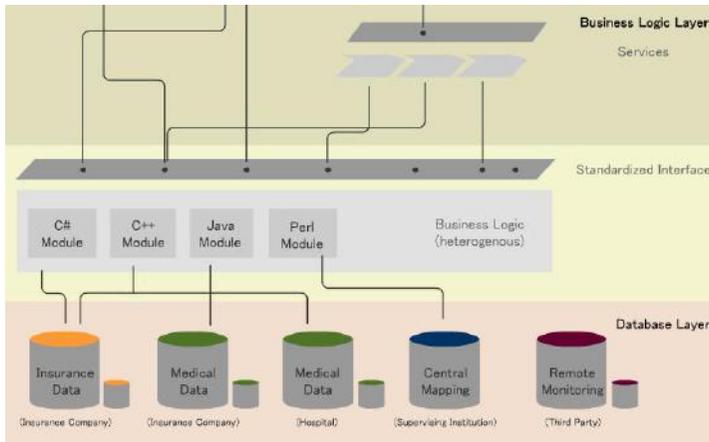


Figure 7.3: The Database and The Business Logic Layer
Source: Own Illustration

The services are the central concept of the service-oriented architecture

(SOA) which is an architectural style for organizing and utilizing distributed capabilities that may be under control of different ownership domains. In that sense a service is a logical self-contained representation of a repeatable business activity. The aim of SOA is to encapsulate the business logic in such services and provide an unified way to access them independent from their environment-specific implementation. [261, 273] An architecture like SOA this enables cost efficient and robust adoption to changing demands and emerging technologies in the future by adding new services or even composing new services from already existing ones.

In order to grant stability and security of the platform the integration of services by 3rd party companies or medical institutions must be done centralized, so the services will be kept consistent as well. Services will be implemented as web services which are software systems designed to support interoperable machine-to-machine interaction over a network. Having message-oriented communication between the service provider and the service consumer is suitable for textual data, but experiences some problems when it comes to transport of binary data. That is why the file servers were introduced to the platform - the service consumer will only request the location of the media resource and then retrieve the requested file.

Physically the second tier of the core platform architecture will reside on application servers accessed via a gateway that also host databases with the programming code of the business logic.

In conclusion the service-oriented architecture embedded in the three-tier architectural design of the platform will foster innovation, allow adoption of emerging technologies and enable the creation of composed services, which solve sophisticated problems, based on already implemented ones.

7.6.1.3 Tier 3 - Applications

The application layer of the health data platform will consist of software for end users. As there are several user groups with different needs, we must either implement separate front ends for each type, or use a highly-personalized single solution. If we decide for a single solution like a role-based enterprise portal, then we will come up to an architectural clear and cost effective solution based on standards.

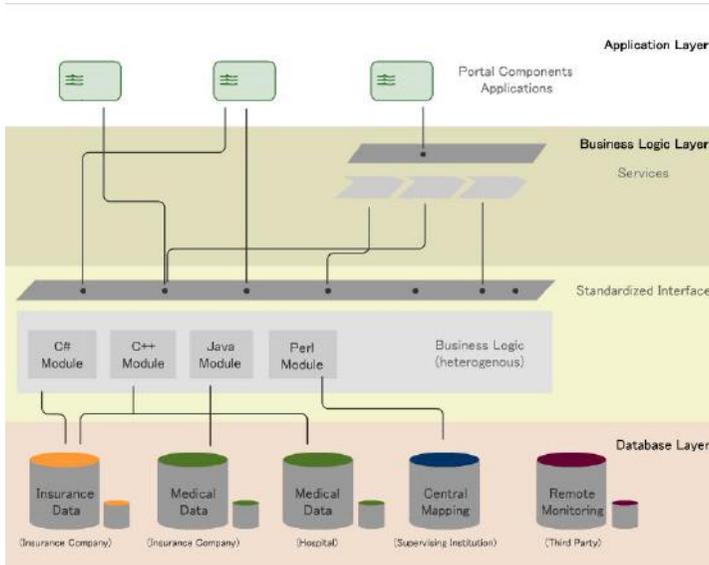


Figure 7.4: 3-Tier Architecture

Source: Own Illustration

Enterprise portals are aimed at integration of people, processes and information and are most often web-based. We benefit from single sign-on interface and personalization of the content by user, deploying small components called portlets, which integrate data and functionality from distributed sources. As the portlets are stand-alone applications they can be distributed by 3rd party companies resulting in integration of value-added services directed to the users. An intuitive implementation of the portlets is by consuming or composing web services that the lower business logic layer provides.

7.6.1.4 Electronic Health Record

The Electronic Health Record (EHR) is digitally stored health care information which aggregates and stores digitally in a standardized manner patient's health data. It includes information such as observations, laboratory tests, diagnostic imaging reports, treatments, therapies, drugs administered, patient identifying information, legal permissions, and allergies. Most of the medical records nowadays are partly digitalized but use proprietary, partly unstructured formats to store this kind of data. As a result of that, interoperability between the different digitalized medical records is a severe problem. [230] Such an EHR represents the health professional's point of view as it contains diagnoses, medical image data, remote monitoring data, etc.

In 2020 elderly will be much more concerned about their health and will

be well informed due to the vast health data amount which was integrated by the introduction of the health data platform. As a result of that, they will be able to express quite exactly how they feel (concerning their overall condition and single symptoms). Fostered by online health communities a standardized Personal Health Record (PHR) can become very popular. In contrast to EHR, PHR will present patient's viewpoint and can be a valuable source of information, especially if his senses can be quantified, which will allow machine interpretation. Being available as 3rd party value-added service and depending on the patient's engagement, such a PHR can be established as a valuable information source. [255]

Another kind of health record based on EHR is the population health record where the remote monitoring data can be of considerable importance. "A population health record contains aggregated and usually de-identified data. It may be obtained directly from EHRs or created de novo from other electronic repositories. It is used for public health and other epidemiological purposes, research, health statistics, policy development, and health service management." [255] The population health record is not directed at the single patient, but rather at the population as a whole and thus helping to identify occurrences wide-spread among the population such as epidemics, consequences of disasters, etc.

Considering the health records, the most important issue to have in mind are the standardized syntax of the records and common semantics for the medical terms and their characteristics. Ontologies can provide descriptions of the domain concepts, depict clear the relationships among them and in that way can be helpful to deduce context-aware meaning and enable computer-assisted diagnosis. A prominent example of a medical ontology is SNOMED CT. [247] On the other hand, "semantic web capabilities will provide a handle on some of the most challenging application issues in health care. (...) Changes in medical knowledge and contract relationships will be expressed more precisely and added to health care systems without interpretation by the programmers of each cooperating institution." [268] According to Gartner Group "through 2009, successful semantic Web projects will be limited to sub-terabyte databases of static data in an enterprise or a tightly controlled community (0.9 probability). By 2012, health care clinical and administrative systems that do not fully incorporate semantic Web technologies will be considered legacy products (0.7 probability)." [268]

7.6.1.5 Data Privacy

Since health data is considered by the majority of the people as very sensitive and confidential data, its privacy must be ensured. In order to achieve that, we must turn our attention to two critical issues, namely authentication and data security.

Through authentication the identity of a stakeholder can be confirmed. As the user is able to set access rights for particular data sets in his electronic health records, the platform must be capable of following these access rules, thus securing the privacy of his/her data. The enterprise portal represents the front end of the platform and is the single way to access it for the user. As it operates role-based, the platform can figure out which data and portlets (applications) are allowed to be viewed by checking if the user's identity matches with the one's who has the rights to execute a service or access data.

Internally the anonymization of the electronic health records is responsible for keeping the privacy of the patient. The distributed data sets of EHR identify the patient only by a patient health id key, which is saved on the patient health card and via it the data can be accessed. Data security can be externally achieved by usage of virtual private network (VPN) and data encryption.

7.6.2 Sub-Platform “Hospital”

Nowadays in hospitals there is a variety of medical imaging and diagnostic devices that have considerable contribution to the diagnosis and treatment decision by the health professional. Those devices have different and most often private-standardized interfaces for data exchange which slows down the data integration and sometimes requires physical effort of the medical personnel. Furthermore the outcome of the diagnostic process in form of image and diagnostic data is represented in producer-specific data formats and has no semantic structure that can enable, for example, machine support by image analysis. In that sense the propagation of the health data platform standards in the sub-platform “hospital” will be vital for the integration of information into EHR. So in order to incorporate the incoming medical diagnostic data from the devices in the hospital, we should create a central sub-platform unit (a computer) where all locally gathered data are sent to. On its behalf the central unit uses services from the business logic cluster, to standardize this pieces of information and save them in the local database server for medical data, thus making them available for the platform. An important issue which is of great importance is the integration of the local HIS (hospital information system) data to the new health data platform.

7.6.3 Sub-Platform “Remote Monitoring”

This sub-platform consists of all invasive and non-invasive devices and sensors which measure vital parameters, mobile devices, a central sub-platform unit called “Patient Box” (PB) situated at patient's home and, optionally, a network of monitoring servers. The patient box is a PC and, as a central unit, has two tasks depending on patient's attitude to privacy. It is conservative PB

acts as an intelligent machine: having EHR, monitoring data and context it is able to decide whether to send alarm to the nearest emergency department. Is the patient liberal, PB just gathers the information and sends it to intelligent monitoring servers where the data is evaluated.

Two modes in which the sub-platform can run are “home” (the patient is at home) and “jungle” (the patient is outside). Is the patient at home, he/she can activate the remote monitoring by turning on the patient box. The monitoring devices and sensors must be encapsulated in standard interface structures, for example SOA on devices, in order to communicate efficiently with the patient box. In jungle mode the monitoring devices and sensors cannot connect directly to the PB, so a mobile device receives the data and transmits it via public mobile networks to PB. [226]

The real-time aspect is critical in case of emergency, therefore the architecture of this sub-platform should be designed so that it meets these specific requirements. [260]

7.7 Conclusion

The Procura platform developed in this work offers a solution to efficiently manage the upcoming data floods connected to the increased demand for health services. It creates direct benefit for the patients by allowing for better diagnosis and according medical treatments by offering better data access to the health professionals and leads to general gains in efficiency for the other involved institutions. The combination of being financed by the considerably benefitting health insurance companies and being supervised by a state-founded self-governed organization makes both possible, a reasonable assignment of most costs as well as a basis for data protection. As the platform is designed consisting of different sub-platforms and using ID pointers to use separately stored administrative and medical data, it perfectly suits the technical demands for such a data-sensitive large-scale project and nevertheless is user-friendly through its interfaces. Its is constructed to integrate emerging technologies thanks to its flexible, service-oriented infrastructure. Future challenges that must be met to make Procura’s successful utilization possible are further technical standardizations and legal frameworks allowing for third party integration and providing a framework for the patients’ privacy concerns.

References

- [221] L. Bass, P. Clements, and R. Kazman. Software architecture in practice - 2nd edition. *Addison-Wesley Professional*, 2003.
- [222] G. Buttazzo. Artificial consciousness: Utopia or real possibility? *Computer*, 34(7):24-30, 2001.

- [223] J.M. Carroll. Human Computer Interaction: Psychology as a Science of Design. *Annual Reviews in Psychology*, 48(1):61–83, 1997.
- [224] C.M. Christensen. The innovator’s dilemma. *Executive Forum*, 1999.
- [225] A.C. Danca. SWOT Analysis. URL <http://www.stfrancis.edu/ba/ghkickul/stuwebs/btopics/works/swot.htm>. Accessed on 03.07.2008.
- [226] S. de Deugd, R. Carroll, K.E. Kelly, B. Millett, and J. Ricker. Soda: Service-oriented device architecture. *IEEE Pervasive Computing*, 2006.
- [227] A.V. Deardorff and R.M. Stern. EU Expansion and EU Growth. *International Economic Association World Congress*, pages 9–13, 2002.
- [228] Deutsches Institut fuer Wirtschaftsforschung. Vermoegen in Deutschland wesentlich ungleicher verteilt als Einkommen. *Wochenbericht Nr. 45*, 74. Jahrgang, 2007.
- [229] C. Dierks. Legal aspects of cross-border health and ehealth services. pages 227–234, 2007.
- [230] M. Eichelberg, T. Aden, J. Riesmeier, and G. Dogac, A. Laleci. A survey and analysis of electronic healthcare record standards. *ACM Computing Surveys (CSUR)*, 2005.
- [231] empirica Gesellschaft fuer Kommunikations-Technologieforschung mbH and TanJent Consultancy. Izip, czech republic: a web-based, nation-wide electronic health record system. *eHealth IMPACT - Study on Economic Impact of eHealth: developing an evidence based context adaptive method of evaluation for eHealth*, 2005.
- [232] Federal Ministry of Justice. Sozialgesetzbuch V.
- [233] Federal Statistical Office. Bevoelkerung Deutschlands bis 2050, 11. Koordinierte Bevoelkerungsberechnung, 2006. URL <http://destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Presse/pk/2006/Bevoelkerungsentwicklung/bevoelkerungsprojektion2050,property=file.pdf>. Accessed on 02.07.2008.
- [234] Federal Statistical Office. Geburten in Deutschland, 2007. URL <http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Content/Publikationen/Fachveroeffentlichungen/Bevoelkerung/BroschuereGeburtenDeutschland,property=file.pdf>. Accessed on 02.07.2008.
- [235] Federal Statistical Office. 80-Prozent-Marke bei der Handy-Ausstattung ueberschritten, 2007. URL http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Presse/pm/zdw/2007/PD07__019__p002,templateId=renderPrint.psml. Accessed on 02.07.2008.

- [236] Federal Statistical Office. Bis 2025 mehr Privathaushalte trotz Bevoelkerungsrueckgang, 2007. URL http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Presse/pm/2007/10/PD07__402__12421,templateId=renderPrint.psml. Accessed on 02.07.2008.
- [237] S.M. Furnell and M.J. Warren. Computer hacking and cyber terrorism: the real threats in the new millennium? *Computers & Security*, 18(1): 28–34, 1999.
- [238] L. Garber. Denial-of-service attacks rip the internet. *Computer*, 33(4): 12–17, 2000.
- [239] Gesellschaft fuer Telematikanwendungen der Gesundheitskarte mbH. Anwendungen. URL [http://www.gematik.de/\(S\(etvlbm55hg2ufw45pvm04qfa\)\)/Anwendungen.Gematik](http://www.gematik.de/(S(etvlbm55hg2ufw45pvm04qfa))/Anwendungen.Gematik). Accessed on 02.07.2008.
- [240] T.J. Handler. Introducing the healthcare consumer of the future. *Gartner Industry Research*, 2008.
- [241] T.J. Handler and B.R. Hieb. Criteria for the Enterprise CPR. *Gartner Industry Research*, 2007.
- [242] T.J. Handler, B.R. Hieb, V. Shaffer, J. Edwards, J.-D. Lovelock, W. Rishel, and J. Holincheck. Hype cycle for healthcare provider applications and systems. *Gartner Industry Research*, 2007.
- [243] J. Harris and A. Henderson. Evolution in Action: HCI in a World of Pliant Systems.
- [244] IEEE. IEEE Std 1471-2000 IEEE Recommended Practice for Architectural Description of Software-Intensive Systems -Description. URL <http://standards.ieee.org/reading/ieee/std/se/1471-2000.pdf>. Accessed on 28.06.2008.
- [245] ifa Systems AG. Mit der Gesundheitskarte kommt das Internet in die Praxis - Informationen zur eGK, zur HPC und zum e-Rezept. 2003.
- [246] Institute for Prospective Technological Studies. ehealth in 2010: Realising a knowledge-based approach to healthcare in the eu - challenges for the ambient care system. 2004.
- [247] International Health Terminology Standards Organization. Snomed ct. URL <http://www.ihtsdo.org/snomed-ct/>. Accessed on 30.06.2008.
- [248] S. Kano. Technical innovations, standardization and regional comparison - a case study in mobile communications. *Telecommunications Policy*, 24(4):305–321, 2000.

- [249] R. Kaplinsky and M. Morris. A handbook for value chain research. 2000.
- [250] J. Kartte. Innovation und Wachstum im Gesundheitswesen. *Roland Berger View*, 2005.
- [251] C. Keuschnigg, M. Keuschnigg, and W. Kohler. Eastern Enlargement to the EU: Economic Costs and Benefits for the EU Present Member States? Germany. *Study commissioned by the European Commission. Study XIX/ B*, 9801, 1999.
- [252] R. Kirchmair. Senioren: die sparsame Generation? *Wirtschaftspsychologie aktuell*, 2, 2005.
- [253] W. König. Netzeffektgüter und diffusionsprozesse, 1998. URL <http://www.wiwi.uni-frankfurt.de/~hack/thema9/Thema9.html>. Accessed on 03.07.2008.
- [254] H. Krcmar. Informationsmanagement. 2005.
- [255] Y.S. Kwak. International standards for building electronic health record (ehr). *Enterprise networking and Computing in Healthcare Industry, 2005. HEALTHCOM 2005. Proceedings of 7th International Workshop on*, 2005.
- [256] M. Langheinrich. A Privacy Awareness System for Ubiquitous Computing Environments.
- [257] M. Lanzagorta and J. Uhlmann. Quantum rendering: an introduction to quantum computing, quantum algorithms and their applications to computer graphics. In *SIGGRAPH '05: ACM SIGGRAPH 2005 Courses*, New York, NY, USA, 2005. ACM.
- [258] McKinsey&Company. Deutschland 2020 - Zukunftsperspektiven für die deutsche Wirtschaft. Zusammenfassung der Studienergebnisse. 2008.
- [259] G. Moore. Nanometers and Gigabucks—Moore On Moore’s Law. *University Video Corporation Distinguished Lecture*, 1996.
- [260] Y.V. Natis and R.W. Schulte. The RTE: Service-Oriented Architecture in Action. *Gartner Group*, 2002.
- [261] Organization for the Advancement of Structured Information Standards. Reference Model for Service Oriented Architecture 1.0 (OASIS Standard), 2006. URL <http://docs.oasis-open.org/soa-rm/v1.0/soa-rm.pdf>. Accessed on 29.06.2008.
- [262] J. Peto, O. Fletcher, and C. Gilham. Data protection, informed consent, and research. Medical research suffer because of pointless obstacles. *BMJ*, 328(7447):1029–1030, 2004.

- [263] M.E. Porter. How competitive forces shape strategy. *The McKinsey Quarterly*, 1980.
- [264] T.S. Rappaport, A. Annamalai, R.M. Buehrer, and W.H. Tranter. Wireless communications: past events and a future perspective. *Communications Magazine, IEEE*, 40(5):148–161, 2002.
- [265] I. Reinecke. E-health - getting there from here. 2005.
- [266] W. Richel. CPR Generation Criteria: Interoperability. *Gartner Industry Research*, 2007.
- [267] W. Richel. The cloud-based personal health record. *Gartner Industry Research*, 2008.
- [268] W. Rishel. Tutorial: The semantic web for healthcare. *Gartner Group*, 2006.
- [269] B. Runyon, V. Shaffer, W. Rishel, B.R. Hieb, T.J. Handler, J. Edwards, and J.-D. Lovelock. Hype cycle for healthcare provider technologies and standards. *Gartner Industry Research*, 2008.
- [270] A. Silberschatz, H. Korth, and S. Sudarshan. Database systems concepts. 2005.
- [271] T-Systems. White paper healthcare industry in germany - structural change and consequences for ict applications. 2006.
- [272] T-Systems Enterprise Services GmbH. White paper health care industry in germany. 2003.
- [273] The Open Group. Definition of SOA, 2006. URL <http://opengroup.org/projects/soa/doc.tpl?gdid=10632>. Accessed on 29.06.2008.
- [274] H. Thimbleby. The computer science of everyday things. pages 3–12, 2001.
- [275] TNS Infratest. (N)onliner Atlas, Eine Topographie des digitalen Grabens durch Deutschland. 2008.
- [276] C. Van Doosselaere, J. Herveg, D. Silber, and P. Wilson. Legally ehealth. putting ehealth in its europe legal context. legal and regulatory aspects of ehealth, March 2008. URL http://ec.europa.eu/information_society/activities/health/docs/studies/legally-ehealth-report.pdf. Accessed on 30.06.2008.
- [277] Xing AG. Fakten und Zahlen, 2008. URL <http://corporate.xing.com/index.php?id=310>. Accessed on 02.07.2008.

8

Chapter 8

Demando - A Social Health Community

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Health care services have always been an issue of great significance to the German economy. With the state shifting from a state which provides public services, towards a state assuring that the accordant services are carried out, the care service sector is about to experience a formidable change.

The purpose of this report is to offer an insight into the design of an innovative business model for an “Online Social Health Community” of the future.

In this study, CDTM students will discuss key trends and point to possible solutions. This study starts by presenting an evidence-based driver analysis for the future of the German health care market and selected domains shaping this market – compiled using the “PEST Analysis”. Macroeconomic factors, such as aging population or insufficient public procurement, are challenging both the public and the private sector. Based on the four detected key drivers, Public Procurement and Regulation, Value Chain Harmonization, Technology and Service Acceptance, and the Integration of the Electronic Health Card.

The report profiles three scenarios for the market environment and competition in Germany’s care service sector in 2020: the Socialization Scenario, the Commercialization Scenario, and the Private Public Cooperation Scenario

In the “Private Public Cooperation Scenario” care service providers offer more complementary services and thereby focus on offering more value to their customers.

As the future scenarios differ significantly from today’s market environment,

any business wishing to succeed in this new market environment must redefine and adapt its business model accordingly. On the basis of the “Private Public Cooperation Scenario”, this paper describes a business model for the “Online Social Health Community” called “Demando”. The online community utilizes the profound effect information and communication technologies and tools will have across the health care service industry. Demando seeks to achieve determination from competitors and rivaling business models through its unique combination of communication, information and health care marketplace functionalities.

This study concludes by discussing the impact of the identified trends and drivers on Germany’s health care service market and overall welfare. The paper will point out how relevant innovative business models in this segment are, to assure economic and social success for both service providers and recipients.

8.1 Introduction

“Community will be the killer app in health care” [286]. This is the prediction Steve Case, co-founder of “AOL”, provided at the “World Health Care Innovation and Technology Congress” in December 2007. The technologies, called social media, that consumers are using in their daily lives for entertainment, education and financial management will also be a platform for consumers to use for health information and support. Innovative online collaborations among groups of patients, medical professionals, and other health care players are not only challenging the notion that health care happens only between a single patient and health service provider in an exam room, but might generally change market transactions in the health care sector. Besides, that people want to take greater ownership of their health information and electronically share it with people they trust – for example their doctor, nurse or family members. Users could control their level of access, share data as desired, and ask for real time advice on health issues. By 2020, this might include sharing your online health record with your doctor, care service provider or family via the internet. This would put the individual right at the centre of the health system.

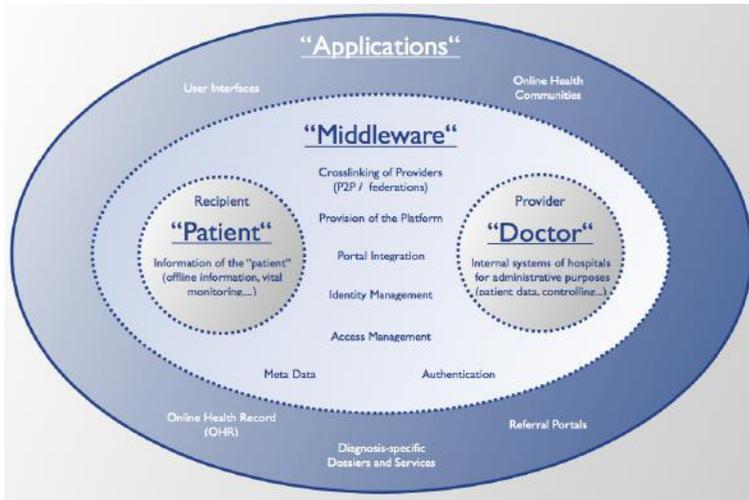


Figure 8.1: The 4-Rings-Model

Source: adapted from Caumanns, J. [287, p. 11]

Social Online Health Portals of the future might be able to help to pursue the five main objectives of the German healthcare system. Firstly each citizen should have guaranteed access to the healthcare services. Furthermore, the

quality and the effectiveness of the healthcare services must be evaluated. That means the healthcare services received must result in successful treatment within a reasonable period of time. Additionally, the healthcare services must be performed in an economic fashion, for example when two identical healthcare services are available, the less expensive should be applied. Lastly, the accomplishment of these objectives should assure the satisfaction of both the patient and the health care provider. [325]

This paper, prepared at the “Center of Digital Technology and Management”, examines the evidence on the costs and benefits of an “Online Social Health Community”, possible barriers to a broader distribution and use of it in care professionals’ offices, and possible options for the federal government to promote use of health information and communication technology.

In the following chapter the paper conducts a driver analysis and reveals key drivers that shape different scenarios, being described in chapter four, “Market environment and Competition in 2020”. In order to clearly differentiate between several key drivers and scenarios chapters three and four are based upon a PEST Analysis¹. PEST is used as a framework for the analysis of macroenvironmental factors under which businesses operate. How such a business model could look like in the future and how its design depends on the underlying scenario is described in chapter five, “Business Model for an Online Social Health Community in 2020”.

It is not possible to deliver an exact forecast about the development of a future Online Social Health Community. But there are several hints that cooperations between private and public sector, aging service technologies, as well as standardization in the health care market will further intensify. Demographic development, a changing legal framework, personalized demand and an accelerating acceptance of social media might frame the scope of change. Therefore online health platforms will be in particular focus and might even be in the center of change.

8.2 Driver Analysis

This paper’s driver analysis follows the structure of a PEST Analysis to assure a high rate of accuracy. PEST is an analysis of the external macroenvironment, namely political, economical, social and technological factors, that affects all firms. Such external factors are usually beyond a firm’s control. Changes in the external environment create new chances and sometimes present themselves as opportunities or as threats. However, changes in the external environment also create new opportunities as well as threats to current business models. As many macroenvironmental factors are country-specific this paper focuses

¹PEST is an acronym for the political, economic, social, and technological factors of the external macroenvironment.

its driver analysis on the German market.

8.2.1 Political and Legal Framework

The political arena has a huge influence upon the regulation of businesses and can have a direct impact on the way business operates. Political factors include governmental regulations and legal issues, which define both formal and informal rules under which companies must perform. Decisions made by government affect every day lives and can occur in the form of policy or legislation.

This paper considers four major aspects of the development in the political and legal framework.

8.2.1.1 Privacy Policy

The first driver this paper analysis, is data privacy. Corresponding to German jurisdiction, protection of data privacy is a “Grundrecht” - a basic right affiliated in the constitution of almost all federal states². Accordingly the person concerned is generally able to decide autonomously, which personal information should be provided to a third party and which data should be kept private.

At federal level the “Bundesdatenschutzgesetz”, BDSG, regulates data privacy and the handling of personal data. Data is “personal” in terms of the BDSG, if it describes individual or factual circumstances of a natural person. Therefore, the person does not need to be appointed by name. It is adequate if the person is definable for example via e-mail-address, IP-address or username. Opposed to personal data the BDSG additionally defines anonymous data, which does not empower to identify a person. [294]

Special types of data corresponding to § 3 paragraph 9 of the BDSG are under particular protection. Those can be data concerning political opinion, religious belief and particularly health related information, for instance. Regarding these special types of data the “Verbotssprinzip mit Erlaubnisvorbehalt” is applied. That means, investigation, processing and usage of personal data is generally forbidden and only permitted, if a legal basis is granted or respectively the consent of the person concerned consists. [298]

Several critics reproach, that excessive data privacy or data privacy “at the wrong place” may be harmful. Inadequate data exchange between health care professionals or the constraint of medical research could exemplify that.³ [284]

²For example in Article 11 of *Verfassung des Bundeslandes Brandenburg* or Article 4 of the *Verfassung des Bundeslandes Nordrhein-Westfalen*.

³For last however, one must notice the importance of anonymous data for medical research, which often is adequate for research purposes.

The main item of medical privacy is the medical record, which historically has been a paper file of the sanitary history of the patient. In recent years electronic forms of medical records have evolved in Europe. Center-piece of the German development in this context is the “Elektronische Gesundheitskarte”, which should form the base of a uniform IT infrastructure throughout the German health care sector. [297]

A further important subject of medical privacy is the caregiver-patient relationship. In Germany physicians, caregivers and psychiatrists not only have standards for confidentiality and privacy in health care, the physician-patient privilege is even legally protected⁴.

In recent years standard setters like “EuroSOCAP”⁵ emerged. Their goal is, to establish an ethical and legal framework as well as guidelines supporting the protection of confidentiality and informational privacy of people in healthcare across Europe. The herewith associated standardization might affect German privacy legislation. [297]

Already today the high status of healthcare confidentiality can be found in several European Union and German laws⁶. With the raising influence of the newly established standard setters on the one hand and the implementation of the Gesundheitskarte on the other hand, one could assume that the status of data privacy in healthcare will increase in upcoming years. [314]

8.2.1.2 Changing Social Health Care System

The German Social System is highly affected by the demographic change and the redefinition of family pattern. Especially the health and nursing care insurances, based on the inter-generation contract, have to face a fundamental change in structure.

As a response to the trends, the federal government started to adapt the nursing care insurances by working out a reform effort which consists inter alia of an individualized case management and a stronger focus on prevention and rehabilitation. These measures are intended to countervail the trends towards an increasing total number of people in need of care and a relatively declining number of non-ambulatory home-cared people.

Due to the constant increase for health care and related services and the declining number of people being available to pay for the emerging costs, the federal government plans to adjust the health insurance as well. Therefore, two different concepts of reorganization, the health premium model, “Gesundheitsprämie”, and the statutory health insurances, “Bürgerversicherung”, were developed.

⁴See § 203 StGB

⁵European Standards on Confidentiality and Privacy in Health Care Among Vulnerable Patient Populations.

⁶For example in Directive 95/46/EC, also known as “data protection directive”.

As the German Social System is affected tremendously, the government generally applies a policy following rules of economization and rationalization. Therefore, more and more Private Public Partnerships were established, enabling the industry to develop business models and ensuring the government is still under control to ensure social welfare.

8.2.1.3 Health Campaigning

Yet another driver for which a clear trend becomes apparent within the next 10 to 15 years is the so called “Health Campaigning” or “Health Promotion”. [303] Embraced by those terms, this paper summarizes the authorities’ activities to promote healthier ways of life by implementing “preventing laws and prohibitions”, like they emerge in many areas of nowadays’ health policy. A typical example is the ban on smoking in German restaurants. With laws like this, the legislator actively tries to change unhealthy behavioral patterns of individuals for the purpose of forcing up common welfare and reducing costs of the health system. Health determinants, such as nutrition, alcohol, tobacco and drug consumption, as well as social and environmental determinants, are the starting point for political action in this field. [313]

It appears likely that Health Campaigning will broaden considerably. The main goal behind that is to increase the number of years without health deficits by promoting healthy ageing. In the “Trend-Report 2008” of the “Zukunftsinstitut”, the author Matthias Horx argues that Health Campaigning will be one of the biggest political phenomena of the next 10 years. [303]

8.2.1.4 Public Procurement and Regulation

This paper considers public procurement and regulation as a key driver. Procurement refers to an overarching process of acquiring products or services. Contingent upon the conditions, it may include disclosing a certain need, specifying the requirements to fulfill the need, identifying potential suppliers, soliciting as well as analyzing bids and proposals, awarding contracts or purchasing orders, tracking progress and ensuring compliance, taking delivery, inspecting and inventorying the deliverable and performance, and paying the supplier. Regularly, the term procurement is most often used within governmental organizations. [311] Opposed to the three drivers discussed above, a key driver does not indicate an explicit development. That is why this paper conducts a profound analysis of several possible occurrences of this key driver.

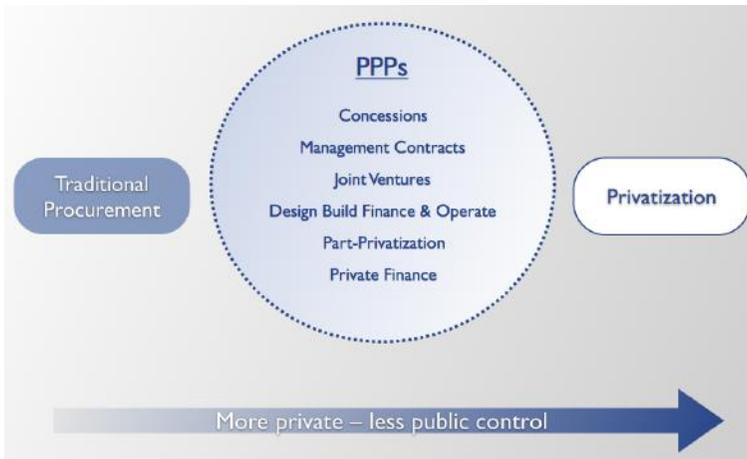


Figure 8.2: Forms of Public Procurement

Source: Own Illustration

In the traditional form of procurement a contract in which the state pays the contractor for the provision of an asset as work in constructing or developing this asset progresses. Such assets are fully paid for after completion. The maintenance of these assets is dealt with in separate contracts, while their operation remains the responsibility of the public sector. A typical example for that is a bid invitation or an invitation to tender by authorities for the constructing of a school building or a state-owned hospital.

A lot of state-run tasks and services did not arise from intended decisions but are rather the result of coincidental historical development. Some of those presently state-run activities could be in equal measures performed by the private sector. The process of moving from a government controlled system to a privately run for-profit business is called privatization.

The reasons for the growing number of privatizations in the Germany are manifold. There are more general reasons such as changes in overall political and economic framework conditions⁷ and there are some more specific reasons, such as changes in the regulation of the German healthcare system and the system of hospital financing and their impact on the financial situation of public organizations⁸. Advantages of the trend towards privatization can be

⁷Among the more general reasons there is first of all the difficult financial situation of most public authorities in Germany which often have to deal with large debts and high budget deficits.

⁸For example, the implementation of the *Fallkostenpauschale*, case lump-sum, in German hospitals does no longer guarantee full cost compensation, since many of them have not been able to finance their operational business. The resulting financial losses of the public hospitals have to be taken by their public owners which are often themselves in serious financial difficulties.

clustered in two fields. Firstly, the advantages for the state, for example, the sales revenues might help to reduce the public debt or parts of the costs for investments could be shifted to private investors. Secondly, the competitive advantages of private business itself, like easier access to private capital markets, more efficient operational businesses or lower labour costs.

An intermediate form between traditional procurement and privatization are Private Public Partnerships, PPPs. A PPP brings together, for mutual benefit, a public body and a private company in a long-term joint venture for delivering high quality public services. Drawing on the best of the public and private sectors, PPPs provide additional resources for investment in public sectors and the efficient management of the investment. PPPs come in various forms. However at the heart of every project is the concept that better value for money⁹ may be achieved through the exploitation of private sector competencies and the allocation of risk to the party best able to manage it.

From today's perspective it is not possible to identify, which form of procurement will be the dominant in 10 to 15 years. Especially for the healthcare services, this is hard to determine. Healthcare services differ tremendously from free-market commercial services. This depends mainly on the nature of health or sickness which "as a whole cannot get the character of a commodity". The health care system creates a special social relationship which needs social protection and cannot be regulated only by the market.

8.2.2 Economic Factors

To get a better overview of the economic factors influencing the scenarios by trend and uncertainty, they will be divided into a political, a public and a private sector. Within the political as well as the public analysis, major trends and their developments will be discussed. Thereupon, the analysis will focus on the private sector, where the characteristics of the key driver "Business Process Harmonization" and its impact on the future scenarios will be provided.

8.2.2.1 Quality Management and Efficiency Seeking

For a successful health care provider it is crucial to focus on the quality of patient care and at the same to streamline processes to provide cost savings, as care providers are usually operating on rather thin margins. [291] For this reason, Quality Management and Efficiency Seeking within health care organizations will be considered as a driver.

The public has never been more focused on the issue of the quality of health care. Hospitals and private care services are being accused of caring only about

⁹Value for money: The combination of cost, over the whole life span of a project, and quality which best meets an organisation's requirements.

money instead of quality. [292] So health care professionals need to improve quality while at the same time foster efficiency gains. This highlights a bigger theme in health care – the tension between personalization and standardization. In an effort to improve the efficiency of health care-related procedures, many care providers try to standardize different aspects of their operations as a way to reduce variations in key processes. This concern to standardize encompasses both medical care delivery and administrative processes such as the scheduling of work shifts. Therefore care organizations continually monitor the impact of new technologies on their businesses and target capital investments to areas of greatest need.

But a competing force is working against standardization – the desire for personalization and customization. Patients want personalized, customized care that is tailored to their unique situation. Eventually, advances in genomics may allow patients to receive truly customized care, including drugs or dosing tailored to a patient's unique genetic make-up. Looking ahead, CEOs will have to carefully balance the competing demands of personalization and standardization. The final result will be very likely complex sets of standards that are based on the needs of small populations or niches of patients and staff. [291]

8.2.2.2 Customer Needs and Perceived Value

Looking at customer needs for home and health care services, significant changes in respect of quantitative and qualitative aspects can be expected.

First of all, due to the demographic change, the absolute demand for home and health care services will certainly increase. Observed in recent years, the ratio of people being cared by family is shrinking which sets a trend for professional health care services. However, people belonging to the Generation 50plus become much longer active, i.e. in their functional age, and scarcely rely on nursing. [282]

In the future, the Generation 50plus could not be considered as a homogenous group with identical needs and similar preferences. A decisive factor is the increasing purchasing power of the Generation 50plus. [307] There seems to be a growing affluence and amplifying hedonistic consumption behavior which will ask for sophisticated services. [318] This could develop into a higher demand for premium services regarding quality and availability. Becoming more selective and sensible, the Generation 50plus will presumably change its relationship to service brands. Therefore, the demand for highly personalized services will likely change the profile of providers, which will hence orientate their choice of services to peculiar groups in the Generation 50plus. As a result, service differentiation e.g. in aspects of culture and religion, like migrant care services, and locality, like rural-urban differing services, are expectable.

This development could encourage the need for a transparent platform

matching specific demands with proper service providers.

8.2.2.3 Business Process Harmonization

The following sector of the economic analysis will focus on the key driver Business Process Harmonization, BPH, and in how it is important for the future development of the topic.

Within the health care market, various profit and non-profit service providers participate in the market to support customers during their convalescence process. Dealing with customer's health, companies and non-governmental organizations have to emphasize on a certain standard of quality to support trust and eventually customer loyalty. Looking into the future, the service providers and health care by itself gets more important due to the demographic change.

Thus, concerning the market players, the degree of cooperation and consolidation of service providers have to be evaluated as a major factor affecting the key driver in order to get an overview of the future market structure and its underlying standards.

In the light of the change in structure, the number of players could increase and hence the high competition could cause declining prices. It is also possible that existing players cooperate or consolidate with each other and create market leaders with a broad range of services. Additionally, global players could enter the emerging market and start to acquire smaller companies in order to start business and to offer fully integrated services. Integrating the supply chain between multiple companies, organizations or merging partners, service providers have to synchronize their standards and emphasize on quality management, e.g. "Six Sigma", in order to ensure a certain degree of quality, to establish a brand and to reduce costs. Additionally, emphasizing on BPH the company also benefits from less organizational and administrative efforts within its own departments. [319]

In this context, BPH is important for the economic development of the health care sector in the future. BPH is the prevention or elimination of differences of standards looking at processes and setting bounds to the degree of their variation.

The current market structure in the health sector is very heterogenous regarding players, size and service range. As said the market could change tremendously in the future, the prospective market structure, the players and their cooperation are still uncertain and are mainly influenced by the degree of BPH of the companies.

8.2.3 Social Factors

The success of a service business depends mainly on the customers' willingness and ability to make use of it. In the following paragraph, the demand for a

Online Social Health Community will be examined.

8.2.3.1 Lifestyle Pattern Compatibility

An important point for the successful usage of a Social Health Community is the social environment and lifestyle of the customers.

In the upcoming years, the Generation 50plus will continue altering the way they live. For the demand of a Online Social Health Community, the living environment is important, in so far, older persons in a single household would more likely use the possibility to communicate and socialize with others than people living with a companion, in a community or nursing homes.

Decisive for the active participation in a Online Social Health Community is the development of the statutory retirement age. Therefore, older people feel the need to work after their retirement. Considering secondary occupation is one of the most important drivers for old people. Most people simply continue working informally after formal retirement. This secondary occupation gives old people a purpose in life, creates a daily rhythm and a feeling to contribute to social capital. [326] An active and constructive participation in a Online Social Health Community could be considered as one. But if the retirement age will be raised, the rate of working people in the Generation 50plus would increase tremendously.

Furthermore, a trend into an increasing mobility and activity among the generation 50 plus can be observed. That might lead on one hand to a minor usage of the Online Social Health Community, since people are less frequently at home. On the other hand, present health information networks are still deployed on a very regional setting. In this way, the online portal will give the opportunity to access information and to communicate from anywhere.

8.2.3.2 Increased Health Consciousness

Another driver can be identified by observing the increase in health consciousness among the Generation 50plus. Elderly people orientate their activities to a healthier lifestyle. [320] They take care of a balanced diet and try to stay healthy by sport activities. An increase in expenditures for organic products can be observed as well as a rising demand for fitness and sport clubs. [320, 285] There are indications that elderly people become less clammed to ask for support and prevention. Furthermore, they actively inform themselves about new developments regarding health care and medications.

In this way, users will very likely use the Social Health Community to share and exchange their knowledge and experiences among each other.

8.2.3.3 Technology and Service Acceptance

The perhaps most crucial and uncertain driver is the customers' acceptance towards the Online Social Health Community. First, the technology acceptance is observed, then the focus is on the acceptance of the services the Online Social Health Community will provide.

Being able to use a service like the Online Social Health Community depends on two factors, the mental condition and competence of the user as well as the physical ability to control it. If the handling overstrains the user, the consequence will be the negation of the service.

By observation, the Generation 50plus will definitely have an increasing technical expertise than in the past. They appear to become less technology averse and more willing to make use of information and communication technologies. [282] However, older people will probably remain unaware of new digital technologies, even if they are used to similar ones from work, education or former practice. The fast development in this branche requires from older people to learn further, which could discourage them, by having negative experiences. As a result, they will likely be resistant to try new high-tech devices. [278] Additionally, the currently observed open-mindedness of middle-aged people to new technologies, is a phenomena which cannot be clearly defined as a lasting trend or just a cohort effect.

Even though older people may know how to use a web-based application, barriers exist in the sophisticated handling of it. Elderly people often suffer from impaired motor function and eye-hand coordination, so standard control devices like keyboard and mouse will not be appropriate. Designers of technology devices must therefore adopt older people preferences, attitudes and capabilities relate to technology, to design technological devices decent for widespread and long-term use. Older people will be less likely to abandon technology if they receive hands-on and other types of introductory and on-going training as well as responsive and technical support easy to access .¹⁰

Having looked at factors concerning the customers' ability to use an Online Social Health Community, their willingness to do so will now be observed.

For example, older consumers may be slower in accepting online provided informations because they do not believe they need assistance. Or people might tend to seek for online health information only when they or their relatives are facing a health problem. So, the frequent and regular usage of the Online Social Health Community is uncertain.

As health care moves towards a patient-centered model and information becomes an integral part of health care, people might still not see the importance to interconnect and interrelate information about themselves with different providers. [278]

¹⁰Furthermore, the layout and interface might not optimized for elderly people e.g. ease of navigation or font sizes.

Similarly, they may not demand Online Health Records because they mistakenly believe that their primary care provider already have a comprehensive view of their health.

The community part of the portal will only be full-scaled used if older people have the demand to socialize in groups of same interests or locality. As several times observed, communication, feeling of inclusiveness and information management is important to old people. In the next years, family structures will dissolve more and more and older people are less cared and looked after by family members. [321] This fosters the desire for the Generation 50plus to connect and interact with other people.

Generally, a person has different health problems at different points in time, treated by different care providers on different locations. Information related to the person's health throughout his life is spread across many independent professional institutions. [279] This distribution gives the person a high degree of security that her data will not be misused. But in a Online Social Health Community, private data is concentrated and available for providers the person is not yet a relationship with. It is very unlikely, that this attitude towards privacy will change in the next years. Therefore, users of the Online Social Health Community will not complete their profile unless they trust it completely.

8.2.4 Technological Trends in Social Media

8.2.4.1 Trends in E-health and Web 2.0

Web 2.0 refers to a second generation of services available on the internet that lets people collaborate and share information online. It allows interaction, which has led to users' ability to create information. In short, Web 2.0 sees the web as a platform where data is the driving force and characterized by an architecture of participation. [322, 305]

Advances in the Information and Communication Technologies, ICTs, and the widespread use of internet is changing the way health care is provided and the term "e-health" is broadly used to describe this evolution. E-health applications underlying Web 2.0 principles lead to a number of applications with potential benefits in a health-care model evolving to a patient-centered scheme, where patients are active participants in the decision making process about their own health. [324, 281] The most relevant applications are:

- Health related web sites/portals offering health related information for patients or professionals.
- Electronic Health Records, EHRs, used in the clinical environment by health professionals and online Personal Health Records, PHRs, where the individual is the owner of his/her medical records.

- Virtual communities and online support groups where people share experiences and information about their disease and provide emotional support to each other.

The main problem with the existing e-health applications is that they are individually used and the produced information remains within the context of each system. As a result, these systems are employed within a narrow scope. Web 2.0 is able to address this issue pursuing an architecture of participation and achieving collective intelligence. Based on the principle of “Web as a platform”, the Web 2.0 is conceived as a virtual workspace where applications offer their data and functionality as a service through open Application Programming Interfaces, APIs, so it can be easily used to build new applications. Thus, it is possible to combine various existing services to create new applications for purposes that supersede the scope of the original applications. This fact is the main motivation for the Online Social Health Community this paper issues. [322, 305]

Furthermore, the notion of community and information sharing is dominant in the Web 2.0. Under an architecture of participation schemes, users actively participate, being simultaneously consumers and producers of information. They are stimulated to share information by developing high quality knowledge resources demonstrating a workable model for collaboration and therefore where applications show effectiveness and a real value added for the users.

8.2.4.2 Aging Services Technology

In the context of the demographic change and with the main effect of an aging population, it is crucial to evaluate and advance the potential of new technologies to help facing this unprecedented growth of older adults and the impact this will have on the health care system in an expected global market for aging related services that is estimated to be over 100 billion dollars annually. [288]

Aging Services Technologies are divided into three broad categories: Technologies for Health and Wellness, Social Connectedness Technologies and Safety Enhancing Technologies. The first one, allows monitoring the occupants’ ability to carry out activities of daily living, by collecting important health information helping older people to take proactive steps to maintain their own health and control their care. At the center of this technology-enabled approach to health care would be an integrated system of Electronic Health Records, EHRs, which serve as a repository of information about the care provided. An older consumer could choose to share this record with all caregivers and health care providers, thus ensuring that each member of the care team has access to accurate and up-to-date information about the consumer’s medical history and current health status. Secondly, as a successful aging also depends on the psychological health, stand technologies that provide social connectedness. These

technologies might include computer-based products designed to help older users enhance memory and entertainment systems. Participation of seniors in social networks as an efficient way for socializing is strongly considered. It can be seen as a powerful tool to overcome the problem of social isolation by helping them to expand their social network beyond the caregiver relationship and improve their social interaction through technology. Finally, there is a collection of safety technologies aimed at offering older people an enhanced sense of security, prolonged independence and improved quality of life, e.g. safety devices for accident prevention by notifying caregivers. [278, 279]

8.2.4.3 Integration of the Electronic Health Card

The Electronic Health Card, EHC, or Gesundheitskarte is meant to modernize the healthcare system using Information and Communication Technologies, ICTs, in order to support patient-centred care and to optimize data provision for health systems management.

The underlying concept of the EHC is the citizen-managed personal electronic health record where the citizen is the owner of the data and gives his consent for an application to specific healthcare providers. Thus, a personal electronic health record is offered and operated by the healthcare system and the data is normally provided and used by health care professionals. [328, 293, 308]

Access to the EHC and the managed data stored on it or accessible via a secure network, is open exclusively to authorized health care professionals and the users based on a special infrastructure, constructed by connecting closed virtual private networks operated by responsible healthcare organizations, e.g. hospitals, pharmacies. This scenario represents the basic usage of the EHC where its deployment is only conceived for this single environment, it is named as “restrictive integration of the EHC”. [328, 293, 299]

In opposition to this approach and taking advantage of the infrastructure built to support the described system, the EHC may be used in other various related health care system contexts i.e. in other networks, apart from the closed one of the statutory health scheme. This leads to the definition of “liberal integration of the EHC”. An example of external usage of the EHC might be its integration in an “Online Social Health Community”, making use of the EHC as mechanism for medical data exchange between peers.

Here, a number of critic considerations regarding security policies must be taken into account as smart cards are the tool used to identify persons, authenticate them by means of encryption / decryption techniques and digital signatures. A successful adaptation of this security measures to external networks will determine the feasibility of the liberal integration of the EHC scheme representing a unique opportunity of exploiting all the features the EHC represents. [293, 308]

8.3 Market Environment and Competition in 2020

In the following chapter the report profiles three scenarios for the market environment and competition in Germany's care service sector in 2020:

- Socialization Scenario
- Commercialization Scenario
- Private Public Cooperation Scenario

The scenarios differ significantly, according to the respective occurrence of the four key drivers:

- Public Procurement and Regulation,
- Value Chain Harmonization,
- Technology and Service Acceptance, and
- Integration of the Electronic Health Card

With the state shifting from a state which provides public services, towards a state assuring that the accordant services are carried out, the care service sector is about to experience a formidable change. As that seems to be the major trend for the future of Germany's care market the Private Public Cooperation Scenario will be assumed the most likely one. Therefore it provides the basis for the business model described in chapter five.

8.3.1 Stable Drivers

The driver analysis has shown, that there is a need for a differentiation between trends and key drivers, which are distinguished by an uncertain evolution in its future development. Therefore, in the following section a prospective analysis of 2020 online health communities will be provided based upon the identified as stable trends . This analysis will be the foundation of the three scenarios which represent different allocations of the key drivers.

As a result of the demographic change and the redefinition of family pattern, the German Social System, the health care market and the German population is highly effected. Given that the Federal Government has to comply its function as a social state, the politicians already stated to restructure the social system with an economization and rationalization approach. Therefore, prevention laws and prohibitions where implemented and the importance of data protection was discussed intensively at the level of Germany as well as the European Union.

Regarding the fundamental changes in structure, the health care market is becoming an emerging market. Adapting on the future demand, the service

providers have to follow the trend towards an highly personalized service with the respect of differentiation in culture, religion and rural-urban among many other relevant considerations. By establishing a mass customization, companies have to emphasis on the quality of their services and seek for efficiencies by establishing standards and monitoring processes.

The demographic change and trend within family and individual pattern causes a high impact on the daily life of people as well as the socio-economic structure of Germany. The behavior of the Generation 50plus is changing towards an increased health consciousness and a more healthy lifestyle. On the other hand, tendencies concerning an arising number of single households of elderly people and a increasing usage of ambulant home care and nursing homes are countervailing the trend in behavior.

Regarding technological trends until 2020, advances in the Information and Communication Technologies and the high market penetration of broadband internet connections are changing the way health care is provided. While eHealth is being developing rapidly within the online markets, the elderly people still have to face problems with the usability of online services as well as the technological acceptance of the access devices.

8.3.2 Socialization Scenario

In the Socialization Scenario we assume that traditional procurement will be the dominant form of public procurement. Today traditionally procured projects are still the most common form of procurement for small and medium size projects and, in genreal, suitable for all projects. [317] Normally, the contractor will be appointed following a tender process or negotiation and will sign up to a contract for the works. Major advantages of this method is that for the state include time predictability and cost certainty. Among the disadvantages, the most important ones are a focus on initial rather than lifetime costs of the project and that operations remain the responsibility of the public sector. [290]

Here, Business Process Harmonization is expected to be widely implemented through the competing companies. The future market structure will be a free market economy and an heterogeneous set of companies. Due to the fact that many companies have set up a central institution to manage business processes, larger companies and global players having entered the emerging market, did integrate and harmonize the value chain through their cooperation partners and within themselves. But small companies providing non-standardized and non-integrated services lead to a liberal and self regulating market done by market leaders putting indirect pressure on the smaller providers to force them to adapt on their standards. The standardization of services will be achieved by integration of the value chain and by establishing integrated quality management, monitoring and regulating procedures between the cooperating

companies.

A public procurement yields in a very high user acceptance of offered services. The state has, in marked contrast to firms, not the aim of maximizing profit but the social welfare. This fact enhances the trust on customer side and therefore users can be sure that their data will be confidentially treated and not be misused or passed by third parties. Thus, high investments in a brand are not necessary. From this one can infer that the social acceptance would be very high in this scenario.

When considering a social online community whose business model is runned by the state, the Electronic Health Card, EHC, stands as the universal medium for health data management and exchange namely liberal integration of the EHC. This way, the EHC would have a further usage and spread beyond the basic scenario i.e. patient health record exchange between physicians located in different health centres. Here, the EHC would be widely used in other various related health care contexts. In particular, its application within the Online Social Health Community would mean a patient inserting the EHC in a domestic and portable device connected to his personal computer. Every time a user contacts through the community a health care professional with the purpose of receiving a related health care service, a basic health record summarizing the health status of this user in need for care would be transferred, making use of the EHC, to the contacted peer. Thanks to that, this professional is able to acquire an accurate vision of the care needed and therefore, determine if he is an adequate physician to carry out those required care giving tasks.

8.3.3 Commercialization Scenario

The Commercialization Scenario is based upon a potential reversal of the purpose-means relation in the organisation of the German health care sector. That means, money is no longer the instrument of safeguarding maintenance, but maintenance becomes an instrument of realizing profits. [280] Since there has never been a public monopoly in the German health market there have never been attempts for an explicit liberalization policy in the past as well. However, changes in the social, political and economic framework conditions might lead to an overall economization and commercialization of the health sector which will promote ongoing restructuring processes of German health care providers.

A stately number of privatization initiatives are confronted with broad local anti-privatization alliances composed of various stakeholder groups such as trade unions, political parties and other civil society organizations which have tried to prevent privatization. Furthermore, there is a complex system of state regulation which constrains the privatization of health care providers. Health care commercialization poses an enormous challenge for political health

planners and activists who aim to ensure decent health care for all. Therefore, political struggles will continue in the future of the German health care sector. [323]

Having said, that Business Process Harmonization is distinguished by a standardization of the firm's internal services as well as a harmonization and synchronization of external service processes between firms. Within this assumed future the key driver will be less implemented in comparison to the other scenarios. A market structure, in which small companies are the majority, leads to a pluralistic state of standards among the industry. These standards are less uniformly implemented within companies and not synchronized among them causing a lower degree of cooperation.

Applying a policy of institutional regulations, the federal government has to trade-off between restrictive framework and liberal quality guidelines.

The privatized Online Social Health Community has to cope with a comparatively low social acceptance. A new company faces the problem of lack of trust and reputation. To build confidence, a third party, generally a public institution, has to verify the service and signal the exercised discretion of the data stored in the Social Health Community. Additionally, the whole service process, including transactions with the service providers, has to be transparent and accountable.

A value added of the community and information part depends on the national distribution and proliferation of the Online Social Health Community among the potential users. Being new on the market, the Online Social Health Community cannot benefit from a customer group as the so-called installed base, hence, it has to invest largely in advertising to attract new customers.

Furthermore, potential users might be deterred by another emerging interest group in the health care sector, besides the state, health care service providers and insurances.

In an online community run under a private scheme, the Electronic Health Card, EHC, is not considered for the health data management and exchange between peers according to a restrictive integration of the EHC scenario.

As alternative method for data management and provision, the Personal Health Records, PHRs, are considered. PHRs are detailed described in the section that issues the third case scenario.

8.3.4 Private Public Cooperation Scenario

A third scenario for the future of public procurement are PPPs. As the state and the private sector cooperate in such projects, this scenario is called the Private Public Cooperation Scenario. PPP projects have been around for many years, but such cooperations have only really taken off since around 2004. Therefore, the financial crisis of German political subdivisions states an important reason. The German government is confronted by fiscal constraints

that force it to carefully prioritize and restrict public expenditures. Moreover, the German public health systems are already indebted and faces further fiscal pressures, such as the need to provide care to increasingly aging populations, improve quality, or invest in often expensive medical treatment and technology advances.

A further reason is based upon the relevance of PPPs for the reform of state and administration. [303] This concerns the overall change from a state which provides public services, towards a state assuring that the accordant services are carried out. Particularly in the field of information and communication technology, ICT, the necessity of innovations and implementation of new developments have influence over the growth of private public cooperations.

Besides organizational aspects, the legal framework concerning the design of PPP projects fosters the set-up of such cooperations. PPPs in the health sector can take a variety of forms with differing degrees of public and private sector responsibility. Depending on what services or facilities PPPs should deliver, they are characterized by the sharing of common objectives, as well as risks and rewards, as might be defined in a contract or manifested through a different arrangement. The private sector partner may be responsible for all or some project operations, and financing can come from either the public or private sector partner or both. [283]

The general goal of PPPs in the health care sector is safeguarding a capable, regional, on site and harmonized ambulant as well as stationary care provision. [295] Due to their increased complexity, PPP projects normally require a higher level of project preparation than traditionally procured projects in that they often require more financial and commercial preparation, especially in the early stages. Nevertheless one can find good market conditions for private public cooperations in Germany. [302] Hence we presume PPPs to be the future of public procurement.

The Business Process Harmonization within this scenario will be distinguished by a firm's internal standardization of services and a less integrated value chain between the different service providers regarding cooperations. Therefore, the standardization of business processes, which intends to improve performance and gives the management more control over operational performance, will be implemented in a medium degree.

The Federal Government as well as other competitors could be a standard-setter by establishing an online platform unifying services. This standard could either put pressure on service providers to adapt it or lead to an avoidance of the platform as an alternative distribution channel. This approach has an impact on the market structure. Depending on how the federal government and its competitors try to establish a quality standard in order to communicate reliability and to build confidence, smaller companies experience these standards as an entry barrier. Particularly, concerning its function as a social planner, the government has to ensure an area-wide coverage of provided

services not only in urban areas but also in regions with weaker infrastructure.

In a Public Private Partnership, the company providing the Online Social Health Community gains from several benefits. Normally, to build confidence, a company needs a third party, for example a public institution, that verifies the service and signal the exercised discretion of the data stored in the Online Social Health Community. The state appears as a trustful partner, ensuring the proper commerce with customers' data.

Additionally, the state in its former dominant role in health care has the advantage to spread the services of the Online Social Health Community fast and nationwide. Consequently, the company is able to benefit from a high awareness of its offered service. This also facilitates the establishment of a large user base actively participating in the Online Social Health Community.

In a social online community underlying a PPP business model, the usage of the Electronic Health Card, EHC, is not addressed leading to a restrictive integration of the EHC scenario. When looking for alternative solutions as efficient mechanism for health data management and exchange between peers it is worth to mention that the here issued online community is conceived as an health information-sharing environment electronically interconnected. As consumers become network participants of the here addressed high scalable social community, new health data streams will be created. On the other hand, these data streams are enormously complex, resulting in copies of information being held simultaneously at many different points. Thus, there is a need for efficient data management tools. [309, 310]

This is the framework for networked personal health information resources, the so-called Personal Health Records, PHRs. The PHR is a a set of internet-based tools designed to track and support health activities across one's entire life experience as an electronic application through which individuals can access, manage and share their health information. PHRs offer an integrated and comprehensive view of health information, including information people generate themselves such as symptoms and medication history, information from doctors such as physician visits, diagnoses and test results and information from their pharmacies and insurance companies. [309, 310]

Thus, it is a single, person-centered system where the individual person is the primary user and information aggregator, and who may allow access to all or part of the PHR to anyone he shall authorize. This access can be performed from any place at anytime, permitting easy exchange of information in a private, secure, and confidential environment. [309, 312, 310] As basic use case of PHR usage within the community, it can be applied the one described in the Socialization Scenario where a user would authorize the access to his PHR to another health care professional peer instead of using the EHC for health data provision.

8.4 Business Model for an Online Social Health Community in 2020

The following business model is intended to highlight the Online Social Health Community under the perspective for investors. However, this business model is not a quantitative approach to the implementation of the community, but a qualitative analysis for prospective companies running such a platform for people in need of care. It describes the provided services and discusses the target group, cooperation partners and competitors. It also analyzes competitive strategies and growing potentials as well as lists a number of revenue sources.

8.4.1 Description of the Provided Services

“Social networks in health are proliferating so rapidly that there is a need for services that ‘knit’ communities together. [It should] enable health consumer to move seamlessly and efficiently through the networks without having to be a member of all the groups that pertain to their illness or interest”. [286] Hence, the Online Social Health Community is an online platform which enables users to order health care services, to inform themselves about health related topics and to socialize with other people. This multifunctional service is intended to run platform independent and its three functions will be described within the following sections.

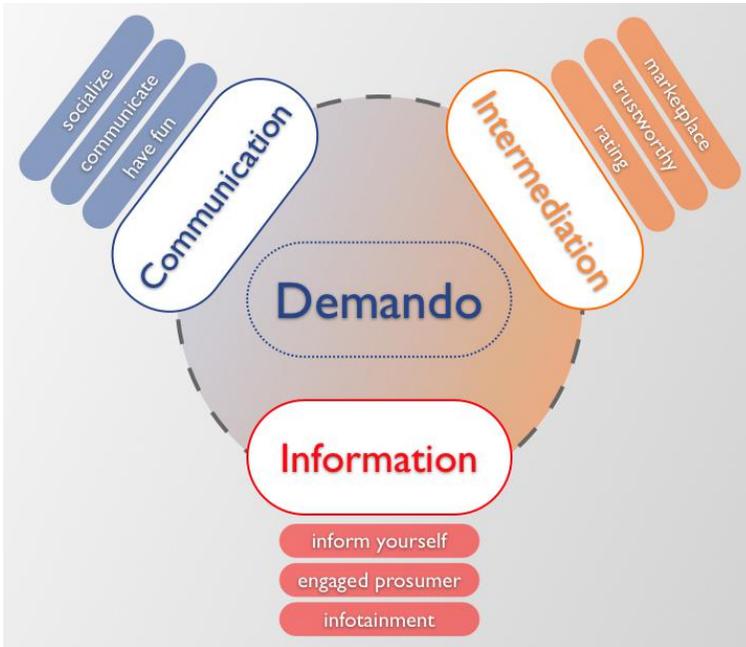


Figure 8.3: Functionalities of Demando - an Online Social Health Community
Source: Own Illustration

Intermediation Function

The intermediation function of the online platform will provide an environment in which customers order health related services. It is similar to an eCommerce platform and will be distinguished by a “Consumer-to-Business, C2B approach which [...] represents the future of eCommerce”. [301] eCommerce is defined as every extend of economical interaction based on electronic devices whereas C2B is used to design systems through which consumers decide what they want to pay, and the vendors decide whether or not to accept. [315, 329] The following text will illustrate the different functions and features of the C2B intermediation platform, like premium section, certification of providers and regional best price approach. The platform has a standard-setter function, defining the scope of services for particular components of the health care. But taking into consideration, that customers demand for an individualized service, the platform provider has to trade-off between service standardization and service personalization for individual needs. In order to respond on this issue, the platform could provide a two section service consisting of a regular and a premium section. Within the regular section, customers can publish a request

which costs are covered by the lump compensation, i.e. “Fallpauschale”. The premium section on the other side is intended to contain additional services which are above the amount of financial support the insurance covers. Both regular and premium service sectors have to be monitored under aspects regarding quality and reliability, due to the fact that providers are dealing with the health of their customers. For the purpose of this requirement, the platform could establish a certificate for service providers, which verifies and guarantees an agreed quality standard in order to support trust and customer loyalty. Additionally, a rating function implemented within the platform is reasonable, enabling the customers to give their own feedback and share experiences. This feedback could be combined with peer reviews and empirical data. [286]

By publishing an individualized premium service request, the customer defines the scope of services and a certain amount of money for it. The service providers bid for this request and announce their calculated offer. In case another provider calculates a lower offer, it is possible for him to underbid the previous provider. This reverse auction causes a strong competition among the providers and facilitates the best price for the customer. Requests are structured according to a regional classification, e.g. zip codes and represent therefore an area-wide network of service providers.

Information Function

Users are continuously searching for health related topics via internet. Therefore, the online platform has to cover such functionality in order to gain a significant market share within the Online Social Health Community. [286]

By emphasizing on customer needs, the online platform could provide two different spectra of information. The first could offer a database with validated information related to diseases, symptoms and medication for people interested in health topics and which could also help patients and family members to clearly figure out which diseases and illnesses were diagnosed in the past. The second could cover the information function by providing a consulting section for medical emergencies and healthy lifestyle practices. Furthermore, the user could get an area-wide list of doctors, ambulances and hospitals. Afterwards, the customer could rate the medical services and give feedback concerning several parameters. In addition, users would have access to information regarding healthy and balanced nutrition, diets, sports, stress prevention etc. for personal wellness improvement.

Social Function

Social isolation is a growing problem for people being cared for at home and cause higher risks for diseases. [296, 327]

The social function of the online platform intends to respond on the deficiency of social interaction of people in need of care. Such a deficit is often caused by changing family patterns and is additionally supported by an increasing dismobility of elderly people. By enabling patients to interact via the online

platform with other peers, counteract against the partitioning of patients is achieved.

Therefore, the third function of the Online Social Health Platform will be determined by a social aspect in which people could create their own pinboard, displaying their personal information, interests and hobbies amongst others. By visiting other pinboards and writing messages between each other, users are able to create their own social network. Thematic group memberships are also contemplated. In this way, elderly people are encouraged to socialize by mean of interaction, i. e. exchange of medical experiences, knowledge and attitudes due to medication and treatment.

In conclusion to the integration of three different functions, this service includes existing business models into an online platform and creates an integrated environment benefiting from its synaptic effects. Elderly people in need for care get their needs satisfied and will perceive a high value, which will be analyzed in more detail under the topic “Customer Benefit”.

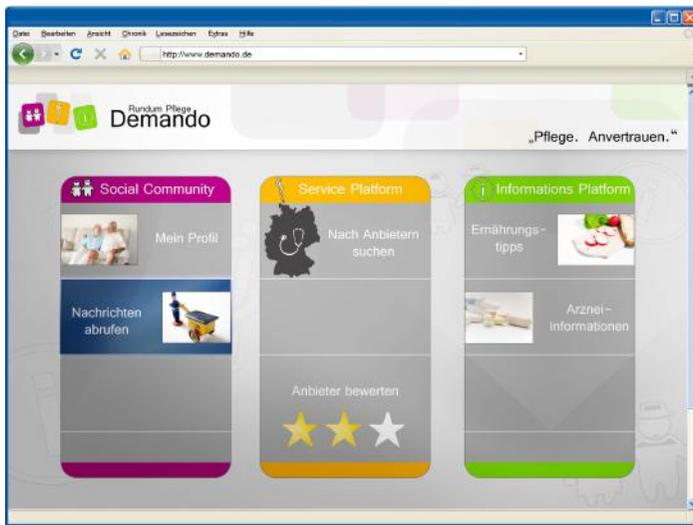


Figure 8.4: Visualization of the user interface
Source: Own Illustration

8.4.2 Target Groups

The here presented social online community pursues targeting mainly three well differentiated audience groups namely patients, care professionals, and family members of patients and volunteers.

In the following sections, each of the groups will be described in detail.

8.4.2.1 Health Care Customers and Generation 50plus

This group embraces members of the Online Social Health Community which are not related professionally to the health care sector and who became members for socializing with other patients peers, looking for health related information or with the purpose of contacting a physician for health service procurement.

The profile of the patient member targeted by the community is a senior user belonging to the so-called Generation 50plus. A focus has been done in this social group as it is intended to be the one demonstrating the greatest coverage in audience target i.e. the group which can get more advantage of the features and capabilities offered by the Online Social Health Community so the potential functionality of the model can be fully exploited.

The Generation 50plus is a highly heterogenic group leading nowadays to a new customer segment and emerging market. This is one of the main motivations for choosing this group as it is the largest one as well as the one expected to appear constantly increasing due to demographic change trends.

As general pattern, people integrating this group have worked and saved money during their lives and feel it is their turn to enjoy life and so are up to satisfy their own needs. For this reason, people of the Generation 50plus are the ones representing the greatest willingness to pay for health services in case it is perceived a valuable and worthy service according to an attitude of increasing awareness towards personal fitness and wellness.

Therefore, the average profile of a community user is a senior above fifty with dynamic and positive spirit and who is likely to become in need of care.

8.4.2.2 Health Care Professionals

The second target group addresses those members of the Online Social Health Community who are directly related to the health care sector and act as professionals within the platform environment. Here, the target group may include professionals acting as advisors for medical advice answering queries and providing educational resources for patient education.

The first identified target group would be integrated by freelance health care professionals belonging to an independent workforce and operating in a more or less reduced geographical area restricted, for example, to an urban district. These freelance workers, such as physiotherapists or nursing care-givers for instance, could provide rehabilitation or care services to patients contacting them through the Online Social Health Community as connecting medium. Together with the health profile matching criteria for service ability delivery, geographical localization may be an influencing secondary factor when looking for a physician. Thus, independent workers in the health care sector classified according to physical location is a major group target group within the here depicted community.

In addition, small and medium companies with a regional focus are listed as potential members of this target group. The inclusion of companies is in special interest in scenarios where the community members may be located in structural weak areas where patients face serious problems for service procurement because of being located in remote geographic areas with severe access deficiencies. In this case, health enterprises operating in a regional level could manage to cover a certain rural area where a number of dispersed villages are located into and ensure health assistance whenever it may be required. Therefore, a second target group can be identified, the one representing health companies of moderated size and with a broad degree of treatment and health service procurement specialization, operating in remote and isolated locations for service deliver through qualified health care personnel.

8.4.2.3 Relatives of Cared-for and Social Volunteers

The third group is directly related to the first one as it consists of family members of patients. In this case it is not the concerned patient who access the community but a relative of her, who takes the initiative of becoming a community and therefore has access to the same services and features as described in the first section.

As the main patient target group considered is the one corresponding to the Generation 50plus, the patient relatives here considered are the family members of Generation 50plus. Furthermore, it is worth mentioning social volunteers who adopt the same role as family members within the Online Social Health Community.

8.4.3 Customer Benefit

Steve Jobs, the CEO of Apple, recently said “Customer´s don´t buy features, they buy benefits, perceived benefits”. Concerning this quotation, customer value is generated when a new product or service is able to provide a value added in comparison to existing products and services on the market regarding the three main dimensions: time, quality and costs. The added value is the essential differentiation criteria which is also called Unique Selling Proposition, USP, in terms of marketing. The following section will provide a more detailed analysis of the perceived value in respect of the Online Social Health Community, its three functions and the already defined target groups.



Figure 8.5: Elderly people using Demando
Source: Own Illustration

8.4.3.1 Target Group: Health Care Customers and Generation 50plus

Health oriented customers in our paper are people within the Generation 50plus who have an increased interest in health related information, sports and lifestyle services. They perceive value out of the powerful information section combined with the intermediation function, getting a broad range of lifestyle tips and being able to thereupon publish health related service requests.

Considering Demando users belonging to this Generation 50plus segment and in need of care the benefits perceived are several. Being in need of care may refer to a desire to contact someone in order to enhance quality of life and health status, like a fitness trainer or a personal coach. Also a user interested in get in touch with associations or groups, for example, advocating and promoting lifestyles and outreach to keep people in fit.

On the other hand, for those seniors with a severe need of care meaning people with health deficiencies as a result of suffering from diseases or any other health related hazard would be able, the community contributes in providing assistance by connecting patients demanding care with physicians offering treatments.

Moreover, and in the same line of the previously described, another decisive aspect covered by the community can be mentioned, that is the need for socialization in order to avoid isolation and marginalization of elderly risky sectors i.e. people living alone on their own in their homes, with high degree of immobility and with a lack of social contacts. They would perceive an enormous benefit as community users as a way of avoiding social exclusion

and to ensure connectedness to the real world by regaining contact with other peers, finding friends and sharing knowledge, hobbies and interests. This feature also reinforces the vision of Demando as social service provider filling the gap between society and social excluded minorities not covered by the way.

In addition, due to the intermediation function reducing costs for patients as a result of the increased competition among the service providers, the customers perceive additional benefit out of the Online Social Health Community. Especially regarding less financially situated elderly gain from reduced costs helping them to get an adequate care. This aspect is highly correlated to the quality of life and therefore perceived as a great benefit. However, elderly people who are well-off are able to afford premium services and hence perceive a higher benefit as well.

8.4.3.2 Target Group: Health Care Professionals

For health care professionals, Demando would provide a new sale channel, giving the opportunity to address potential customers by an effective online presence and thanks to which they would be able to generate additional profit out of.

Generally, smaller service providers and especially the freelance health care professionals benefit from the intermediation function. It enables them to offer their range of services within an area-wide market and to start cooperations with larger companies which intends to integrate their partners horizontally leading to growth potential.

Additionally, Demando could be used as a marketing platform, establishing a brand and enhancing customer loyalty.

8.4.3.3 Target Group: Relatives of Cared-for and Social Volunteers

Relatives of people in need of care usually look after their family members but face more and more problems due to the expenditure of time for their job and their non-regional residence. Even if they feel responsible for their relative in need for care, they are not able to care for her. Such a situation is not a single case but a widespread tendency, caused by a fundamental change in social family pattern.

In order to respond on this trend, Demando enables the relatives to care - or to organize the care - for their relative in need for care and hence comply with their responsibility for them. Therefore, another usage performed by Online Social Health Community could be gathering health information about illnesses from other patients suffering the same in order to share experiences and gain additional information to provide better care. Additionally, family members would be able to look for assistance on behalf of the patient, e.g., a working son contacts a physician to take care of his mother.

8.4.4 Competition Analysis

In the following section, threats from direct competition, by existing and new players, and indirect competition, by related formats, for the Social Health Community will be analyzed.

8.4.4.1 Direct Competition

Competition is a business relation in which two parties compete to gain market share. The most narrow form is direct competition where services which perform the same function compete against each other.

The biggest threat for the presented Online Social Health Community will be already established web service provider, with a high brand awareness and gaining from a large number of users, which become aware of the attractive market segment of the Generation 50plus and target this group effectively.

Even a lack of social communities with health-related topics in 2020 is very unlikely, the full-scaled conjunction of the three functions as intermediation, information and community might be still unique. As services, especially web-based ones, can be easily copied by others, the functions of the Online Social Health Community will be adopted by competitors. For instance, there are already emerging websites for Online Health Records, health-related communities and information platforms. It can be expected that the intermediation function, for example, will be added by other health-related information platforms.

However, Online Social Health Community competitors will not have to provide all three functions. Of course, the interconnection of the Online Social Health Community between all three segments is a clear advantage for users in the aspect of convenience and synergies, but incumbent websites might be more attractive with a higher user quantity by serving only one function. Furthermore, linkages and alliances between these established websites will likely reduce the advantages of the Online Social Health Community.

There is little chance, that new entering players will be successful in the market. They do neither benefit from a customer base nor from connections to health care service providers. On the contrary, having no direct or indirect support by the state, new players have to build confidence as a start.

Another potential competitors could emerge from service provider side. Competing with each other, service providers see the way to distinguish themselves by widening their service portfolio. They might offer a web-based information platform addressing potential customers directly. Waging service providers could also build alliances and establish an autonomous health portal. By refusing to offer their services on the Online Social Health Community, this vertical integration appears to be a serious threat.

Summarized, the toughest competition has to be expected from companies which are not facing a market entry barrier of a sufficient user base. These com-

panies are able to adapt the functions of the Online Social Health Community and might have closer connections to the care service provider side.

8.4.4.2 Indirect Competition and Substitutes

Looking at competition, the indirect competition, where products which are close substitutes for one another competing with each other, has also to be considered.

In this case, it might happen that traditional distribution channels will still dominant the market, even though transaction costs are much higher. For example, the “Gelbe Seiten” are a highly established print medium in which almost every regional firm is listed.¹¹ This wide range of service providers is unlikely to be achieved by Demando. The disadvantage of Gelbe Seiten is the lack of an evaluation system. Choosing from a neutral list, customers cannot figure out the service providers’ quality before ordering.

As a substitute for Demando’s intermediation and communication functions can also local non-profit networks be considered. For example, churches offer counseling sessions for elderly people to order the appropriate care service provider. Additionally, the church community gives them the opportunity to socialize and communicate with each other.

Emerging “Gesundheitszentren” cover more the Online Social Health Community’s third function, the information part. Professional consultation by physicians and the concentrated cluster of hospitals, rehabilitation facilities and service providers enable well-fitting treatment and convenient referrals for the customer.

Integrated Care Managers, ICMs, take the same line by providing a system of achieving the optimal health status for customers by offering monitoring and evaluating health care services. [306] Having close and long-term contact to the customers, integrated care managers coordinate health care processes which fit best to special needs. In contrast to the Online Social Health Community, customers cannot freely choose their care services, but have to accept providers cooperating with the integrated care managers. Furthermore, focusing merely on professional health care, ICMs do not include wellness and fitness services.

8.4.5 Revenue Sources and Revenue Sharing

When the here issued online community is intended to leverage profit, a number of effective strategies must be conceived for value generation. Different revenue sources can be identified, taking into account that these revenue generating activities must be aligned with the value offered to Demando members. The

¹¹Gelbe Seiten, i.e. Yellow Pages is already present in the internet with its own portal. However, the original book is still the more common medium.

most effective strategies and tactics for generating value from an Online Social Health Community are listed below. [304]

Serving as a intermediary between health care service providers and customers, the main revenue source of Demando consists of fees the providers have to pay by every transacted service. The Online Social Health Community gets a percentage of the paid money directly from provider side. This revenue model is similar to already existing intermediation portals¹². If Demando experiences a high demand from provider side to use the platform as a main distribution channel, it can be considered to raise a charge on a regular basis. However, in the beginning, to attract as many providers as possible, this option should be disregarded.

Regarding advertising, Demando represents a platform for peer-to-peer interaction where advertisers are able to participate in. This advertising must be targeting, i.e. done in a reasonable and coherent way, by ensuring ads are relevant to the content the community is generating and do not interfere with member activity at any case. This is achieved through tools like contextual matching or by means of profile tags indicating health status or preferences and sold the same way as keywords for advertising in search engines. [304, 289, 300]

Secondly, affiliation procedures and charging for community subscription are powerful ways for obtaining revenue. Tiers of membership are established as members are charged for accessing to additional content and/or services, meaning high-quality community features as a privilege of subscribership. This may comprehend custom domains, private groups, enhanced profiles, enhanced support, access to experts, premium articles, extra storage, etc.

Sponsorship can be also considered, though it is not very likely to have success in having individuals paying directly but, for example, in getting supporting institutions to pay for their employees' access. [304, 289, 300]

In addition, as a way of monetizing social networks, community members co-create value that the community resells. Here, engagement, loyalty, satisfaction and influencer activity of online community members represent highly valuable aspects and metrics. For example, an user creates video and upload it, getting income per a certain number of views. It is a win-win situation in which hosts gain income from advertising and sponsorship. Moreover, there is the added benefit that the community minds less about the advertising when the revenue is going to another peer. [304, 289, 300]

It is decisive to know how the community functions and to get depth understanding of its dynamics. Knowing what Demando values and what members expect from interacting to each other, ables to determine what they will pay for and what types of advertising they will tolerate, giving the opportunity to advertise and to offer value-added services that can generate revenue. Discounts, price breaks and revenue sharing to a select group of creators and influencers should be offered as incentive. Furthermore, previously

¹²Examples for such portals are ebay.com or myhammer.de.

described revenue sources might be combined to achieve an even higher rate of return. [304]

8.4.6 Competitive Strategy

As described above, the health care industry has several important features that have band together to create a unique market environment. Additionally, the industry has been and will continue to be very dynamic. Accompanied by rapid technological change, health care spending will be on a sharp rise in the next decades. In this chapter the paper discloses, how a Social Online Health Community could profit from and even shape competition in the health care market as well as how to differentiate from competitors.

8.4.6.1 Positioning and Unique Selling Proposition

Due to the fact, that health care in Germany is an emerging market, high competition between different players will form the basis of the future market. Competition in the health care sector is socially and politically volitional as long as it improves value for customers, or the quality of products or services relative to their price. Contention between health care providers leads to improvements in efficiency, product quality and customer service. Innovative business models propel advances in the state of the art of maintenance. Thereby, quality adjusted prices fall, the market expands and more customer needs are met. Besides, choice expands as firms work to distinguish their products or services from others. Excellent firms prosper while firms with low quality, poor service or high costs decline or go out of business unless they make fundamental improvements in the way they operate. [316]

This is how value based competition should look like, but it is far away from what one sees in today's health care sector. Demando will position itself in the center of the German health care market and foster development towards consumer-driven health care. Demando's relative position within the industry and its competitive strategy determines it's profitability. Fundamental basis of profitability in the long run is sustainable competitive advantage. To gain that advantage the Demando community has to differentiate from competitors and rivaling business models. Demando seeks to achieve determination through its unique combination of communication, information and health care marketplace functionalities. The needs of patients and their relatives form the community's hub. In doing so, Demando wants to establish itself as the Online Social Health Community individuals entrust to.

In addition, care service providers profit from a cooperation with Demando. There is no need for small and medium care providers to offer all services to all patients, as Demando improves and simplifies care service selection, allocation and hiring. A team-based focus on a carefully defined set of integrated services and practices delivered to one individual by more providers becomes

possible. Care providers will achieve scope and scale by growing locally and geographically in their areas of strength, rather than expanding the breadth of their service offering. This allows care professionals to perform on a cost efficient level.

High service quality is ensured by the use of the ranking tool described above. The best, most innovative providers will be rewarded with more patients as their results, in terms of patient outcomes, become widely known via the community¹³.

Thereby the Online Social Health Community serves as a standardsetter for measuring the delivered value for cared-for and customers.

Demando might bring benefits to German care services customers that other consumer-driven industries enjoy - choice, information and control - plus more focused and integrated care. In this ecosystem citizens take an active role in managing their health and are ready to pay for received value¹⁴.

The scope, where Demando is competing, from a geographical, product and segment point of view is discussed above. To develop a further reaching competitive advantage over its competitors, the geographical and the product-related extent of Demando is expandable.

8.4.6.2 Strategic Partnerships

Innovation PPP

In our scenario Demando is designed as PPP. In this set-up the German state is the most important partner for the carrier of Demando. The strategic partnership between the state and the carrier further develops the competitive advantage in the seminal health care sector. By utilizing the advantages of both the public and the private sector the common goal of both players involved can be reached. This objective is to efficiently execute an online platform to deliver health related services to the customer.

The private carrier of Demando yields the management and innovation competencies. Therefore, the Demando project is a so-called “innovation PPP”. In such cooperations the public partner especially takes stock in the usage of new markets and changing competition patterns inclusive the opening up of innovations for the public sector. The private partner on the other hand

¹³Outcomes are multidimensional, and include not only contentment but extent of recovery or disability, errors, complications, care time, recurrences, and other aspects of the patient’s care experience.

¹⁴Critics of this business model might argue, that consumers cannot navigate or offset the dysfunctional competition in the current system. They cannot direct their own care in a system with fractured care cycles, constrained networks, and personal financial charge that depends on how much one’s insurance is paying rather than on what care is being delivered. Without competition centered on improving results at the care condition level over the care cycle, consumers will not be able to identify good value or make good choices about necessary services.

focuses on creating new markets and sharing risks with the public partner. An important question in this context is an equal and fair risk allocation. The risks associated with the project must be allocated to the parties best able to manage those risks. This concerns must be met in the procurement contract.

Hence, this paper proposes “Vertragsprivatisierung”, contractual privatization, as an appropriate design for the PPP, though the Demando project should be conferred upon a private company. Fulfillment of planning, funding, design, set-up and operations should be conducted by the private partner. This leads to a relief of the private sector, who confines itself to controlling Demando’s services. Financial compensation of the private carrier could for example be designed as a guaranteed monthly rate, like in a “Bertreibermodell”, or as a right to fully obtain keep revenues, like in a “Konzessionsmodell”. Financial risks of the private partner can be narrowed down by a start-up financing on the part of the public partner.

The right public partner for Demando might be the “Bundesministerium für Gesundheit”, German Ministry of Health. Besides the financial benefits it can bring into the project, the trustworthiness of public authorities play an import role. Demnado as a whole can benefit from the state’s trustability and reliability.

Privacy Seals and Seals of Quality

But Demando cannot just counteract consumers’ concerns about data privacy and quality of health carte information and services by cooperating with the state. Users of Demando should be provided with tools to assess the integrity of their data and the quality of information. Privacy seals, seals of quality and trusted filters for information create a perception of the business as a responsible consumer advocate.

Privacy seals are images displayed in an online community that are granted by privacy seal providers. Seals assure verifiably users that an operator cares about their private information. Obtaining a privacy seal means that an organization has surpassed a set of guidelines, both for how it collects, handles, stores and shares personally identifying information and for how it crafts and presents your privacy policy. Example for online privacy seals are “TRUSTe”, “BBBOnLine” and “PrivacyBot.com”.

Seals of quality differentiate from privacy seals, as they focus on improving and setting standards for the quality of information. “HON Code”, for example, is a code of conduct for medical and health web sites to address reliability and usefulness of medical information on the internet. It is intended to both patients and medical professionals¹⁵.

Strategic Partnerships with both existing seal providers and other standard-setters, like for example “EuroSOCAP”, would enable Demando to actively

¹⁵For further information, see <http://www.hon.ch/HONcode/Conduct.html>

shape future standards and further establish itself as a reliable Online Social Health Community.

Cooperation with Insurances

Furthermore partnerships with German insurance companies could enhance Demando's customer benefit. Via the online health care marketplace insurances could promote, which care services are carried over in insurance products. Thereby, insurance companies could distinguish themselves from competitors and selection of care services would be more transparent for the users.

Cooperation with Hardware Suppliers

But not only as regards content, one should find strategic partners for the portal. In order to guarantee an unique user experience, Demando should find a strategic hardware partner. As Demando is meant to run platform independently and across different interfaces, input/output systems for elderly people are crucial for the success of the online community. One could think of easy to use remote controls or even voice control to navigate through Demando's portal. In contrast to "lean forward interaction portals", that are usually accessed via a computer with a keyboard and a mouse, we think of a "lean back interaction" for Demando. Users should have the possibility to literally lean back in their sofa, using only a remote control and perhaps their voice as a way for interacting. The demands of distance and user input devices remark the importance of Demando's look to be designed differently than in other online communities. To assure a high degree of design matching between software and hardware strategic partnerships in this area appear to be expedient.

8.4.7 Value Added Services

Demando's positioning and unique selling proposition as described above could be enhanced by optional Value-Added Services, VAS. Those VAS describe non-core services or, in Demando's case all services beyond communication, information and intermediation of health care services. Those services add value to the standard service offering, spurring the user to use the platform more intensely. This paper does not distinguish between standard VAS and premium-charged VAS.

8.4.7.1 Implementation of the Electronic Health Card

One option for providing a VAS, is the implementation of the Electronic Health Card, EHC, or Gesundheitskarte. As far as this opportunity arises Demando could become the one interface to manage one's health related data.

Existing Demando services could thereby be improved. For example, could information which is stored and secured via the card be shared with selected care service providers. Based on the detailed information supplied on the card, care service providers could further personalize their service and increase value to the customer or cared-for. As in the Private Public Cooperation Scenario integration of the EHC is restrictive, this service is basically not implemented.

8.4.7.2 Provision or Integration of an Online Health Record

But there is a similar option, which could integrate the VAS of storing and sharing your personal health information in a uniform way. This option is to provide or integrate an Online Health Record, OHR, which is independent from the EHC. Depending on the development of existing OHR solutions, Demando has to decide whether it is more profitable to integrate such third party solutions¹⁶ or to set-up an own OHR service. With the OHR, users have the chance to keep their care providers and family members up-to-date about their health. At the same time get informed well directed about for them important health issues.

8.4.7.3 Interface for Vital Monitoring Services

If Demando users can store and manage all their health information in one place, the integration of basically Vital Monitoring Devices, VMD, would be the next logical step to add value to the portal. Instead of having different applications for several VMD, Demando would be the interface where users can store and examine all their results and data. These results could then be gathered in the OHR. The user chooses what data should be shared and what should be kept private.

8.5 Conclusion

The purpose of this report was to analyze the future development of online social health portals in Germany. We described stable trends, key drivers and out of it resulting scenarios for the future market environment and competition in 2020. Based upon the Private Public Cooperation Scenario we developed a business model for Demando, an online community for cared-for, their relatives and care professionals. We identified that such a portal might bring benefits to German care services customers that other consumer-driven industries enjoy – choice, information and control.

To back-up that development the state should partner with the private sector, as a business model like described above offers advantages to both sides.

¹⁶An example therefore is Google Health: www.google.com/health

Health care services have always been an issue of great significance to the German economy. With the aging population its value to the German economy will further increase. This paper's results denote, innovative business models are likely to arise in this environment. Sustainable competition, meaning competition based on the value for health care customers, between German service providers has the ability to enhance social welfare.

Due to the rapid development of the underlying technology and the service market itself, it remains a need for future analysis of business models, as well as constant market observation.

References

- [278] M. Alwan and J. Nobel. State of Technology in Aging Services According to Field Experts and Thought Leaders. *Center for Aging Services Technologies (CAST), American Association of Homes and Services for the Aging (AAHSA), Harvard School of Public Health*, 2008.
- [279] M. Alwan and J. Nobel. State of Technology in Aging Services: Summary. *Center for Aging Services Technologies (CAST), American Association of Homes and Services for the Aging (AAHSA), Harvard School of Public Health*, 2008.
- [280] U. Bauer. Die sozialen Kosten der Oekonomisierung der Gesundheit. *Aus Politik und Zeitgeschichte*, 2006.
- [281] C. Bezold and J. Peck. Patient-centered Care 2015: Scenarios, Vision, Goals and Next Steps. 2004.
- [282] G. Bovensiepen. Generation 55+ Chancen für Handel und Konsumgüterindustrie. 2006.
- [283] D. Budaeus. Public Private Partnership - Ansätze, Funktionen, Gestaltungsbedarfe, 2004. URL <http://goew.de/pdf/c.3.7.1.goew.pdf>. Accessed on 30.06.2008.
- [284] A. Burger and D. Herfert. Datenschutzgesetz trifft Informatik. 2006.
- [285] F. Buslei and L. Hermann. Auswirkungen des demografischen Wandels auf die private Nachfrage nach Gütern und Dienstleistungen in Deutschland bis 2050. *Deutsches Institut für Wirtschaftsforschung*, 2007.
- [286] California HealthCare Foundation. The Wisdom of Patients: Health Care Meets Online Social Media, 2008. URL <http://www.chcf.org/documents/chronicdisease/HealthCareSocialMedia.pdf>. Accessed on 01.07.2008.
- [287] J. Caumanns. Die elektronische fallakte. DRG-Forum plus, April 2008.

- [288] Center for Aging Services Technologies (CAST). The consortium on the impact of technology in aging health services. 2007.
- [289] K. Chai, V. Potdar, and E. Chang. A Survey of Revenue Sharing Social Software's Systems. 2007.
- [290] Constructing Excellence. Procurement, 2004. URL http://www.constructingexcellence.org.uk/pdf/fact_sheet/procurement.pdf. Accessed on 28.06.2008.
- [291] Deloitte. The Future of Health Care, 2005. URL [http://www.deloitte.com/dtt/cda/doc/content/The%20Future%20of%20Health%20Care\(1\).pdf](http://www.deloitte.com/dtt/cda/doc/content/The%20Future%20of%20Health%20Care(1).pdf). Accessed on 01.07.2008.
- [292] H. Deutsch, D. Ralfs, and U. Knopp. Public Service Value im Gesundheitswesen, 2006. URL www.accenture.com/NR/rdonlyres/FDEECEB2-3179-48F3-A3D8-A243A197D61D/0/%20Accenture_PSVStudy_2006.pdf. Accessed on 01.07.2008.
- [293] D. Drees. Introducing the German eHealth Card (eGK). *Presentation for The World Health Care Congress March 30th, 2006 Gematik GmbH*, 2006.
- [294] Federal Ministry of Justice. Bundesdatenschutzgesetz, 1990. URL http://www.bundesrecht.juris.de/bdsg_1990. Accessed on 23.06.2008.
- [295] Federal Ministry of Justice. Pflegeversicherungsgesetz. 2002.
- [296] Forschungsinstitut des Wiener Roten Kreuzes. Pflege. *Hans Huber, Bern*, 01:25ff, 2008.
- [297] G. Freriks and P. Thornton. European Standards on Confidentiality and Privacy in Healthcare, 2006. URL <http://www.eurosocap.org/Downloads/European-Guidance-German.pdf>. Accessed on 20.06.2008.
- [298] H. Gartska. Informationelle Selbstbestimmung und Datenschutz. 2003.
- [299] Gematik GmbH. The specification of the german electronic health card ehc part 2: Applications and application-related structures. 2007.
- [300] R. Gordon. The Online Community Cookbook. Section 3: Making Money with Online Community. 2008.
- [301] J.H. Greenberg, D. Dankell, and B. Furht. A Content oriented Architecture for Consumer-to-Business E-Commerce. In *Proceedings of the 6th Int. Conference on Enterprise Information Systems*, volume 04, page 1, 2004.

- [302] M. Harlow. PPP in Central Europe: How to get the best out of the private sector. *CEI Summit Economic Forum*, 2004.
- [303] M. Horx. *Trend-Report 2008*. Zukunftsinstitut, 2007.
- [304] B. Johnston. ForumOne Communications. Online Community Revenue and ROI Techniques. 2007.
- [305] Karkalis, G.I. and Koutsouris, D.D. E-health and the Web 2.0. *IEEE*, 2006.
- [306] J. Kastens. Integrated Care Management. *Nursing Economics*, 1998.
- [307] R. Kirchmair. Senioren: die sparsame Generation? *Wirtschaftspsychologie aktuell*, 2:53, 2005.
- [308] R.A. Mainz. Electronic Health Cards - European Perspectives. *Presentation for the 1st National eHealth Conference*, 2006.
- [309] Markle Foundation. The Personal Health Working Group. Final Report, 2003. URL http://www.connectingforhealth.org/resources/final_phwg_report1.pdf. Accessed on 30.06.2008.
- [310] Markle Foundation. Common Framework for Networked Personal Health Information Policy Brief, 2008. URL <https://www.policyarchive.org/bitstream/handle/10207/15531/CCPolicyBrief.pdf?sequence=1>. Accessed on 30.06.2008.
- [311] MasterCard. Business Planning - Basic Definitions. Technical report, 2008.
- [312] Microsoft Corporation. A Vision for Advancing Healthcare Through Technology. 2005.
- [313] PatientView Ltd. The Views of Health and Social Campaigners worldwide. *HSCnews International*, 2006.
- [314] J. Penn. Privacy Seals: Opt In Or Opt Out? *Forrester Research Trends*, 2006.
- [315] A. Picot, R. Reichwald, and R. Wiegand. Information, Organisation and Management. *Springer*, page 317, 2008.
- [316] M.E. Porter and E. Teisberg. *Redefining Health Care: Creating Value-Based Competition on Results*. 2008.
- [317] PriceWaterhouseCoopers. Developing Public Private Partnerships in New Europe, 2004. URL http://www.pwc.com/ie/eng/about/svcs/corp_finance/pwc_ppp04.pdf. Accessed on 28.06.2008.

- [318] A. Reidl. Neue Wege und Inhalte: Kommunikation mit der Generation Silber, 2005. URL http://www.gfk-verein.de/index.php?article=act_05_06&lang=german&f=congress05. Accessed on 21.05.2008.
- [319] T. Richen and P. Steinhorst. Standardization or Harmonization? You need Both. *BPTrends*, 2005.
- [320] Roland Berger Strategy Consultants GmbH. Wirtschaftsmotor Alter, 2007. URL <http://www.bmfsfj.de/bmfsfj/generator/RedaktionBMFSFJ/Abteilung3/Pdf-Anlagen/endbericht-studie-wirtschaftsmotor-alter,property=pdf,bereich=bmfsfj,sprache=de,rwb=true.pdf>. Accessed on 01.07.2008.
- [321] Rostocker Zentrum für Demografischen Wandel. Deutschland im demografischen Wandel, 2007. URL <http://www.zdwa.de/zdwa/artikel/broschuere>. Accessed on 18.06.2008.
- [322] J. Saraohn-Kahn. The wisdom of patients: Health care meets online social media, April 2008. URL <http://www.chcf.org/documents/chronicdisease/HealthCareSocialMedia.pdf>.
- [323] T. Schuten. Liberalisation, privatisation and regulation in the German healthcare sector, 2006. URL http://www.boeckler.de/pdf/wsi_pj_piq_sekkkrankh.pdf. Accessed on 28.06.2008.
- [324] M.W. Stanton. Expanding Patient-centered Care to Empower Patients and Assist Providers, 2002. URL <http://www.ahrq.gov/qual/ptcareria.htm>. Accessed on 18.06.2008.
- [325] T-Systems. White Paper Healthcare Industry in Germany., 2006. URL http://download.sczm.t-systems.de/ContentPool/en/StaticPage/29/29/29290_Whitepaper-Healthcare-ps.pdf. Accessed on 01.07.2008.
- [326] V. Venkatraman. Design for an Aging Society, 2007. URL <http://www.indexaward.dk/content/image.asp?id=2609&download=true&lcid=1030>. Accessed on 02.07.2008.
- [327] E. Wilson and R. Krueger. Loneliness and Risk of Alzheimer Disease. *Archives of General Psychiatry*, 02/07 Bd. 64:234, 2007.
- [328] N. Wirsz and A. Kassner. ID Cards in Germany and Integrated Care. *Presentation for the IHE Europe Committee Siemens Medical Solutions VHitG Projectmanager Telematics*, 2005.
- [329] www.BusinessDictionary.com. C2B Definition, 2008. URL <http://www.businessdictionary.com/definition/consumer-to-business-C2B.html>. Accessed on 01.07.2008.

9

Chapter 9

Health and Lifestyle - New Services for the Needs of Seniors in 2020

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The demographic change has severe effects on the German society. Within the next years the composition of the population will extremely change and by 2020 elderly people, the so called Generation 50plus, will represent the half of the population. Due to their high number and their good financial status, the “seniors” will stand for a big spending power and become the major customer group for the industry.

On the other hand, the demographic change menaces the German social system which is build on the “Generationen-Vertrag”. As a consequence the health care sector has to think of possible solutions to finance the aging population.

Both circumstances, the need for reduction of costs in the health insurance industry and the development of a big new customer group, hold a lot of potential for services in the health care sector. Two promising services that address the needs of both customer and provider have been designed. iDoc enables medical consultation via the Internet and holds benefits for patients, insurances and doctors.

Health Care Vacation combines two deluxe needs of the Generation 50plus. Travelling and having checked the personal health status.

9.1 Introduction

Germany, desert of services? Many people tend to criticize the German tertiary sector. Rightly? Fact is that although the service sector stands for 70% of the German gross domestic product, Germany still drags behind the international average. Countries like the US are far ahead and hence utilize the high potential that lies within the tertiary sector much more efficiently. However, the good thing is that Germany has a lot of room for improvement. As a consequence the German service sector is undergoing a constant upswing.

At this point we want to give a short definition of service. In this report, it is associated with the economical understanding of service and corresponds to a good with the difference, that a service is always non-material. Therefore, a service provision does not result in a change of ownership.

The positive development of the German service sector will especially concern the new growing customer segment of the Generation 50plus. Due to the demographic change a huge potential arises with the people above the age of 50. Current marketing activities start addressing the promising customer and products are designed to perfectly adapt to the needs of those people. It is hence time to also think about services specific to the Generation 50plus.

The goal of this report is, by analyzing the development of the environment of and the Generation 50plus itself, to look into the future (2020) and derive two promising services for this customer group.

In the first section we present an analysis and ranking of the drivers for potential services. Having separated them into two different groups (certain and uncertain drivers) the basic scenario, deriving from the certain drivers, is presented to the reader. After a short explanation of the key drivers three possible scenarios are discussed and evaluated.

Based on the selected scenario we developed two different services. Both of them are related to the health care sector and address the future needs of the Generation 50plus.

9.2 Driver Analyses

9.2.1 Drivers in the Lifestyle and Health Industry

When talking about new potential services for the needs of seniors in 2020 it is inevitable to first have a closer look at all the drivers in this industry segment.

In the following the overall trend in society as a whole, in the specific subgroup of the seniors, and in the development of technology will be explained and analysed.

9.2.1.1 Trends in Society

The society itself is an important indicator for what products will be needed and accepted in the future. Trends in this area hence have to be looked at carefully.

Demographic Change

Looking at the German population pyramid the most obvious and alarming development in Germany is the mutation of the pyramid into an inverse hourglass. There is a thick life buoy at the age-range of 30 to 45, a growing topping above the age of 85 and a slimming stem (see figure 9.1).

This fact is worrying because of the 'Generationen Vertrag' (contract of generations) that the German social system is based on. As it is the younger people that work and hence pay for the retired/old ones, the shrinking youth menaces the living standard and the safety of the older generations. The 'babyboomers' (now 40-50 years old) will soon go into retirement and make demands on their pension. [341]

The "Generationen Vertrag" (inter-generation contract) as it is for today will soon be no more adequate to deal with this demographic change. The German government hence has to look for new solutions for the German social system. One will certainly be to rationalize the current system.

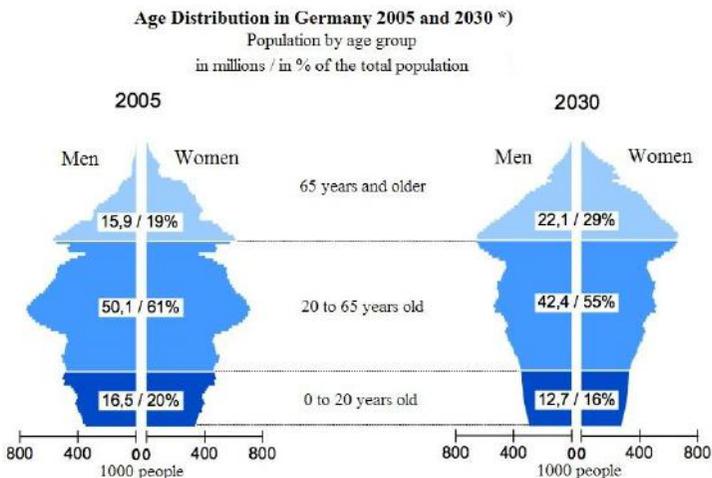


Figure 9.1: Population pyramid
Source: Own Illustration

Rationalization

With the demographic change comes the problem of how to finance the social system. There is not enough income to compensate for the rising spendings due to the aging population. As a consequence the government has to improve its budgeting. Talking about the pension system this will be done by diminishing the statutory benefits over the next years. More private pension schemes will emerge to compensate for the economizations. Besides cancelling benefits the German government will work on optimizing the present social infrastructure. A lot of cost can and will be saved in the administration sector. The introduction of the “Gesundheitskarte” (health data record) is a first step which will/has to be followed by many more within the next decade.

Growth of the Service Sector

Since the beginning of the eighties the service sector is the biggest sector of the German economy as it accounts for 70% of the German GDP. The so called tertiarization is expected to further continue within the next years and hence will be very important for the German economy. However experts have noticed that compared to other countries Germany still lags behind. This on the other hand leads to the conclusion that there exists a huge potential the Germans can bail out. The government is aware of the necessary transformation processes and initiated several programmes like “dl210” or “Innovationen mit Dienstleistungen” (innovations with services) in order to further improve the tertiary sector. One goal to achieve is to expand services in the ongoing field of social services. [347]

9.2.1.2 Trends in the Population Group of Seniors

Having analysed the German society and their major trends that are important to have in mind when talking about new services for seniors, it is the seniors themselves one has to have a closer look at.

The future seniors are the current babyboomer generation. They are in their 40s-50s and still participate in the working life. When they become seniors the composition of the Generation 50plus will change significantly. There will still be the 'old ones' (now 60-70) who are seniors they way we know them to be. More or less inactive, fragile and old-fashioned. Thanks to improving health treatment and life conditions they are getting older and older and as a consequence are in turn in increased need of health care and nursing.

However besides those 'oldies' in 2020 there will also be the 'babyboomers' in that particular age box (>50). And those guys follow a completely different pattern. They are far from being inactive, fragile and old-fashioned. The new 'Generation 50plus' is quite the opposite.

The people grew up in a prospering time of the country (after World War II) and hence had a higher chance of receiving better education. This fact is reflected by the overall decline of 'Hauptschulabschlüsse' (CSE) and a growing

rate of university degrees. [332] A higher level of education often comes along with a better job in the future and as a consequence a higher level of income. This can be observed here as well. The current generation 40-50 has a higher income than its antecessor (see table 9.1). [335] Having this in mind it is a logical consequence that those people, when entering the retirement age, become an extremely powerful and interesting customer group: Having nothing to do (no work) and a lot of money to spend.

And they will spend that money! This future senior is grown up in a consumption society (compared to the 'old' generation of World War II), is very open minded, and will mainly spend his money for habitation, hobbies, travel and health care.

The latter is a very important aspect. The youth of today more and more cares about its health status. There is a great awareness of the demographic change and the fact that the state won't be able to care about its citizens as capaciously as it has done for the past 40 years. The people hence start paying attention to their health in a more educated and preventious way. With introducing organic products in the cheap grocery stores the big organic-wave has even reached the poorer part of the population. The willingness to spend a high percentage of the income on healthcare and prevention is an ongoing trend.

Age	Spending Power (billion Euro)	Spending Power per Citizen
15 – 19	15.5	3,261
20 – 29	136.0	14,189
30 – 39	292.4	22,881
40 – 49	323.2	24,880
50 – 59	238.6	24,008
60 – 64	112.0	20,443
> 65	292.6	19,691

Table 9.1: Spending power in Germany
Source: Deutsches Institut für Altersvorsorge [335]

9.2.1.3 Trends in Technology

Technology is a very important aspect when designing new products. Especially when talking about healthcare devices. However it should even be kept in mind when the product is a service. Many new service models developed during the past 10 years thanks to the tremendous advancements of the internet. Technology and its acceptance is hence a crucial driver of the lifestyle and health industry and needs to be analysed in detail.

Technology Acceptance

Technology became an indispensable part of our life. 'Primitive' technology like a vacuum cleaner as well as 'advanced' technology like 'vital monitors' are common devices in the modern society. Everybody uses technology to some extent, is to a certain degree dependent on it and in most cases doesn't understand how it exactly works. However especially due to the latter, ever so often, technology is a suspicious black box to people. The younger generation grew up in a higher 'technology-contaminated' environment than the present seniors. Its level of mistrust against new technology is hence low. Even though the current seniors are still reserved when it comes to new technology this will change within the next years. The generation 40-50 already uses advanced technology like computers in their daily life (at work or at home) and is quite familiar with it. Which means once those people are old, technology adversity will not be an issue anymore.

Telecommunication

In the past couple of years telecommunication has penetrated human life. Not only is it the younger generations that make use of all kinds of technology in order to communicate and socialize. It is more and more the elderly people that also have cell phones and internet access. Furthermore there seems to be a trend towards virtual social networks as well. StudiVZ, facebook and XING are just three of such new services that developed in the past five years. It seems like people no longer shy at publishing their needs, fears and their complete private life in the world wide web. It is a new development and the raising formation of various social networks proves the acceptance for it (among the younger generations) to be high. The industry has already noticed the potential that lies with the seniors in that specific area. They are more restricted in the sense of mobility and hence their possibilities in maintaining a vital social life are limited. Having a present 80 years old woman in mind it is difficult to imagine her chatting via Skype with her grandson or finding old class mates in a 'StudiVZ-pre1950'.

Information Technology

When talking about rationalization of the German social system and particularly about optimization of its administration, IT becomes an important factor. In the ancient health infrastructure lies a lot of potential for optimization. A simple example is the doctoral letters that still are in written form. In most cases the reason for the lack of progress in the IT infrastructure is data security. The data is extremely sensible and confidential and a lot of attention must be paid that it is protected against misuse.

As there are constant improvements on the technology side, especially on data encryption, it is just a matter of years until the IT infrastructure of the German social system will be updated.

The 'Gesundheitskarte' is the first step in the right direction and further

ones are following for sure.

9.2.2 Ranking of the Drivers

At the beginning of our analysis, we made out many drivers that might have strong impact on the projections for the future. A lot of studies have been undertaken to explore the future trends in society and technology. Our challenge was to explicitly do research on the lifestyle and health industry and focus on the elderly population. While we can not claim completeness we found several strong drivers with more or less certain progress. Before continuing with the creation of possible scenarios, we evaluate all drivers concerning their certainty and importance. The latter is measured as the degree of impact on the future of the lifestyle and health service industry. We excluded unimportant drivers from our analysis. Certain drivers will serve as a base for our basis scenario less certain ones will create multiple future scenarios. For an overview, see figure 9.2.

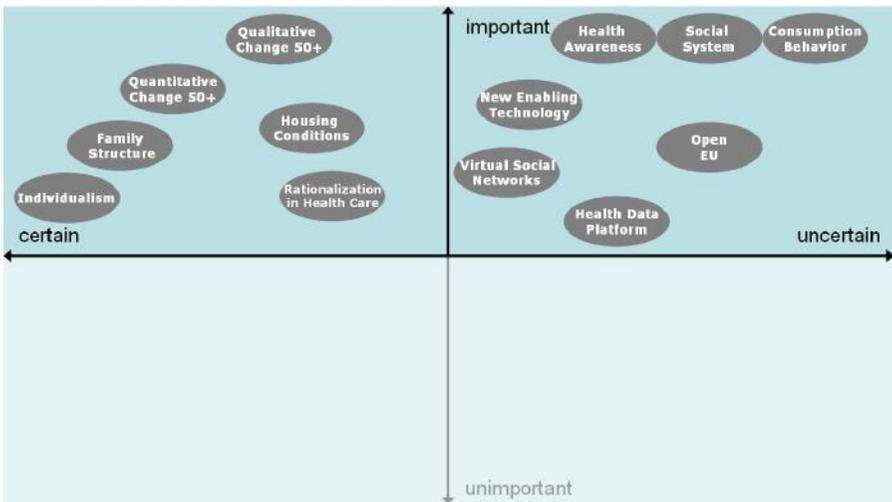


Figure 9.2: Ranking of the drivers

Source: Own Illustration

9.2.2.1 Certain Drivers

The following drivers show a high certainty of future development. These drivers create the basis scenario which then builds the fundament of our prediction of the market in 2020:

- Individualism

Is there a trend to a homogeneous society in Germany and Europe? Germany has a declining birth rate and an aging population. Moreover forecasts predict a positive net migration between 100,000 and 200,000 people per year thus preventing a fast shrinking of the population. [340] According to the United Nations Population Fund, Germany has the third-highest number of international migrants worldwide (12 percent of the population of Germany). Therefore, we strongly believe that there will be the trend to a multi-ethnic society with people of different cultures, races and religions. The diversity of the population, particularly in Germany but also in Europe, will have a different and high expectancies towards services in future. We therefore rank individualism as an important and certain driver.

- Family Structure

Our opinion is that basic changes will take place in today's family structure. There will be an increase of possibilities for female work while the emancipation movement will gain influence.[339] In addition, we think that by 2020, there will be a strong family separation between generations. In addition, parents will no longer be dependent on their children in terms of health care. We certainly believe that new services will guarantee adequate support for elderly people in the future.

- Qualitative and Quantitative Change of the Generation 50plus

According to the demographic development, there will not only be an increasing number of people, but also a stronger need for care and nursing by 2020. We strongly believe that with this demographic change, more technology is required to support the elderly people. Due to the higher active lifestyle of the Generation 50plus by 2020, we predict that new needs will come up and more services will be required.

- Housing Conditions

According to the Federal Ministry of Education and Research, the number of people living alone is increasing. There might be the trend that elderly people will live together in order to cultivate social contacts. Therefore our idea is that elderly people will probably more and more live in apartment-sharing communities.

- Rationalization in the Health Care

Rationalization in the health care sector is a basic trend in Germany and Europe to lower cost and rise flexibility of services. In future for example, it will certainly be possible that medicines will be sold as Over-The-Counter (OTC) drugs, especially in online shops. These medicines might

be sold with, but also without, a paper-based prescription. We assume that by 2020, more adequate distribution of services among different health care levels will lead to a strong rationalization.

- Shortage of General Practitioners

By 2020, there will be a significant shortage of doctors, particularly general practitioners. Although the need for this occupation group will have strong influences all over Germany, it will be the Eastern part of Germany suffering most from the shortage.

9.2.2.2 Uncertain Drivers

We identified a number of uncertain forces that will have significant influence on our future scenarios.

Those drivers are variable and can influence the future scenario in different ways. However it is difficult to make a clear prediction about their future development.

- Consumption Behavior

According to GfK AG, Germany's largest market research institute, the yearly net income of 30.2 million people of the Generation 50plus is estimated over 643 billion Euros. This amount of money exceeds the yearly net income of people between 30 and 50 years.[337] Will the amount of money of elderly people even increase by 2020 together with their willingness to spend this money? We believe that the consumption behavior is influenced by several factors. Nevertheless, the ability to spend money will be an important driver for our scenarios in the future.

- Social Systems

Will today's public and private health insurance companies pay for new services in future? Will there be founded new established insurance institutions, if the compulsory health insurance fund will not financially support elderly people any more/not to the previous extend? Will the government grant subsidies? At this point we can not predict who will cover the costs for services, but it is a important driver that will influence the design of products in terms of high- or low-cost services.

- Open EU

We are unable to prognosticate the borders of the European Union by 2020. The fast development and joining of member states might lead to unexpected effects on macroeconomic factors. New member states by 2020 might push through their interests and change today's EU-treaties. New laws such as a Europe-wide establishment of minimum wage

will strongly influence the availability of cheap workforce in Germany, especially from countries of Eastern Europe.

- Health Sensibility

Our idea is that the health awareness of people might change in the future. If there is an increasing interest for a special service, we have to be prepared for a huge new market. Therefore, health sensibility remains an important factor for the future development of lifestyle and the health industry.

- Health Data Platform

Health Data Platforms already exist and are used for data exchange. We investigate the organisation of health data platforms in the future. Is it possible that these platforms get connected in order to provide a paperless workflow, or will these health data platforms remain only accessible for single institutions, doctor's practices or health insurance companies? Although there are many possibilities for improvement of organizing health data platforms, we are uncertain about the basic conditions concerning privacy, data security and costs. However, we consider health data platforms to be a less important factor for future services.

- New Enabling Technologies

Although the EU has recently started many research and funding initiatives to improve the life of elderly people in the European Union, the crucial point is the success of developing new technology and the time to bring new technology products to the market, particularly to the ambient assisted living industry. Although it is highly predicted that basic milestones in product development and marketing will be met within the next years due to the ending of many EUwide projects, the consumer behavior of the outcoming products still has to be evaluated. How much do German citizens want to be assisted by intelligent machines like service robots, alarm systems, self-controlled networks of electronic devices or just a fridge that orders automatically new food when getting empty? Today, we can see elderly Japanese in nursing homes playing with robot dogs in order to reduce the social isolation and feeling of loneliness. This is still in contrast to Germany, where technology based on assisted living is alien to society. Although the acceptance of those intelligent devices is mainly depending on cultural background, influences concerning legal framework, security and liability aspects turn technology into a driver that is difficult to predict.

However, "There is no reason for older people in Europe to miss out on the benefits of new technology" says Commissioner Viviane Reding and

points out that by 2020 a quarter of the EU population will be aged over 65. [334] Technology therefore remains an uncertain, but important driver for our investigation.

- Virtual Social Networks

Recent polls of the institute TNS Infratest have shown that 40.3 percent of the German population aged 50 years and older use the internet. For this survey '(N)Onliner Atlas 2008', the institute interviewed 52,000 people and found out that there is an increase of 4.9 percent of the internet user Generation 50plus compared to last year. Although this development might give the impression that elderly people will no longer have problems with using the internet, we are not sure whether social networks like Studivz.net and Facebook will serve as communication tools for elderly people in the future. Nevertheless, we consider social networking as an important driver, particular because of the wide acceptance by young people.

9.3 Scenario Analysis

9.3.1 From Drivers to Scenarios

9.3.1.1 Basic Scenario

Germany 2020. The demographic change caused seniors aged above fifty making up nearly half of the overall population. The Generation 50plus is not the same they used to be. Compared to today their characteristics moved to a more active behavior, technology awareness and a tremendous capital background. Moreover health awareness soars and due to immigration the society gets more and more multicultural.

The combination of the certain drivers' forecast build up our basis fundament for the market for health care and lifestyle in Germany 2020. The forecast for the development of the German population unveils a significant increasing share of people aged above 50. They make up 47% of the whole population (own calculations based on Statistisches Bundesamt [336]). The increasing life expectancy and a corresponding augmented number of elderly that suffer from multimorbidity cause higher demands for nursing, health treatment and consulting. That increased demand for medical services bears a challenge for the health insurance as the number of payers remains constant but the payouts are higher. Moreover, Germany faces a shortage in general practitioners in its rural areas. [348]

The seniors in 2020 tend to follow a more active lifestyle and it is not the real age but the perceived age that matters. With the internet entering many fields of life, also 50-plus aged evolve higher technology awareness. Thanks to

the better education being available after world war two, many of the people entering the 50-plus segment have or had good paid jobs and been able to save money. Moreover they belong to the heir generation who was able to inherit some funds. With the offset of the retirement age from 65 to 67, the legislation countersteers severe problems in the pension system. (own calculations based on Statistisches Bundesamt [336])

Health awareness is continuously rising. Therefore the quality of food and beverages pushes into the spotlight. Forehanded actions to prevent negative outcomes like intentional nutrition and fitness are in fashion. More and more people live in cities and the most common household size for seniors is two. [341] Till 2020 between 1.2 and 2.25 million people will net immigrate to Germany. [336] This will foster a more multicultural and multilingual society.

On the technology side the convergence of such devices as the personal computer, the telephone and television leads the way to omnipresence of the internet. Additionally mobile gadgetry enables rich media communication that is independent from location. Research in micro-electro-mechanical systems (MEMS) produced useful tools to monitor vital parameters especially of elderly. Moreover miniaturization and improvements in energy storage enable very small devices that are able to stand alone for a long period.

9.3.1.2 Key Drivers

In the previous sections the drivers for the service segment have been introduced and ranked based on their expected importance and on the probability of their incidence. In the following sections, the key drivers, which are the drivers of high expected importance and with an uncertain development, will be discussed in order to show their different possible developments. The future scenarios for the year 2020 in particular are based on the key driver analysis.

- Necessary Rationalization within the Health Sector

Rationalization is a comprehensive term which covers several fields important to the service sector. In the Basic Report 'Trends in the Social System', the current situation of the German health insurance system is described and shows the problems caused by the demographic change and the high costs for administration. The future development of the system is of importance for services in health care and lifestyle, because the offer and the premiums of health insurances determine the demand for additional services as well as the ability to pay for them. An overall change of the system in order to face the demographic change in an adequate way is currently discussed by the German government. The decrease of administration costs are in the focus of the "Gesundheitskarte", which tries to make health-related data more available and promotes a simplified communication between doctors, insurances and pharmacies. As the "Gesundheitskarte" is currently already used for test purposes, a

general use of the card seems possible for the year 2020. [338] However, the variety of different stakeholders and interests in this project makes a deployment of the systems difficult. The question is, if there will be reduced administrative costs due to the deployment of technical systems and how integrated these systems will be. The possibilities range from single concepts such as an electronic health record to a totally paperless workflow, which supersedes for example the scanning of hand-written medical reports in insurance companies.[344]

Another way of rationalization can be expected in the field of general practitioners (GP) and pharmaceuticals, as both, a deficit of GPs and a change of the pharmaceutical market due to the emerging online sale, may lead to modified structures. Both, a development towards a scenario, where nurses or other medically trained people act as GPs and pharmacists are able to hand out prescriptions, and a scenario where structures of surgeries are changed and pharmacies become less important compared to pharmaceutical online stores are possible. [333]

- Acceptance of Virtual Social Networks

Social networks describe differentiated sets of stakeholders or groups of stakeholders and the relationships between them. [343] In the Internet, social networking takes place in a virtual way. Platforms such as Facebook, MySpace or Xing offer an infrastructure to manage the networking. The attitude towards virtual social networks within the elderly in the year 2020 is important to the service sector, since a high acceptance would offer new ways of using, presenting or even creating services. On the one hand, the Internet usage of the elderly increases constantly, on the other hand, Web 2.0 plays only a marginal role for them. The high velocity of developments and diffusion of new offers in the Internet could enable a high acceptance of the elderly. However, the amount of older users, who make use of interactive Web 2.0 applications might not be sufficient to speak of a high acceptance within the group of elderly.

- Amount of Unprofessional Care

The main problem of ambulant care services is the large amount of illegal employment. The demand for professional carers decreases, as women from eastern European countries often accomplish a twenty-four-seven care for a much lower price than local professional carers. Regarding the growing number of people in need of care, a decrease of illegal employment, which could be triggered by a decline of the wage differentials within Europe, could lead to a situation where not enough professional carers are available. The reform of the German care insurance aims for making professional care more available and affordable. Depending on the success of the reform, professional care will be more

tailored to suit market needs in 2020 and a lack of carers is anticipated by creating new care models, which amongst other things simplifies the registration of carers with different competencies.[342] With a failure of the reform, more and more people in need of care will either fall back on illegal carers, who might not have the skills of professional carers, but are cheaper or face a lack of available professional help.

- Availability of Health Data

The collecting of health-related data will rise in the future, as new systems and technologies are going to enter the market. We divide these data in three categories: Distributed data which can be accessed via the electronic health card, real-time data which are collected by electronic devices observing for example vital parameters and user-generated data, which are collected and allocated by the user. An important aspect concerning these data is privacy.

The electronic health card will come, as it is a system, which is expected to enable a much better patient care and an extensive rationalization of the health system. From a technical point of view, it is already possible, but legal and organisational issues might delay the adoption of the card. Therefore, the question is, whether in 2020 the card will be used by the majority of the population. If so, the next question is, if it will be a national system or if an integration of different national systems will exist. With the development of communication systems, which can measure vital parameters and transmit the data to a processing unit, new service possibilities arouse. However, the diffusion of these devices and therefore the number of users is not predictable.

The same applies for user generated data. These data might be collected with a cell phone camera or special applications on mobile devices. The number of users will depend on the available services processing these data.

In general, the collection of medical data is most useful, if the data are going to be processed in order to improve the patients situation. Therefore, the accession to the data is an important issue. Possible solutions are user access, access only for the doctors and access also for authorized third parties.

- Intelligence and Usability of Technology

For the year 2020, the progress in technology is considered regarding the intelligence of systems, the usability of technical devices and the trust people have in them.

The development of intelligent systems may be of great interest to service providers, as it might create new service opportunities and reduce

personnel costs. However, what possible services will look like depends on the degree of intelligence widely distributed devices will possess by 2020. The different possibilities are systems, which collect and evaluate data, such as data warehouses. This however would mean, that until 2020 no essential progress will take place. Other possibilities are systems, which possess intelligence concerning a single task, such as refrigerators, which can order missing groceries. The most progressive possibility are systems, which can evaluate a lot of data and make complex decisions without human impact. An example for such an autonomous system is a care robot, which helps seniors with domestic work.

An important point concerning technology is the development of the interface between the human users and the technical devices. The future use of technical devices within the older generation will depend on how easy-to-handle devices are going to be. Therefore, the distribution of mobile devices such as cell phones or measuring devices among older people will depend on the further investment in usability research.

Closely connected to usability is trust. Therefore both a generally trusting and a mistrusting attitude towards technology can prevail within the group of older people in 2020.

- Development of Health Insurance

The future of the German health insurance is not fix, but important for the development of the health care service segment. The scope of benefits determines the latitude for additional offers concerning health services.

The demographic change leads to a situation where more and more people claim benefits from their health insurances, while less people pay in. Depending on rationalization activities and system modifications, the scope of benefits in the year 2020 is unclear. With an indolent development of new administrative and systematic solutions, it could stay the same as today. Facing the increasing demand, it could also be reduced to accomplish primary health care. Another possibility is a development towards a simplified, and purged health system, where the health insurance covers as much as it does today and additionally supports precautionary activities.

Depending on the scope of benefits, the demand for additional providers of health-related services increases or decreases. A health insurance, which covers only primary health service, creates room for additional service providers, who will have to be financed privately by the customers. Contrary to this, a health insurance which covers also precautionary activities, would leave space for additional service providers, who might be paid by the insurance and offer services for a lot of customers.

The existence of a lot of additional offers leads to a complex market, where consultancy is needed. In 2020, both, a situation with a lot of health service providers and a need of additional consultancy, and a situation with less demand for consultancy due to a more powerful health insurance are cogitable.

- Consumption Behavior

As described in the Basic Report 'Market Trends', the spending power of the 'Generation 50plus' is high and will even rise until 2020. However, the spending power is not directly connected to the income, as for example assets are not considered. Possible inflations, a tremendous rise of the oil prices, the development of the insurance systems as well as the pension development can lead to a both higher and lower spending power of the older generation. Therefore, the propensity to consume can be higher or lower by 2020.

9.3.2 Key Scenarios

Through correlations of the key drivers we developed three scenarios for the healthcare and lifestyle market in Germany in 2020. Firstly we distinguish between less and more spending power. Secondly we split the latter between high and low acceptance of virtual social networks in the age group of 50-plus.

9.3.2.1 Scenario 1 - Less Spending Power

Comparatively lower spending power than in the basis year 2008 is a key characteristic of this scenario for 2020. Reasons for this development may be small economic growth, high price increases e.g. caused by high prices for resources and the demographic change. Especially the latter also influence the pension systems as the number of payers remained on a certain level whereas the number of pensioners increases. Moreover, the health insurance suffers from the aging society as older people usually more often have diseases. This lower spending power in combination with an unsure future has a heavily negative influence on the likeliness to spend that money. Therefore, basic services and products are demanded. In addition there is only a small market for prevention.

The statutory health insurance suffers from the increased demand of treatments and the general price increases. Thus they have to cut costs and decrease their scope of service to solely basic services. The cost pressure also matters for the pharmacies which are substituted by large online discounters for medicine that offer both, prescription and over-the-counter drugs. Moreover, there are many specialized insurance offers that try to fill every niche. Besides some treatments and other services being too expensive to maintain for the statutory health insurance, there are customers that want to insure themselves against

these risks. This leads to some interesting niches. Health travels remain a bastion of own initiative and management.

Another effort to counter the need for rationalization is the health data record which is employed nation wide. Due to the mistrust in technology, access is only granted to medical doctors and to everyone for her/his own data. Additionally to the pure health record some upload user-generated content like pictures of moles or lesions to discuss with their doctor in remote. The best answer to the required cost reductions is the virtual social network where patients exchange their knowledge with each other and thus forego some visits of the doctor's. For example through this virtual society people who suffer from the same disease could discuss about proper ways to deal with it. Especially the group of seniors aged above 50 is keen on this service due to their broad knowledge about diseases and their lack of shame to talk about those sensitive topics. Moreover, this virtual social network also allows them to socialize with their peers and stay physically at home.

The mistrust against technology originates from the poor developments achieved in the field. In the design of user-interfaces only little progress has been made thus many elderly have to learn hard how to use modern technology. Furthermore, state of the art technology to process a huge amount of data is online analytical- processing (OLAP), which was already used by companies like Amazon since early 2000s.

9.3.2.2 Scenario 2 - More Spending Power, High Acceptance of Virtual Social Networks

The spending power of senior citizens aged above 50 in 2020 clearly exceed the level of 2008. Driving forces behind this development are a prospering economy in between these two years. Moreover, higher education and consequently better paid jobs contributed to this positive trend. Those elderly who are still working, directly profit from this development, the one's already retired profit from their savings which have been enabled through the good economic development. Furthermore pension payments have grown more than just the adjustments for price increase also caused by the well performance of overall economy. Additionally heritages further improve their financial situation. As the economy is growing and spending power is high they love to spend money. Especially luxury services in lifestyle and healthcare as well as prestigious products are demanded.

On the care taker side there is a lack of nurses caused by a higher demand for home care service on the one hand and an upwards adjustment of labor wages in the European surrounding of Germany.

Technology development made a big step forward thus autonomous systems are available. These self-governed systems enable for a first time a real interaction of humans and intelligent machines. This ability in turn allows

totally new user-interfaces that are more and more similar to interpersonal communication than to human-computer interaction. But this technology is not only a breakthrough in the front-end towards the user but also unveils new capabilities in the back-end for fields like maintenance and development which have become significantly easier and data processing that gets a new dimension with the decision making feasibility. Consequently virtual social networks powered by this technology adds enormous value to users as it acts like a consultant. Thus virtual communities are highly accepted within the elderly. Moreover, the European health data record has developed to a European integrated system with all hospitals, medical doctors, pharmacies and insurances connected. This totally paperless workflow within the health care industry enables cost savings and counters the shortage of nurses. Due to the intuitive user-interfaces people have a deep trust in technology. Thus real-time feeding of data and user-generated content both has a large user base, too. Furthermore, access to the individual health data is granted for everyone that is authorized by the user. Intelligent systems are also employed (as service robots especially in homes of elderly) and directly antagonize the lack of nurses.

Health insurances have saved an enormous amount of money through efficiency gains due to the European health data record system. The providers of health insurance share their benefit with their customers by cutting the fees and offering a wider scope of service. This enlargements concern especially the precaution checkup and consulting as well as the organization and sponsoring of medical travels. Pharmacies, as they have access to the health data network, could look up the individual persons' health history and prescribe many drugs themselves.

9.3.2.3 Scenario 3 - More Spending Power, Low Acceptance of Virtual Social Networks

The spending power of Generation 50plus is at least at the level of 2008 with an upward tendency. This is caused by various factors. Firstly the people in the target group that still work have better paid jobs due to their higher education. Secondly retired people do on average receive less than working people but still the inflation adjusted level of the pensions does not decline. Thirdly moderate inflation rates in the prior years preserves the value of heritages. Besides owing the possibility to spend the money, seniors also enjoy doing it. Some areas where they like most to consume are individual investments as healthcare and lifestyle products and services. Due to their high requirements especially luxury good and services are demanded.

Notwithstanding their higher technological awareness, seniors prefer meeting each other in the real world and reject virtual social networks. Driven by rationalization concerns the 'Gesundheitskarte' has established nation-wide

in Germany. This data storage system enables more efficient exchange of relevant health and billing data for the hospitals, general practitioners and insurances. Access to the stored medical data is granted only to medical doctors and everyone for her/his own data. The health data record adheres the possibility to feed in real-time health data, that is monitored directly at the patient's body by special devices. Moreover, user-generated content like pictures or movies may be uploaded although this, and the real-time data are not widely adopted from our target group. Furthermore, not every communication between medical professionals is integrated in the system of the "Gesundheitskarte". Still there are areas where tangible media are essential like e.g. X-ray radiography. Furthermore, it is usual to buy over-the-counter as well as prescription drugs in online shops like DocMorris. Therefore, health insurances are able to cut back a remarkable amount of costs through more efficient processes in the interaction with hospitals, general practitioners and pharmacies. They used this advantage to reduce their fees and to maintain their high level of scope of service e.g. in the support of precaution checkup and treatment. Additionally, some special insurances offer services responding to the individual needs of e.g. seniors. The high health awareness stimulates health travels, especially for elderly. These are common and are organized from individuals or various service providers. Such offers comprise of targets where climate fits the needs of seniors and health infrastructure is sufficient.

Technology development has made several advancements in the prior years. Thus intelligent systems that could come to their own decision on certain specific topics are broadly diffused in Germany. Elderly enjoy the convenience of an intelligent refrigerator that orders on his own if running empty. Crucial for the wide spread of these technologies have always been their user interfaces which are very easy to handle and user-friendly. They adapt themselves to the needs of the particular user. Thus people do not fear technology but trust it as a valuable contributor to daily life.

9.3.3 Selection of the Most Probable Scenario

We find the latter scenario More Spending Power, Low Acceptance of Virtual Social Networks the most probable. Due to the fact that presently the economy is growing it tends to support the trend towards a higher spending power to be achieved in 2020. This is further fortified by the fact that very high inflation is not eager to occur and the amount of savings thus is save from depreciation. Furthermore, the high individualism and more active lifestyle of the Generation 50plus leads to its low acceptance of virtual social networks. The 50-plusers prefer the real life interaction and exchange with their friends and peers. Seniors enjoy their mobility and prefer meeting at cafes or in parks. Moreover, well known virtual social networks like Facebook still are coined from the youth culture and to messy for easy use by elderly.

9.4 Service Models based on Selected Scenario

9.4.1 Service 1 - iDoc

In times of growing demand of medical consultation due to the aging society and drastic rationalization necessity in the health sector, an online service enabling remote medical consultation and forwarding to medical specialists can make a drastic improvement on the patient's side, on the doctor's side and on the side of insurances. Enabled by the rapid development of telecommunication channels, patients can video call or call the doctors anytime from everywhere. The doctors work in a highly efficient call center and due to the electronic health card, they can fall back on their patients medical history and therefore get to know them immediately. In the call centers, a high number of 'treatments' can be achieved and neither expensive equipment nor medical assistants are needed. Therefore, the costs can be reduced to a much lower level than with today's general practitioners. This disburdens the health insurances and enables them to pay for the online service and keep it free of charge for the patients. The advantages for the patients are obvious: They can talk to a doctor twenty-four-seven, even if they are not mobile or on holiday and they can be sure that the doctor knows about their medical history. Further, they can make use and profit from additional services such as diet and fitness consultancy or counselling on addiction. However, there are also advantages for doctors. Especially young doctors often have extremely long shifts in hospitals. Working in one of the call centers can guarantee them regular working times. All in all, it is a system which shows benefits for all involved parties.

9.4.1.1 Introduction of the Service

In 2004, the German government introduced a fee called 'Praxisgebühr', which has to be paid by every patient every time he visits a doctor's surgery. [349] The aim was to reduce unnecessary doctor visits from patients looking for medical advice. On the one hand, a consultation at a general practitioner is expensive, if it is focused on health-concerned questions which do not require an examination or prescriptions. On the other hand, the attempt to reduce the resultant cost for the health insurances by charging every consultation might have negative effects on the medical prevention. In times of a growing group of older people, who have an increased health awareness, and a shortage of general practitioners, new ways of satisfying the needs for medical consultation and support are needed.

An Efficient Contact Point

The fundament of the service is something like a medical call center. A team of doctors is holding consultations with patients, who contact them via a web interface. Therefore neither rooms for examinations nor special

equipment is needed. Also the number of additional employees such as medical secretaries can be reduced drastically. The goal of this setup is to achieve a high amount of consultations, which can be offered cheaper than in the traditional way. Consultations, which can be accomplished remotely are general medical questions, forwarding to specialists and situations of acute sickness.

The necessary equipment consists of an office, which is the center of the service, workstations with personal computers and accessories needed for carrying out the video chat and information technology infrastructure to host client data and manage the intern network.

In order to make use of the service, clients have to register and create a profile, which grants access to the health data record enables billing, content-management and other administrative tasks. The registration and the use of the service is free of charge for the patient.

Doctors Know Their Patients

With the availability of the patients health records and additional medical data accessible through the electronic health card, doctors can get a quick overview of the particular health histories. This enables a quick immersion into every case and allows for a solid evaluation of the patients situation. The patients data are processed and visualized in a way which supports the doctor and reduces his intellectual effort in summarizing the patients situation.

Meeting the Needs of the People

As showed before, the aging of the society in combination with a growing sensibility for health leads towards an increased demand for medical advice. To seek this advice by going to a doctor's surgery is both expensive and increasingly difficult, as the number of general practitioners declines. The collection of medical information available online is huge, but mostly not tailored to the patients specific needs and the research is time-consuming. By giving the people a possibility to contact doctors in a more efficient and cheaper way, the medical consultation and prevention could be extended and more accessible.

The trend towards individual lifestyles amongst the Generation 50plus will result in the coexistence of people, who are still working, retired, but active people with various interests and rather passive people, including people in need of care. What these people have in common is an increased convenience. An online consultation can be extremely time saving as both the trip to the doctor and back and the time spent in the waiting room are omitted and might even be carried out during work. This might also be extremely interesting to employers, who do not have to do without their workers for half a day. The constant online availability enables people on holidays in case of illness to consult a doctor of their nationality and receive initial help. People, who are less mobile can also profit from such a service, as the troublesome way to the doctors surgery might be saved in some cases.

As it is not assumed that older people, which are the majority of the expected clients are regularly using Internet communities, iDoc does not provide any networking functions. Patients have their profile, but it is only used for administrative purposes. Profiles cannot be linked to other profiles, because we expect especially older people to be purposeful and not interested in sharing intimate medical data online.

The Doctor's Interface

The key features of the doctors interface are the video chat window, on which the doctors see their patients, the visualization of the patients medical history, the listing of available additional data and further administrative functionalities. An exemplary illustration can be seen in figures 4 and 5.

With the authorization of the patient, which might be given through some kind of certification functionality on the patients profile, the doctor can access his health record. The data is visualized in a way, that it gives him an immediate impression of big medical issues such as sicknesses or former operations. Additionally, allergy and immunization information and related data such as radiographs can be retrieved. Appointments with specialists can easily be arranged, prescriptions can be send out electronically and in case the patient keeps a list of drugs he consumes without prescriptions, the doctor can check for unwished or dangerous mutual interferences.

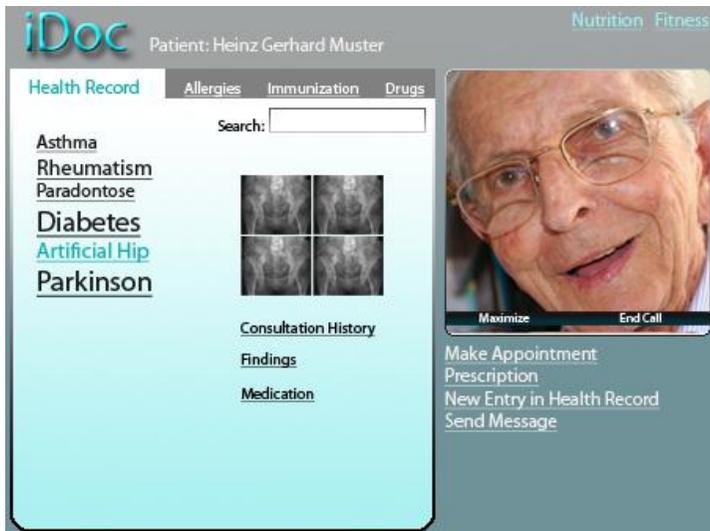


Figure 9.3: The doctor's interface
Source: Own Illustration



Figure 9.4: A doctor working at iDoc
Source: Own Illustration

The Patient's Interface

The key features of the patient's interface are the video chat interface, the possibility to send messages to the service provider, a list where he can insert the drugs he currently consumes and administrative functions. This interface has to be designed in a user-friendly way in order not to alienate people with a less strong technical background knowledge and has to be as easy-to-handle as a phone call. Patients should be able to make use of the service on different platforms. With the convergence of telecommunication and television towards an IP-based system, people shall be able to consult a doctor in front of their television as well as using a web browser running on their personal computer or their mobile device. See figure 6-9 in order to get an idea of what a future consultation can look like.

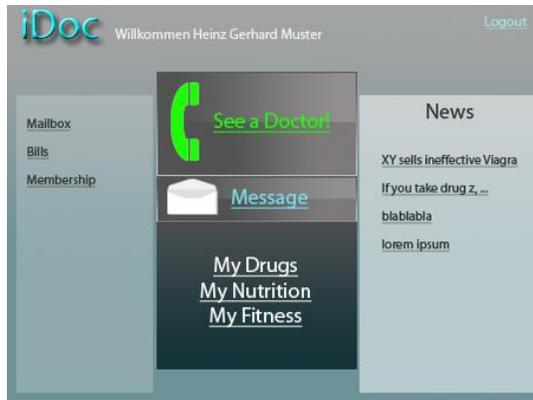


Figure 9.5: An exemplary profile of a patient
Source: Own Illustration



Figure 9.6: Mobile interface
Source: Own Illustration



Figure 9.7: Patient's interface during a consultation
Source: Own Illustration



Figure 9.8: A senior during an iDoc consultation
Source: Own Illustration

Advantages for Insurances

With lowering the barriers for consulting a doctor (instead of rising them with the introduction of the 'Praxisgebühr'), important indications of sicknesses might be recognized earlier and prevent a long, complicated and expensive

course of disease. In general, the service is intended to amplify appropriate medical prevention in order to reduce costs, which result from neglected prevention. Due to the reduced costs of the service compared to a traditional general practitioner, also the forwarding to specialists can be carried out more efficiently.

Thoughts about the Workforce

A question, which should be asked concerning this service is, whether the workforce has to consist of doctors or if it implies a new sort of profession, for example a medical consultant, who does not have to go through a six-year long university program. Apart from that, working in such a medical consultancy center might be an attractive alternative for young university graduates, since their job prospects in hospitals augur long and exhausting shifts and strict hierarchies. The high amount of contacts can lead to a steep learning curve in evaluating illness situations.

Related Work

In Switzerland, where the lack of general practitioners has emerged early and is of greater evidence than in Germany, the company Medgate offers a service called 'Doc around the clock'. [330] Clients of Medgate are looking for general medical advice or are in acute situations of illness. Contrary to the above introduced service, Megate cannot resort to general health-related data, but works with an additional group of medical specialists.

Another approach is pursued by the company Myca. [331] They also try to establish a web-based online consultation service, but furthermore, they are maintaining offices as well to give the patients the full choice of how to contact a doctor. Their consultation is also based on an online health-record, which is created and maintained by Myca.

9.4.1.2 Market and Players

iDoc aims to be the first contact point for the patient that has a medical concern. Thus we compete in the market of general practitioners that usually take this task. Following the structure of the market and main players are analysed.

Main Competitors

General practitioners are the main competitors as we take over their task to be the first point of contact for the patient. Especially in urban areas where the competition between general practitioners are high and the journeys are rather short. Mostly general practitioners are self-employed and operate their practice on their own. Therefore the market consists mainly upon many very small firms. On the one hand doctors have a great influence on the government and the health insurances through their unions and the high importance of their service. On the other hand a shortage of general practitioners shows effects

foremost in the eastern part of Germany and in rural regions. Moreover, the health insurances showed several times that they have the closer relationship to the government and implemented some rules in favor for them also against the doctors' unions.

Suppliers

As found out Germany in 2020 lacks general practitioners. This shortens the supply of the most important resource for iDoc as the medical doctors are finally the executors of the service. Taking a closer look there are still many students graduating in human medicine each year. Usually after graduation many work as assistant doctors in hospitals. These jobs are notorious for their extraordinary long shifts. Thus iDoc offers these assistant doctors a regular worktime and a high learning curve by dealing with very many patients. For the more senior jobs iDoc's strategy is to employ experienced medical doctors that prefer being employed in a company but on the other hand avoid the hospital's shifts.

Furthermore iDoc purchases its information technology infrastructure from outside suppliers. Therefore the special software has to be developed and supported. As there are many companies on the market developing easy and userfriendly user-interfaces and even more that are qualified to develop the system this is not a bottleneck. Additionally also the hardware suppliers more and more concentrate on intuitive usability of their devices. iDoc uses standard hardware that is widely spread like webcams, personal computers, set-top-boxes and television that are connected to the internet. Moreover, the system is not limited to certain devices or special companies therefore bargaining power of the IT suppliers is rather low.

Customers

iDoc has two main customer group the clients like health insurance companies that mostly pay for the service and the consumers who benefit from the service provisioned. Health insurance companies have significant bargaining power as their attitude towards the iDoc service is crucial for the payment for the service. If the insurers decide not to cover the costs of this telemedical service iDoc probably will not achieve many consumers that then would have to pay. Therefore the business model of iDoc aims to convince the health insurance companies as iDoc offers huge saving potential due to more efficient allocation of resources. Thus insurance firms may benefit from lower costs per patient that uses the iDoc service. If health insurances are motivated to save their spending they may push their customers with incentives to use iDoc. Consequently, consumers that seek for medical advice and use our service man not only benefit from the convenience of medical service from where ever you are but also could gain monetary profits through incentives from their health insurances. iDoc offers a basic service in health advice therefore there is a constant demand stimulated by the increased health awareness.

Substitutes

If virtual social network become more widely used and patients don't mind the lack of professional training of their conversation partner they could substitute some of iDoc's services. Also hospitals could enter this segment as they are experienced in professional health treatment and know how to structure processes to efficient offer services. Another possible substitutes are intelligent computer systems that could match the ailment of the patient to a database of illnesses and decide which is the most likely. Last but not least the general practitioners could organize themselves and build up group practices and professionalize and rationalize their service.

New Entrants

As iDocs business model is based on efficiency gains economies of scale and scope are important to be exploited. Therefore there are high entry barriers to reach the critical mass to be able to offer the service at the same quality and this low price. Moreover, a significant amount has to be spend for marketing the service and building up a brand credibility. Operating companies of private hospitals could try also to enter this market through a fast follower strategy.

Government

The government's duty is to secure an adequate supply of medical care in high quality and to every citizen where ever she or he lives. Due to the fact that Germany faces a shortage in general practitioners higher efficiency is necessary to maintain the high level of supply. Therefore iDoc is a problem solver for the government. On the other side the administration not only aims long term goals but also has to consider the next election. Thus protest by medical doctors and their unions could bias the government's opinion although rational it is wrong.

9.4.1.3 Value Added Services

The core business of the service is an efficient medical consultation of patients. Next to the actual talk to the doctors, other additional functionalities and offers can improve the patients' health management.

Knowledge Management

Based on the high expected amount of consultations, the service can offer a valuable knowledge management. Frequently asked questions and suitable answers can be published on the website with a low latency and prevent a lot of redundant consultations. Due to the expected breakthrough of a broad Internet-based trade of pharmaceuticals, these questions can concern for example trustworthy sellers or doubtful generic pharmaceuticals.

Nutritional Advice and Fitness Advice

Part of the health management and also growing in demand are healthy nutrition and physical fitness. Therefore, it seems useful to integrate adequate advice. For an extra charge, the clients of the service will have the possibility to report their nutritional habits and get personalized feedback. The real advantage can be seen in the chance to adapt the nutritional advice to the health situation. As multiple aspects are involved in individual nutritional issues, the integration of medical information (Which pharmaceuticals are consumed at the moment?) and physical status information is a valuable service, which is complex to achieve when different institutions are involved (general practitioner/diet consultant/fitness club).

Fitness feedback can give clients valuable information about their physical status. It also profits from the above mentioned integration as unwished interdependencies between training, nutrition and medication can be considered easily.

As in this scenario a high amount of user generated data from older people is not expected. That means, that there will not be a majority of older people who possesses devices, which deliver vital parameters to service providers in real-time and the generation of data such as pictures of meals will not take place on a constantly high level. Therefore, these additional functionalities have to be carried out based on the web platform of the service. For clients of the additional services, this can for example be an interface to upload data or fill in and submit prefab forms concerning diet or vital parameters.

Premium Services

Thinkable are also premium services, which are connected to additional fees. For example, patients could pay extra money in order to be connected to a doctor of their wish.

9.4.1.4 Business Model

iDoc's critical success factor is its efficient structure that enables significant cost savings. Thus economies of scale and scope reduce the overhead of traditional general practitioners. Moreover, iDoc limits its business to the core competency of offering a very efficient first point of medical advice.

Business Model of Traditional General Practitioners

Traditionally general practitioners are self-employed. In many cases only one doctor works in a practice. Therefore, all the costs for the practice's accommodation, medical and administration equipment as well as medical assistants account. Thus, on the earnings a general practitioner (GP) gets per patient, she/he not only has to pay the employees but also finance this significant overhead in order to achieve make profit. In Germany most citizens are member of either the statutory or private health insurance. These insurances usually

pay treatments and consulting visitings at the GP's. The health insurances in turn earn their money through a fee that is based on the patients income. Many health insurances force their customers at any discomfort to first go the general practitioner and consecutively be referred to a specialist. Moreover, GPs offer a wide scope of medical consulting, check-ups and treatments.

Business Model of iDoc

iDoc aims to reduce costs in the first contact point of the patient with health professionals. It wants to enhance this process for all stakeholders. iDoc operates a call center where medical doctors communicate with the patients via video and voice calls. A computer scheduling forwards patients automatically to the next free consultant. iDoc checks the health status of their patient and if necessary refers her/him to a specialist. As there are many health professionals sharing one office the accommodation costs per person are much lower. Moreover, the office does not have direct customer contact and thus could be located in cheaper suburbs. Furthermore, due to the high number of patients, forecasts about the timing of demand get more precise and allow together with the efficient scheduling computer to distribute the patients to reach a constant high level of workload. This in turn reduces unused time and thus increase efficiency. iDoc operates various offices around Germany to staff its service. The internet technology allows that the customer does not notice this regional spread but receives iDoc as an intuitive system where the customer only have to request to call a doctor and then do not recognise if their communication partner sits e.g. in Munich or Dresden.

The value chain of iDoc starts with the purchase of the soft- and hardware to build up their system. As iDoc's core competence is offering efficient medical service the information technology is outsourced to specialized companies. Thus iDoc always benefits through their outsourcing partner always from new research and development. Together with iDoc's strategic IT department the initial software development and hardware architecture was made. Maintenance and enhancements are mainly performed by the outside contractors.

To enable iDoc not online the doctor's office has to be equipped with communication technology but also the customers should in the best case own video communication devices. iDoc's software is distributed free of charge to our customers, as we profit from a wide spread of accessibility to iDoc and costs of diffusion are marginal. Moreover, iDoc resells a small range of basic devices that enables its service such as set-top-boxes and web cams.

Moreover, for iDoc the supporting activity human resource management is a crucial factor as the service is only scaleable with new employees. To advice patients on health issues each person on the phone has to be a medical professional. If all call center employees have to be medical doctors or advanced medical assistants depends on the jurisdiction.

As the cost structure of iDoc's operations is completely different to usual general practitioners it could also charge less to the health insurance companies.

In turn the insurers are incentivized to push their customers to use iDoc and will motivate them to do this e.g. through special telemedical tariffs which employ lower fees. Therefore everyone in the value chain gets a benefit. If iDoc saves e.g. 50% of the costs and bills its service 40% cheaper than GPs to the health insurance this in turn could offer their telemedical tariff at 30% off. In every step the stakeholders are at least 10% better off.

9.4.2 Service 2 - Health Care Vacation

75 percent of the German population is annually going on holiday. Significantly less people are doing health examinations. On the first view, these two matters do not have anything in common, but both should be roughly done the same number of times. So why should one not combine both of them at the same time? Relaxing and recovering during holiday while checking your constitution, fitness and physical health by an examination? With our new service, we offer you the unique chance to step into a world of higher health consciousness. Our brandnew service is called “Health Care Vacation” and combines your ordinary vacation trip with a preventive medical checkup by a doctor with German academic background. You can easily save time and money by booking one of our compact offerings. Due to many economic advantages in our host countries, services are available at a lot cheaper price, but same quality as in Germany. Join our “Health Care Vacation” with one of our individual package deals that are carefully prepared for several different types of people. Our service fits to people of every age, never mind whether you belong to a high-risk group e.g. smokers, addicted, or highly stressed type of person, health-conscious people e.g. you regularly work out and eat healthy foods or you are just the average person that only wants to check your health status. Our special service is not standardized, but we offer an individual examination that gives every person additional and useful advices for a healthy lifestyle in future. Optionally, we offer support in individual nutrition plans. With taking part in one of our offered “Health Care Vacation” packages, people should be prepared to enjoy a unique service that keeps one in healthy shape. Concerning the financial aspect of our service, our customers and health insurance companies are the financing source for loans, treatment expenses and costs of maintenance

9.4.2.1 Service and Opportunities

Description of the Service

Health Care Vacation is a service whose parts already exist in Germany by now. People can go on vacation anywhere, at anytime and with pretty much any fancy supporting program one can think of. It is also possible to get all kinds of medical treatment and health checkups in multiple well known clinics all over Germany. What our service covers is the combination of those two

services, tourism and health care, and hence providing special value added to the customer. See figure 9.9 for an exemplary poster.

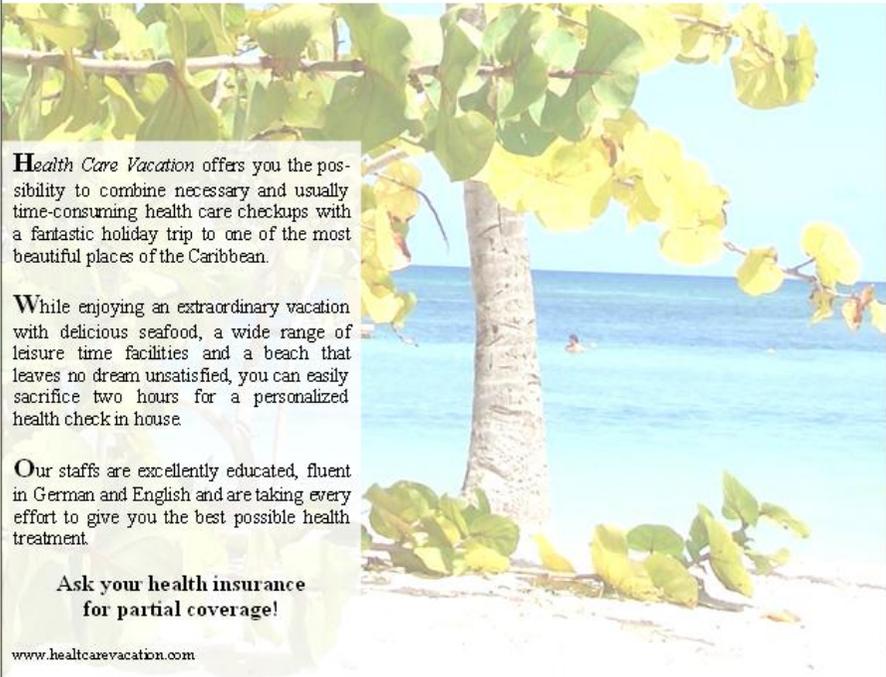
A well known German private clinic (a popular German name will be needed in order to have the good image) opens up a 'hotel' in a tourist area like Hawaii, the Bermudas, Mallorca or the like. The selected location has to be independent from weather cycles because compared to other normal hotels our staff will be employed and hence paid all year long. As a consequence a high capacity utilization 12 month a year has to be assured.

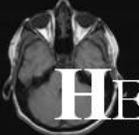
The 'hotel' is pretty much designed like a normal one with just one major difference. It has an integrated health care ward equipped with everything that is needed to ensure high quality medical checkups. The customer who books the vacation can choose between a set of different checkup packages or reassemble his own personal package by choosing several examinations by himself (like allergy tests, skin checks etc.).

Predefined packages will be for example a basic check (covering examinations like basic laboratory checks, ECG, pulmonary function as well as a ultrasonic testing of the abdominal viscus), an overall health check (audiometry, visual test, ECG and stress ECG, big laboratory checks, sonography, testing of the lung function checking etc.), a fitness check (special focus on checks that are important to ensure health while doing sports), a special vascular check, gynecological check, smoker check, diabetes check etc. As there are also people in the Generation 50plus that still participate in the working population an additional manager check will be offered. This covers CT of the coronary vessel, MRI of the brain and extensive laboratory checking. Further packages can be designed in order to offer the customer a big variety that he can choose from.

Our service is not a pure trip to the inner health status but should be more or less perceived as a 'normal' vacation. What makes our 'hotel' more valuable compared to the millions of all-inclusive- and wellness hotels, is the perfect infrastructure for those health checks and the possibility to get them done in a non-frightening environment in an efficient and little time consuming way.

The doctors (2-3) have to be German specialists for the major medical fields (internal medicine, cardiology, radiology). However it is the goal to keep the staffing on the high level extremely low. There should only be a small number of doctors present because the main examinations will be done by local nurses. It is out of question that these nurses have to be fluent in German and be educated in common German health treatment. The reason for not employing German staff (except the doctors) is the costs. Local labor is much cheaper but not less capable of providing high quality service.





HEALTH CARE VACATION

Health Care Vacation offers you the possibility to combine necessary and usually time-consuming health care checkups with a fantastic holiday trip to one of the most beautiful places of the Caribbean.

While enjoying an extraordinary vacation with delicious seafood, a wide range of leisure time facilities and a beach that leaves no dream unsatisfied, you can easily sacrifice two hours for a personalized health check in house.

Our staffs are excellently educated, fluent in German and English and are taking every effort to give you the best possible health treatment.

Ask your health insurance for partial coverage!

www.healthcarevacation.com

 BASIC CHECKUP	 SPORT CHECKUP	 SMOKER CHECKUP
PRICE \$ 400	PRICE \$ 150	PRICE \$ 400
DURATION 2 hours	DURATION 1.5 hours	DURATION 2 hours
SERVICES ECG Laboratory Visual Testing Audiometry Sonography	SERVICES ECG Laboratory Lung Function Heart Checks Sonography	SERVICES ECG Laboratory Lung Function CT

Figure 9.9: Exemplary poster for the service
Source: Own Illustration

Motivation for the Service

In 2020 there won't be enough money to pay for all the social benefits and health treatment will be limited. The government and also the private insurance companies will constantly have to look for possibilities for reducing costs. It is proven to be less expensive to pay for certain health checkups compared to paying the health treatment for a sick person. Therefore, insurance companies already partly bear the expenses for such health care services. In the scenario we have chosen in 2020 the support German citizens will receive from the insurance companies will look like today or will be a bit better. We hence expect the additional (more than a 'normal' vacation) amount of money that customers of our service will have to pay, be partially paid by the insurance companies. With the overall costs of such checkups abroad being less than what clinics in Germany ask for it is also in the interest of the insurance companies if the insured decides to book a health care vacation instead of turning to a doctor at home.

But our service is not only of value for the insurance companies. It is especially the 'patient' him or herself who will profit most from the service. In the selected scenario we assume that in 2020 the Generation 50plus will be extremely health sensible and in addition to that will be willing to spend a decent amount of its income for health care related services. Health checkups as a consequence are, and will especially be even more in 2020, popular. It is in everybody's own hands to take care of his or her health. However, standard checkups are rather expensive and extremely time consuming. In most cases visits in at least 3 different clinics or hospitals have to be scheduled. Having in mind that it will mainly be the people at the age of 50 to 70 we will address with our service, it is important to notice that the main part of those customers will still be participating in the working life (retirement age will be 67). This means these people don't have time to lose by sitting in waiting rooms and traveling from one doctor to another. At the moment the 'patient' will have to take an entire day off in order to make such a health checkup.

Our service steps in here. The customer is already on vacation and has more time for the entire procedure. Having implemented a well structured organization there will also be no delay by switching from one doctor to another. Everything is under one roof and the stress caused by all of these examinations is reduced tremendously.

9.4.2.2 Market and Players

Health Tourism

According to a McKinsey study [346], health tourism will become more and more important in the future. It already takes place and is mainly focusing on eastern European countries like Poland. It is esthetic surgery and dental treatment that are the economic motor in this field. With the EU getting

bigger and more standardized (especially concerning legal affairs) those health trips within the European countries are further developing. It is however important to mention that health tourism for German 'patients' is so far focusing on the European union. Security-, legal- and quality issues still stop the Germans from health trips in non European countries. When it comes to operations people still hesitate going abroad because of a lag of information about the quality service. This is less severe when talking about wellness trips. There is no real potential danger arising from those health trips as there are no invasive surgeries involved. Hence German tourists are much more willing to consider even non European countries for that kind of vacation.

Health Checkups in Germany

Unfortunately the Germans are not persistent enough when it comes to health care. They do not do health checkups on a regularly basis. For example it is only 48% of the women and 16% of the men making use of cancer early diagnosis examinations. The reason therefore in most cases is the ignorance of what is being paid for by the insurance company and what not. As a consequence, with the beginning of 2008, the German government has enacted a new regularization which should motivate patients to make use of health care checkups to a higher extend. Many early diagnosis examinations are paid for by the insurance companies (laboratory checks, skin cancer screening, x-ray of the breast every other year, dental examination two times a year and health check every other year). [345] However it is not up to the 'patient' anymore whether or not he or she wants to do those examinations. Some of these checkups are even obligatory. If not done the insurance company is allowed to reduce benefits.

Thanks to this development in the health prevention sector many German health institutions like medical practices or hospitals offer those checkups. However in most of the cases the patient does not get all services under one roof but has to consult several different institutions instead. As this service becoming more and more attractive there are clinics specializing on health checks and further improvements may be expected. Nevertheless services here in Germany will always be more expensive than abroad.

Direct Competitors

Our service is the combination of two different services that already exist on the market. However there is no service like ours on the market so far. As mentioned in the previous sections health care institutions do exist in Germany and so do health/wellness trips. But we are not aware of any existing 'hotel' similar to the one we are planning. Health Care Vacations is going to fill a niche in of the Health Care sector.

Nevertheless there is a high risk that our service model will be copied in the future. We even expect this to happen. The market is extremely promising and we are convinced that there will be a high demand for the service we

described. The tourism as well as the medical industry will certainly jump on the bandwagon as well. Therefore it will be important to be on the market fast, with extremely high quality and with a USP that saves us for immediate imitation. The latter is planned to get by developing a strong cooperation with the insurance companies.

9.4.2.3 Value Added Service

Our service provides a variety of value-added services to enhance its competitiveness in the healthcare market. First, we offer our service at a location that is usually known as a place for holiday. No tourist would ever expect to receive first class health examination next to his hotel. This unique and close location to the tourist's accommodations increases the value for our service. Local doctors who offer a service that is similar to our business idea might live in a larger distance to the customer. Next, the assistant medical director of our health center has a German academic and medical background. We will start our service mainly for German patients with focus on elderly people. Especially elderly people do not have the knowledge of foreign languages and will therefore prefer a treatment environment with their native language. Therefore, we expect that our costumers prefer German-speaking employees for treatment. While medical secretary will include local labor with less knowledge of the German language, it is our great advantage to provide a doctor with German origin. Not only the knowledge of the German language might be an important advantage, furthermore, the doctor will be hired from one of the Germany's top medical schools with a lot experience who is eager to work in a foreign country. With this high reputation of a German medicine school, the doctor can take advantage of his high level of performance. As a result, German costumer will have a higher confidence in the examination quality than by going to a local doctor's practice without knowing his medical background. Although we do not expect that our medical employees will need medical advices from further German medical experts and doctors, we provide a state-of-the-art communication platform to German hospitals in order to make sure that examinations will be accomplished with high quality. However, we will carefully select general practitioners that we will not be dependent on further advices from doctors in Germany. We will integrate nutrition experts in our new service in order that costumers are able to get an evaluation of their daily lifestyle in order to improve it concerning health measures. For example, people will receive a plan for a balanced diet if necessary and get health advice for their daily meals. Although our main goal is to check the costumer's health, we also want to offer this optional information for our customers in order to guarantee a sustainable well-being. Our service shall also encourage people to plan and act with foresighted measures.

In summary, we strongly belief that these advantages will let our service

successfully enter the market of healthcare.

9.4.2.4 Business Model

Our service Health Care Vacation is mainly financed by our customers. Travel agencies and health insurance companies will do advertising locally, but also sell our service and make the contact to the customers. Although medical checkups might give the wrong impression of high arising expenses, we expect that the amount of money for a treatment will not exceed one third of the original travel cost. Therefore, we believe that there will not be any difficulties with financing the Health Care Vacation for most people. Furthermore, many preventive medical checkups are mandatory in Germany. As a result, most people will not care about the examination location. As checkups will be even less expensive in foreign countries than in Germany because of cheaper labors, we think that most people will highly appreciate it, if they can combine their holiday with a less expensive, but obligatory examination. In addition, a lot of treatments will already get paid by public and private health insurance companies and are therefore important sources of financing for our business plan.

Customers will have the chance to choose between different checkup packages that focus on different groups of customers and therefore offer different services. The price for a package is fixed, however, packages are available in different price categories. We consider packages as an advantage in terms of easy logistic and fast organization for our service. In addition, we think that customers highly appreciate complete packages instead of booking single treatments. Often customers are not in the know of what types of treatments are important and necessary for them, therefore packages will let them feel of receiving a full body checkup. We will create an attractive package with focus on three core groups: smoker, fitness and basic. All packages are designed that health insurance companies will full or partly pay for treatment in order to sell the product as cheap as possible to our customers. The package idea should be similar to treatment packages for cancer patients for example like here in Germany, that provide full support for people by private or public health insurance companies most times. Under these circumstances, we try to enter the market and become a Unique Selling Proposition status as soon as possible. We know that we will have to compete with companies that offer similar services, however, our strong intention and strategy is to at least stand any competition and to earn and properly position our brand in the market. Nevertheless, we believe that the market situation seems to show a perfect competition in the future, therefore we are optimistic that expanding companies will not squeeze us out of the market once we will start our service.

Depending on the market situation for real estate, we aim to build up a new hotel with state-of-the-art technology. If there will be a financial advantage in

property-leasing we might consider this opportunity, too, and will furnish the hotel with medical equipment.

Customers and insurance companies will be the financial source for paying the costs of medical employees (doctors, nutritionist, medical secretary), running costs for the hotel including medical equipment, and further service costs.

9.5 Conclusion

Germany's population gets older. Changing conceptions of being old, an increasing health awareness and the mere size of the so-called generation 50plus challenge the social systems, which have to deal with an increasing burden concerning pensions and health expenses, the economy, which faces a new and still unexplored market and the society, which has to rethink their own constitution. These challenges also hold chances for new service models.

Services addressing German seniors in 2020 will depend on the rationalization in the health sector, their acceptance of virtual social networks as well as on the development of the social systems. The convenience of the Generation 50plus as well as their variety of individual lifestyles suggest a range of unsatisfied needs. Depending on the further development of the health and pension 40 system, the attitude towards new technologies, further developments in the care system and other factors, different scenarios for the year 2020 are thinkable. This report tried to analyze possible developments concerning the service sector focused on the generation 50plus and introduces two exemplary services, which are embedded in one of the designed scenarios: iDoc, which enables online consultations and contributes to the need of rationalization in the health sector and Health Care Vacation, which offers a combination of vacation and medical routine checkups.

First, we had to focus on several main drivers which will most likely influence our future scenarios. We divided these into certain drivers which we think will influence the service sector in a predictable way and uncertain drivers, which are important for the further development of the service sector, but hold different development potentials. Based on these drivers, we identified the key drivers and designed different scenarios.

We think that the increasing importance of health - both the demand for medical care and healthy nutrition and fitness will rise - combined with the resulting need of rationalization of the social systems and the emerging shortage of general practitioners will make services such as iDoc necessary.

Due to the convenience and the financial potential of the Generation 50plus, luxury services which simplify necessary procedures such as medical prevention could become interesting for a bigger group of senior customers. Therefore we designed the service Health Care Vacation which aims at a combination of vacation and routine medical checkups.

References

- [330] Medgate, 2008. URL <http://www.medgate.ch>. Accessed on 03.07.2008.
- [331] Myca, 2008. URL <http://www.myca.com>. Accessed on 03.07.2008.
- [332] H. Avenarius, M. Baethge, H. Döbert, H.-W. Hetmeier, E. Klieme, G. Meister-Scheufelen, T. Rauschenbach, and A. Wolter. Bildung in Deutschland. Ein indikatorengestützter Bericht mit einer Analyse zu Bildung und Migration, 2006. URL <http://www.bildungsbericht.de/daten/gesamtbericht.pdf>. Accessed on 03.07.2008.
- [333] Begam. Hausärztemangel, June 2007. URL <http://www.begam.ch/Unterwebseite/Hausaerztemangel.htm>. Accessed on 03.07.2008.
- [334] A. Charlesworth. EU to fund technology for the elderly, 2008. URL <http://www.vnunet.com/vnunet/news/2219905/ec-fund-technology-elderly>. Accessed on 03.07.2008.
- [335] Deutsches Institut für Altersvorsorge. Reiche 40er, 2005. URL <http://www.dia-vorsorge.de/downloads/df020321.pdf>. Accessed on 03.07.2008.
- [336] M. Eisenmenger, O. Pötzsch, and B. Sommer. *Bevölkerung Deutschlands bis 2050, 11. koordinierte Bevölkerungsvorausberechnung*. Statistisches Bundesamt, 2006.
- [337] Federal Ministry of Education and Research. Market Potential. URL <http://www.aal-deutschland.de/marktpotenziale>. Accessed on 03.07.2008.
- [338] Federal Ministry of Health. Die Gesundheitskarte, July 2008. URL <http://www.die-gesundheitskarte.de>. Accessed on 03.07.2008.
- [339] Federal Statistical Office. Recent trends in female employment examined. URL <http://www.eurofound.europa.eu/eiro/2003/08/feature/DE0308105F.htm>. Accessed on 03.07.2008.
- [340] Federal Statistical Office. Im jahr 2050 doppelt so viele 60-jährige wie neugeborene, 11 2006. URL http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Presse/pm/2006/11/PD06__464__12421,templateId=renderPrint.psml. Accessed on 03.07.2008.
- [341] Federal Statistical Office. Entwicklung der Privathaushalte bis 2025, Ergebnisse der Haushaltsvorausberechnung 2007, 2007.
- [342] fuer-eineinander e.V. Reform der Pflegeversicherung tritt zum 1.7.08 in Kraft, May 2008. URL <http://www.openpr.de/news/212536/Reform-der-Pflegeversicherung-tritt-zum-1-7-08-in-Kraft.html>. Accessed on 03.07.2008.

- [343] S. Haas, T. Trump, M. Gerhards, and K. Klingler. Web 2.0: Nutzung und Nutzertypen. Eine Analyse auf der Basis quantitativer und qualitativer Untersuchungen. *Media Perspektiven*, 37:215–222, 2007.
- [344] H. Krcmar. Informationssysteme im Gesundheitswesen - Herausforderungen des demographischen Wandels. Presentation within Basic Report Class at CDTM in summer term 2008, 2008.
- [345] A. Kruse, C. Ding-Greiner, and P. Mader. Gesund altern, 2007. URL <http://www.erfahrung-ist-zukunft.de/Webs/EiZ/Content/DE/Artikel/Materialien/Anlagen/20071018-gesund-altern-bmg-pdf,property=publicationFile.pdf>. Accessed on 03.07.2008.
- [346] McKinsey & Company. Deutschland 2020. Zukunftsperspektiven für die deutsche Wirtschaft , 2008. URL http://www.mckinsey.de/downloads/profil/initiativen/d2020/D2020_Exec_Summary.pdf. Accessed on 03.07.2008.
- [347] Rationalisierungs- und Innovationszentrum der Deutschen Wirtschaft e.V. Wachstumsmotor Dienstleistung. URL http://www.rkw.de/99_UeberRKW/Magazin/RKW-Magazin_0307/Mag307_Titel/. Accessed on 03.07.2008.
- [348] Welt Online. Ärztemangel -Deutschland droht ein Mediziner-Notstand, 2007. URL http://www.welt.de/politik/article1248623/Deutschland_droht_ein_Mediziner-Notstand.html. Accessed on 03.07.2008.
- [349] ZMOnline. Weniger Andrang im Wartezimmer, January 2006. URL http://www.zm-online.de/m5a.htm?/zm/2_06/pages2/aktthem.htm. Accessed on 03.07.2008.

10

Chapter 10

M.I.A. - Living in a Thinking and Assisting Environment in 2020

Denniz Dönmez, Eva Reinstadler, Anja Staudt, Thilo Weghorn

Health care will be shifted from hospital and nursing homes to people's home in 2020. Therefore people's homes will be important in terms of medical treatment, monitoring and caring. This development of intelligent home systems will be driven by three dimensions - technological, social, and economic. Parts of the drivers are interrelated. The drivers vary in their extent of influence, thus some of them are common for all scenarios. Further there are key drivers, which provide the basis for building an optimistic, a conservative and a more realistic scenario of the future. A detailed description and visualization of the intelligent home is based on this realistic scenario, given more information about services in general and especially for elderly people. The focus of the system lies on the central unit, which represents the main interaction tool in form of the personal assistant M.I.A. (My Intelligent Assistant).

The iHome market is characterized by few big players, niche-providers and a strong position of customers. To meet the customer's individual needs, providers will form strategic networks.

10.1 Introduction

Health care is coming home again could be the slogan for the German health care system in 2020. Therefore houses will play an important part for medical treatment, monitoring and caring.

Over 2000 years ago, the famous roman writer and architect, Marcus Vitruvius Pollio or Vitruvius (born c. 80–70 BC, died after c. 15 BC) wrote in his famous book: *De Architecture* about the three principles for houses. These are: *Firmitas*, *Utilitas*, *Venustas*. *Firmitas* - buildings have to be strong, durable and sturdy, *Utilitas* - they should accommodate human needs and *Venustas* - like Venus, they should be beautiful.

These three qualities of houses can still be applied today. Continuing his idea regarding health care in the future though, *Sensitas* should be added. *Sensitas* - building should be wise and intelligent. Houses should be smart enough to do the right thing on behalf of their residents.

Elderly people nowadays have to leave their homes to live in nursing homes where they can be fully cared for. Others have even to go to hospitals for special treatments. This could all change with future intelligent homes.

This paper is analyzing important drivers with which scenarios of the future will be developed. At first common drivers and correlations will be explained. Through combining different outcomes of the drivers, three future scenarios were built and will be presented in the following chapter. Based on a key scenario, a product called the iHome together with its features and business aspects will be introduced in the last chapter.

10.2 Driver Analysis

In order to analyze future trends a particular set of assumptions about the future is needed. Every development is driven by several changes or forces. These drivers exist as long as the system is not perceived as being perfect. They even can consist of several levels. For the development of intelligent home systems there are mainly three dimensions, which are the technological, the social, and the economic impact. Each of these dimensions contains a few drivers that are more or less certain and more or less important. In the following section the key drivers for the development of an intelligent home shall be examined, followed by a section to analyze the correlation between them. Finally out of the main drivers the fundament for several scenarios is built.

10.2.1 Technological Impact

In 2020, technological devices will play a major part of intelligent living. They make the big difference to the current living standard by informing and

supporting the people at home and at daily life tasks. In the following, drivers like technology performance, prices, intelligence and communication including their importance and certainty shall be presented.

10.2.1.1 Advance of Performance

Moore's Law says that the number of transistors on a chip will double every two years. In the past 40 years this has led to increase in power output and technological progress. This observation in the field of semiconductors had a big impact on the technology performance in general, especially on the processing power (q.v. figure 1: Moore's Law and the Processing Power). For instance if one compares a computer of today with computers of a few years ago, the current products are of much higher performance because of technical progress and innovation.

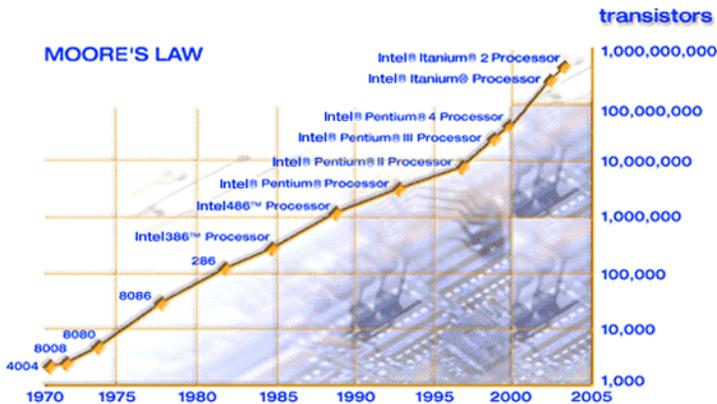


Figure 10.1: Moore's Law and the Processing Power
Source: Intel [365]

Devices and the technology improved a lot in the past decade in terms of speed [363], usability and functionality. The power of technical products rose while at the same time the size became smaller or stayed the same. Thus these devices can be versatility integrated in daily life, make it easier and give people more mobility. An example for a new technology which fits very well into homes especially for elderly people in 2020 are hand-waving computer interfaces replacing touch screens. [362] Ant this evolution still has not ceased; investments in research and development (R&D) constantly foster innovativeness. This not only brings new products onto the market but also leads to decreasing prices. It is certain that such developments are making our devices increasingly powerful and let Moore's Law continue to hold. Performance is very likely to continue improving on a moderate level but there

are uncertainties concerning revolutionary innovations within timeframe of the upcoming twelve years. Still, the performance and functionality of devices for intelligent living e.g. monitoring is highly important and a prerequisite for a technical equipped and functioning intelligent home. [365]

10.2.1.2 Integration of Artificial Intelligence

In the last half of the 20th century the technological trend of artificial intelligence (AI) arose. The vision of machines with human intelligence seemed to become reachable - motivated by the high performance, the world-wide dissemination of micro-processors and the emergence of complex problem solving computer programs. AI is divided into strong and weak intelligence. Strong intelligence describes the creative, philosophical way of human thinking to solve problems by own thoughts and new ideas. Weak intelligence describes the way of mathematics and informatics without self-made solution, but by adopting preprogrammed patterns. Today's main focus and advance in the AI sector is in the development of the weak intelligence.

In the last years robots like vacuum cleaners which find the way on their own, were developed. Up to now there were only prototypes of intelligent devices, because there are still many challenges to overcome. But the research in the AI sector advances and therefore experts expect that the rate of intelligence features in all our daily devices, like mobile phones, cars, televisions, etc. will increase in the near future. This rise of intelligence could be compared with the trend of gaining more features, like mobile phones with integrated cameras, cars equipped with Global Positioning System (GPS) or televisions equipped with a video recorder. Providers compete in equipping daily use devices with the *intelligence-feature*.

There are four main aspects of AI, ordered according their complexity:

- **Emotional Intelligence** is needed to solve problems where humans are involved, in particular if you want to solve problems in a team. The aim is to put oneself in the position of someone else to understand his or her thoughts and feelings. This is crucial to find fast and fitting solutions for all involved stakeholders.
- **Pattern Recognition** is needed to find the underlying structure of a problem for deducing solutions. The main method is abstracting the given problem and finding general valid solutions. This type of intelligence is still in development and there are lots of complex problems to solve. One aspect is for example video or image recognition. An intelligence device has to recognize different objects and has to decide their spatial structure and adjustment. A more general aspect is the recognition of repeating like the daily routine in an enterprise or of occupants at home.

- **Voice Recognition** is needed to improve the human-machine interaction. One aspect is the syntactical understanding, which means the translation of spoken language received by acoustic sensors into machine readable data. This sector is already well developed and will likely be marketable in the next ten years. The main difficulty is still the context awareness, because therefore emotional intelligence and broad experience of the world is needed. Another Problem will be the indistinct pronouncing of elderly people. It will be necessary to equip voice-operated devices with specified programs in cases of incomplete articulation or regional dialects.
- **Expert systems** are needed to solve specialized problems like specific medical issues or failure analysis of operational sequences. This type of intelligence is already developed. There is no internal activity of the intelligent device, because the developers of the application programmed and integrated it before the device's completion.

Another important aspect is not only to increase the intelligence of every device, but to build up groups of devices to work on a problem. The teamwork aspect of future appliances is highly influenced by the development of emotional intelligence. In this term emotional intelligence means understanding the *thoughts* or the work of the other device to tie it with further *thoughts*, i.e. devices which do not have a central unit that *thinks* for them. The actual teamwork of intelligent devices without using preprogrammed methods within the next twelve years is very unlikely to happen. A more certain development in this sector would be data exchange between a group of intelligent devices. Such data could be sensory or status information. The devices ought to interpret the situation according to preprogrammed or learned patterns. One important technological improvement in the next twelve years could be intelligent devices learning by observing the occupants' behavior. By finding patterns AI could create suggestions for optimization by their own according to preprogrammed methods.

Another important aspect which is directly correlated to the development of AI technologies is the convenience of devices. Devices are becoming increasingly easier to use. An interface between people and technical devices is not only possible by touch. Control by voice and gestures are becoming more popular and is constantly improving. Computers are able to recognize people by their voice and looks and make the communication thus easier. [350]

The development of AI is a very uncertain field. Breakthroughs are needed to make technology applicable on a large scale. Additionally to the uncertainty of AI evolution there is a huge importance attached to that.

10.2.1.3 Trend of the Price Performance Ratio

Moore's Law also underlines the decreasing costs of technical devices. While the number of transistors is rising, their production costs are falling exponentially. [365]

Although production costs are falling, according to the statistical federal office prices for technical devices have only slightly decreased in the past ten years. This concerns prices for data processing devices, electrical components and telecommunication devices.

The price trends for personal computers in the consumer price index thus show a price level that is in steep decline, even if consumers today do ultimately not spend very much less on a new computer. However, they do receive a much better computer for the same money (see table 10.1). [357] Similar trends, even if by no means to the same degree as with computers, can be observed with video cameras, televisions, etc. [357]

	1994	2004
Processor	486 DX	Pentium 4
Speed	66 MHz	3 000 MHz
Internal memory	4 Megabyte	512 Megabyte
Harddisk	260 Megabyte	120 Gigabyte
Price	2,000 DM (approx. 1,023 Euro)	899 Euro

Table 10.1: Typical Characteristics of Computers from 1994 and 2004
Source: Federal Statistical Office of Germany [357]

Technical progress, innovation and globalization support this development, thus, cost advantages and lower prices can be realized for goods on the market. The increasing possibility of producing parts of components cheaper at other locations also enables declining costs.

This development is of high importance as costs and prices have a big impact on whether consumers are able to buy and it thus fully and quickly penetrates the market.

The question is how much consumers appreciate extra features and how much they are willing to pay, if there are grave innovations which lead to fall in price. So the influence on the intelligent home development is not considered as uncertain.

10.2.1.4 Development of Broadband Connections

Broadband connections are an important driver for communication technologies and are become more necessary for communication. The relevance in society is

noticeable in the increasing number of broadband connections. In 2010 there will be about 21 million connections going up to over 29 million connections in 2015, which is 80% of the households in Germany in 2015.

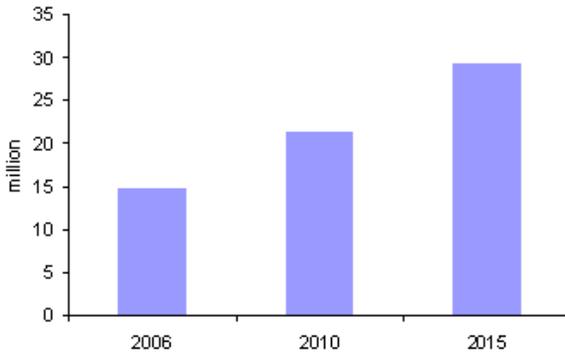


Figure 10.2: Development of Broadband Connections 2006 - 2015

Source: Deutsche Telekom AG [355]

These 80% certainly count for areas, with high population density, i.e. cities. Whereas it is doubtful if rural areas will be able to use broadband internet access. Emerging applications using broad band access need larger bandwidths due to transmitting vast data amounts, e.g. for communication with a medical institution using a video application. The performance and attractiveness of applications for the user depend on the bandwidth. A further and continuous growth for the bandwidth is expected in the future. [371] Certainly the usage of bandwidth over 16 Mbits/s will rise and substitute lower bandwidth in the German households until 2015.

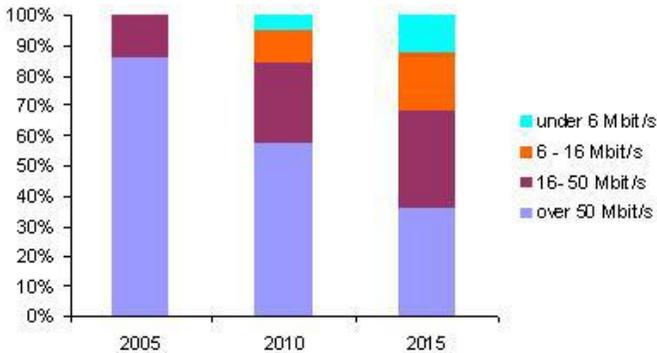


Figure 10.3: Development of Broadband Bandwidth 2006 - 2015

Source: Schmitt [371]

However, still not all households will have a high bandwidth. Higher bandwidths are again spread faster in cities whereas rural areas will lack of broadband access with high bandwidth (see figure 10.3). Additionally the question is if all necessary institutions are equipped with broadband access by 2020.

Bandwidth is an important issue concerning the assistant living development. Though, the previous section showed that it is developing into certain direction. So the bandwidth aspect is rather predictable.

10.2.1.5 Trend of wireless Communication

In intelligent homes there will be devices for monitoring, data storage, communication or information, to mention just a few of them. These devices will be interacting and communicating. Radio networks allow wireless data transfer via electromagnetic waves over short and long distances and are already widely in use. An example for short range transmission technology is Bluetooth. Bluetooth is widely employed for data transfer and supported by many devices. There is a variety of wireless networks like Wireless Personal Area Networks (WPAN) or Wireless Local Area Networks (WLAN). They differ in their sending distance, e.g. WLAN 100 – 300 m coverage in 2008, and also in using different standards based on the Institute of Electrical and Electronics Engineers (IEEE). In the far future a new standard, Worldwide Interoperability for Microwave Access (WIMAX), shall replace the existing WLAN and allow wireless data transfer up to distances of 50 km. Universal Mobile Telecommunications System (UMTS) is the third generation technology used for transmitting data wirelessly for mobiles. In contrast to Bluetooth and wireless networks there are no limitations regarding the transmission scope.

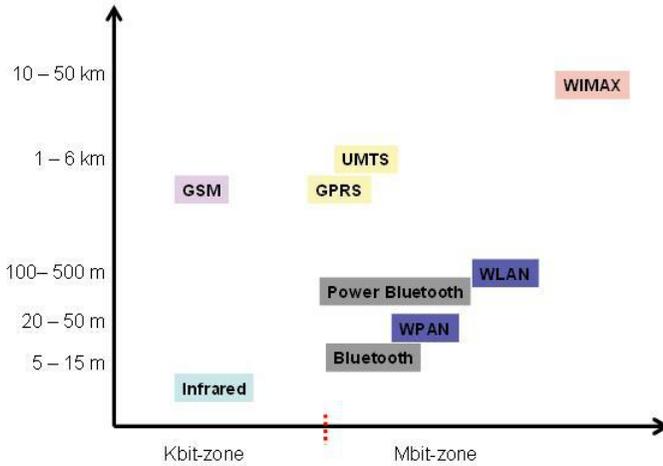


Figure 10.4: Wireless Connection Scopes

Source: Own Illustration

Standards are important due to various reasons.

The need to have commonality and interoperability between devices grows. [...] When you have common interfaces, common protocols, then everyone can innovate and everyone can interoperate. [...] consumers can expand their choices, the technology moves forward faster, and users get more benefit [366].

Due to the existing networks it is already possible to exchange data wirelessly in general, but there is still missing a common standard for communication of the devices among each other. All these networks are using different IEEE standards, which makes a communication of devices using different networks impossible. A communication standard is important to exchange information between the devices supporting the person living in the intelligent home. The influence which a possible standard existing in 2020 has is not to describe with certainty.

10.2.1.6 Deployment in Cryptography

A further aspect is connection security. People send information to each other or communicate data via devices. There it is important that the transmitted data is encoded and saved from possible attacks. The connection security of many important network services is based on openSSL. OpenSSL among others offers applications for certificates and encoding. But in circumstances it is still possible for raiders to get unauthorized access to servers. [364] Especially

health data is highly sensitive and contains important information. If this information is monitored or manipulated by a third party it has negative consequences. Until now the mathematics are not completely sure, that an algorithm could be found which is capable of decoding RSA¹ encoded data in an acceptable amount of time. If somebody finds a procedure to decode RSA-encoded data it would have a great impact on our existing social system. Online banking and anonymous online communication would become almost impossible and as result without the possibility of transferring the sensitive health data via wireless and online connections the smart home would lose two of its most important applications. This indicates that the influence of the security aspect is not that sure but still is of a relative importance.

10.2.1.7 Development of Power Consumption

As already mentioned above, devices are becoming more and more powerful. This leads to the question of power consumption and sources. Devices at home which run on battery or on storage battery have to be charged on a regular basis, which reduces the convenience for the user due to extra charging devices and less mobility if the device needs to be plugged in for power supply. To some extent the power consumption is important but its influence on the development of intelligent homes is not that strong.

10.2.1.8 Design of Hologvideo

Holographic display technology is still in a research stage. But the future promises exactly what hologvideo needs: more computing power, higher bandwidth of optical modulation (i.e. possible data volume displayed per second) and improvements in holographic information processing.

The bandwidths of computation and modulation are likely to increase steadily. Improvements in holographic information processing will be likely to provide dramatic improvements in both of these areas.

For this trend report and its induced product the hologvideo development is not absolutely essential, but would improve the human-machine interaction to a large extent. Hence, it is assumed to be marketable in 2020, but could be substituted easily by present technologies as today's flat screens. [368][369]

10.2.2 Social Impact

Beside the technological drivers, there are several social aspects that have an impact on the development of intelligent homes in the next decade. Therefore social wants and concerns shall be examined, also in respect to their coherence with technology. In the following section the key drivers as well as important side aspects will be described.

¹named after the inventors: Ronald Rivest, Adi Shamir and Leonard Adleman

10.2.2.1 Life Quality Standards

Staying at home provides, from the ill person's viewpoint a better quality of life than hospitalization. Also elderly people who only need help in the household or for sanitary needs prefer staying at home to being put into a nursing home. Staying at home is a crucial factor for life quality. Elderly people have the wish to maintain this quality by keeping keep their usual life style through staying at home. Thus they are more independent and can live autonomously. [354]

Elderly people in 2020 will be a more heterogeneous group, with a more active, healthier and more demanding lifestyle. For their qualitative lifestyle they will wish to have personalized solutions and support according to their particular needs and circumstances. [352] This driver is very certain and also quite important for the development of the iHome services.

10.2.2.2 Desire for Staying at Home

Elderly want to stay at home as long as possible, as it is their well known surrounding. They are used and familiar to the accommodation, their neighborhood, the people and sounds. Thus they feel comfortable and secure there. Staying at home also means to keep their privacy and live in a marginal changing surrounding. Elderly people do not want to lose this and thus prefer their secure home. [370] Staying at home can only be achieved, if people are able to manage their daily life independently. Therefore they need a product or a technology which provides them with an infrastructure that supports them in daily activities when they are not able to perform them sufficiently anymore. This wish to stay at home is very important and certainly drives the development towards home solutions with intelligent technologies.

10.2.2.3 Provision of Private Data

The problem of assuring the privacy to end-users is of fundamental importance in home-care applications as they deal with extremely sensitive data such as personal videos and voice, or biomedical signals. [354]

Monitoring people constantly allows the immediate registration of actions. The behaviors of elderly people in terms of activity, movements and also physiological information can further be recorded directly onto their health record, which allows higher quality and efficiency of care. [370] In respect to the development of an eHealth infrastructure including centrally stored health records, powerful databases will have to store great amounts of data in a secure way.

However, the collected data could serve on the one hand for research purposes, as constant monitoring allows dynamically generated patterns from observed

data. This stored data and generated patterns are also highly interesting for business purposes on the other hand for strategic planning.

Marketing strategies today focus on the individual and recommend similar or complementary products. There concrete consumer data is of high interest and crucial for the design of services and products. With permanent home monitoring of people those insights on the customer behavior can be gained. For the best possible healthcare at home it is important to monitor and measure personal values. And businesses and researchers are interested in analyzing customer data and behavior records. But it is not certain if everybody wishes to be that transparent for the outside world and provide its personal data, as there are concerns about third parties' access to their data. Data security and to know who has access to their data is important to the consumers. If people fear a lack of data security and thus don't trust and use the product, this will have an impact on the market success and development.

10.2.2.4 Concern about Health Condition

The customers' information level about its own health condition is changing due to better access to information online and higher awareness for its health status.

The internet plays an important role for informing oneself about health issues. It has attracted considerable attention as a mean to improve health care and its services. However it is not clear how prevalent the use of the internet for health care really is or what impact it has on health care utilization. [351] According to a survey conducted in 2001 in the USA by L. Baker, approximately 40% of respondents with internet access reported using the internet to look up advice or information about health or health care. Since that time many more people gained connection to the internet and thus this motivation of informing oneself independently might have risen.

In the web 2.0 age many databases with user generated content arose and continue to grow. Parallel to this phenomenon the number of professional health information systems, like e.g. informative sites provided by medical institutes increased. It is assumed that elderly people will use these services as they are more familiar to new technologies and especially the internet.

The second aspect deals with the personal concern about the own health situation, and the motivation for faster rehabilitation. People have defined needs and want a speedier and personalized treatment that responses to their needs. [373] They are afraid of inefficient treatment and having to return to the hospital several times, like in the case of the so called *Drehtüreffekt*. A vital monitoring system in an intelligent home could provide improved medical care at home, also in terms of functional rehabilitation and preservation and also answer the rising interest in personal health. Still, its influence is not that important but neither certain nor uncertain.

10.2.2.5 Acceptance of Technologies

User acceptance can be defined as the willingness within a user group to employ a certain technology designed to support tasks or activities. The acceptance of a technology consists of several dimensions. One characteristic is the extent to which a new technology offers real improvements over available tools. Besides it is also important, that it is consistent with social practices and norms present in the user group. But the two most important dimensions are complexity and operability, which determine whether a technology is easy to use and fast to learn.

Since elder people are likely to be slower and more critical adopters than younger generations they are a very good indicator for acceptance or resistance towards changing technologies. Human-Computer Interaction (HCI) interprets acceptance in terms of usability, which is a prerequisite of it. But many technologies that are demonstrably usable are never accepted by the target users. So the ability to use technology is not sufficient to ensure acceptability. Hence, the acceptance of technology is a crucial factor which remains uncertain regarding the time frame of the upcoming twelve years. [356]

10.2.2.6 Security Needs

Security is a highly psychological issue. It is both a feeling and a reality and has great influence of human behavior. But feeling and reality are not the same. In terms of home, risk refers to a physiological dimension; e.g. a burglary or any other kind of physical threat. People do not calculate their risk by the real mathematical probability. They act according to their feeling. They even exaggerate risks that are unfamiliar, uncertain or directed against their family members. [372] Further, elder people tend to be more prudent and more concerned about their home as a secure area. Instead of rational consideration of facts they rather rely on the effectiveness of different countermeasures. Such countermeasures can be part of an intelligent home and thus the need and the willingness to pay for a security system certainly have an impact on later scenarios. It also can be characterized as important as the need for security is a very natural one.

10.2.2.7 Desire to Connect

One further aspect to be mentioned is the desire to connect. Driven by cell phones, BlackBerry devices and home broadband, users increasingly expect to be connected all the time and have made connected use models an essential part of their lives. [367] This is very relevant and becoming for sure increasingly important to elder people as the modern family structure nowadays has changed. People are generally more mobile, e.g. children move out earlier and create their life and career at places all over the world. Thus telecommunication

technologies become the crucial means of interaction as family members still want to know about the other ones' lives and be as near as possible to them. Such devices could be integrated in an intelligent home and generate a great advantage for the probably more mobile society in 2020. The desire to connect is dependent on the degree of mobility of the society so the influence on the iHome technology is not that certain. But it is not that important as the existing means of communication already are sufficient and thus are not driving the development of new technologies to a big extent.

10.2.3 Economic Impact

The development of intelligent home environments is also driven by economic factors. Some of these factors come from a cost perspective, others are due to new markets and profits. In the upcoming paragraphs some of these driving factors are explained in more detail.

10.2.3.1 Emerging Attractive Markets for Industries

In building intelligent homes there are opportunities for a variety of different industries to become involved. This makes it an attractive sector and possibly drives development in each of them.

It is not only IT industries who can contribute parts to an intelligent home. Besides there are also opportunities for building services and construction related fields, as they can provide macro systems of the house infrastructure. Further, telecommunications could offer data transfer contracts, security services install protective systems. Medical industries and insurances adapt their services to the house devices. But still it is not sure that each of the named sectors enters the market. For some it is more likely, e.g. telecommunications and IT. They might even have to face tough competition. For others it might be less lucrative or they might not explicitly involve in intelligent home services. The importance of this driver lies in the in the fact that the development of the iHome services is dependent on the involved industry.

10.2.3.2 Profit Possibilities

The willingness for different industries to involve in the intelligent home environment business sector derives from the profitability of the products.

The number of customers is going to be huge as the devices are not primarily for older people but address all households. So the maximum market potential of the German market corresponds to 40.5 million, the number of households in 2020. [360] As stated above, it is quite likely that there is a demand for intelligent homes, especially among wealthier customers.

Another detail which in terms of profitability makes the market very attractive is the fact that by the involvement of different industries synergies can

be realized. It provides the basis for the development of strategic alliances which foster profitability. iHome devices can also become network goods. As mentioned above it is of importance to have a common communication standard. In a market perspective the first one to establish a standard is to become the market leader. This offers the possibility of a monopolistic market structure which results in a high market power for the leader.

From a governmental point of view it is to mention that cost reductions for the state can be realized by combining intelligent home services with e.g. medical services funded by the national health system. It is therefore even likely that the business is subsidized as intelligent home environments especially for older people might be of interest for the state out of these cost reduction reasons.

For the development of the intelligent home the profit possibilities are very important as they foster the competition and have a positive influence on the market of iHomes.

10.2.3.3 Cost Development of Health Services

Another factor driving the development of intelligent home care for elderly is the fact that the costs for health care are constantly rising and exceed the state's budget. State and health insurance companies have to switch health services to cope with these rising costs.

The costs for health issues include treatments costs and costs for care and accommodation for older people, which represent a big part of the total costs. The rising of costs are consequent to several interconnected reasons. First of all, more people are in need of care as the share of older people in society rises from 39% today to 47% in 2020. [358]² Secondly, the further life expectancy among 60 year olds is going to rise to 27.1 years for women and 23.2 for men. [359] This results in a longer care period. [373] The first step to cope with that challenge is to replace costly treatments by cheaper methods. But bare cost reduction is not sufficient because of the increasing number of patients so another goal is also to make treatments more efficient [352]. Following these two conditions, cost reduction and efficiency, the development of telemedical and home care tools is going to be reinforced. They provide a cheaper treatment as well as the possibility for carers to work more efficient as there are fewer resources needed for caring for people.

The mentioned cost facts are a very crucial and have to be resolved within the near future. Therefore they represent a certain and important driver towards the development of an intelligent home as cost lowering alternative.

²The total population will decline from 82 to 80 m.

10.2.3.4 Purchasing Power of the Customers

An important economic aspect of the future intelligent home is concerned with is the purchasing power of the people. Any technology and design of devices will be limited by the consumers' willingness to buy them. Therefore the economic situation of the future target groups and their willingness to buy intelligent home products has to be analyzed.

As the part of working people, who are crucial for a functional pension system, is diminishing. One group to focus on is the generation of aged citizens who are concerned with keeping track of their health situation. This part of the older people is growing, due to this change in the relationship, in 2020 the pensions for the elderly are not likely to be as high as they are today. Although the pensions will reach an 18.5% higher level in 2020 [353], the income of the pensioners will decrease in comparison to people who are still employed.

This would mean that senior citizens in 2020 will have less purchasing power and will not be affluent enough to spend extra money on their health.

However, there are still income sources in form of savings. At the moment, the *Generation 50plus* is in possession of more than half of the total private wealth in Germany and this proportion will significantly rise in the future [361].

There is a trend towards more hedonistic consumer behavior among aging generations in our society. Concluding from diverse scientific studies, in 2020, the people above the age of 50 will be addressable not only for standard products, but also particularly for luxury goods and very exclusive services such as extensive product support.

Still, the influence of the purchase power of elder people is not to say with certainty. But as said above it is a very important aspect concerning the economy and thus the development of the intelligent home market.

10.2.4 Evaluation of the Impact

In the previous chapter the drivers were listed and described. To characterize their influence on future development of intelligent home products the connections between them have to be assessed. First of all, the drivers are examined in terms of certainty and importance for the iHome product. Especially interesting are drivers that are uncertain and important. Those drivers in the following chapters will build the basis of future scenarios which describe the situation in 2020. Second, it will be looked at the driver's interconnection. There will also be some drivers that seem to be important but sure. These drivers are the common drivers and are interpreted to be the same in each of the scenarios.

10.2.4.1 Certainty and Importance of Drivers

During the drivers analysis it was already mentioned for each driver how it is characterized concerning the two dimensions, importance and certainty. The grid below shows the drivers positioned according to their considered value of the two dimensions.

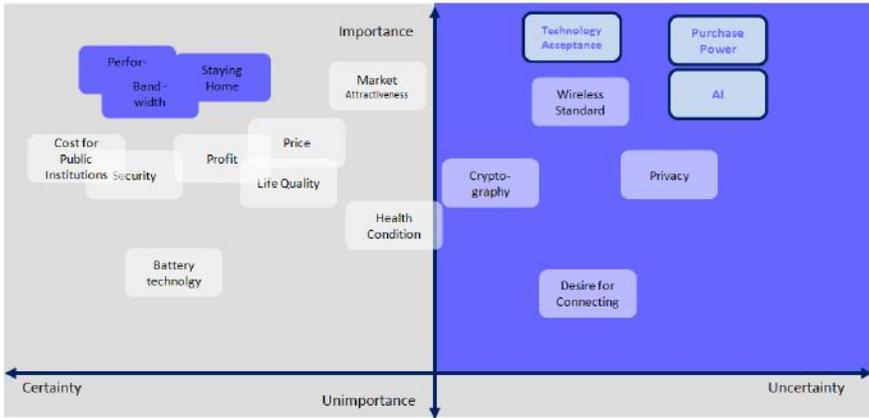


Figure 10.5: Importance and Certainty of Drivers
Source: Own Illustration

It is clear to see that there are no unimportant drivers. All mentioned drivers have been selected due to their importance for the later product and the scenario development.

But still, there are differences in the evaluation of their future impact. Although they are all quite certain, factors like the usability and the battery life of future devices are considered less important compared to issues like market opportunities, bandwidth or technological performance. The reason for that is that they do not seem to influence the launch of intelligent home products as strong as the latter ones.

There are also insecure factors as their specifications can go into different directions. The more important they are, the bigger the impact they will have on future development. These factors consist for example of the development of AI, the acceptance of the technologies or the purchase power. In the scenarios of the next chapter they will play the key role, as they are the most important and at the same time rather uncertain. Parts of AI for instance is already highly developed and could be integrated in and benefit people's life. However today in 2008 AI is not found in normal households, as it also still quite expensive. It is thus questioned if and to what extent this will change in 2020.

Other insecure factors might also influence the development: The standard-

ization of wireless communication is partly important as it might decide on the market structure and also the firms entering the market. The data protection issue respectively the privacy is also slightly influencing the direction of the services offered.

On the grid there are further drivers mentioned, which are either uncertain and not that important or which are on a medium level of all secure and important factors.

Putting it in a nutshell, the grid displays exactly, which of the factors are the key drivers for the future scenarios (black bordered in the grid). They are characterized uncertain and important, and consist of AI, the purchase power and the technology acceptance. Later in the scenarios analysis they will play the main part and provide the characteristics of the influencing factors.

10.2.4.2 Correlation of Drivers

Parts of the drivers mentioned above have beside their independent influence on the future living also interconnection to other drivers, which will be described in the following.

The **performance**'s development will follow Moore's Law and is almost independent from the development of intelligent home systems. There are many more influencing factors like the PC industry, the military or the mobile technology sector. It is obvious that sufficient performance is needed to enable future technologies like AI, Voice Control or 3D visualization.

At a technological level **standardized wireless communication** decreases a device's complexity. However, the willingness to use it is not that highly dependent on this factor, but nonetheless influenced by it. Additionally, standards permit more possibilities of combining devices from different manufactures which increases the market attractiveness.

The available **quality of the internet connection** is not really influenced by any drivers mentioned above, except partially the technology acceptance again and the desire for connection of the elderly people. It is a crucial precondition for many features of the intelligent home system, but it is very certain to be integrated in most of the households in 2020.

Advance in **cryptology**-research are not influenced by the drivers mentioned. As mentioned above encoding the RSA-algorithm would have a great impact in our society but mathematical break troughs are almost unpredictable.

Advancements in the research of **power consumption** and new longer lasting batteries causes a higher usability, because more devices will become more portable and the users need to recharge them less frequently. Additionally, the possibility of saving electrical power and environment protection often increases the technology acceptance.

The **price** is a crucial but certain driver as discussed above. It is influenced by the supply and demand. The demand is mainly based on the technology

acceptance and factors like desire for security, for health knowledge, for quality of life, for connecting and for staying at home. The supply depends on the market attractiveness and profitability.

The desire for **health knowledge**, **staying at home** and **security** are very independent from the other driving factors mentioned in this report. They depend on social aspects in the future and on individual customers' desires and situations, which are often almost unpredictable.

Privacy issues also influence the acceptance of intelligent home technologies. It is dependent on the transmission of recorded personal data and the encryption of these. This means that if people do not want to publish data it is quite likely that they would not accept insecure data recording and transmission.

The elderly people's **technology acceptance** is highly correlated with the usability of the product. Technological devices consisting of many features, but with confusing and over-detailed interfaces are not likely to be attractive. This is due to the effort required for learning how to use the devices. If AI is integrated smartly into technological components, this might further increase technology acceptance, if it leads to an easier way of interaction. Too much AI can turn people's attitude to being reluctant towards usage as they might not trust in the devices anymore.

The **usability** of an intelligent home system depends on the research status of AI and human-interaction technologies like voice control and 3D-Visualization. If control by voice and gestures works effectively and easily people might e.g. save time using a device. They recognize the benefit and have a higher acceptance even for complex products.

The **market attractiveness** is mainly influenced by the profitability and by the market volume of intelligent home Systems. The market volume in turn depends on the technology acceptance by elderly people. The increase of market volume and profitability will lead to more investment in R&D and could boost research in the sectors AI and voice control which are crucial technological improvements for intelligent home systems.

On the other hand the **profitability** depends on the market attractiveness and the market volume. Providing intelligent home systems by mass production influences the profitability and depends on the sales potential.

The **purchasing power** has an influence on almost all other drivers. People have to be able to pay the relative price of a product which determines the quantity of demand. In the best case a complex and well performing technology will be offered at a low price, and thus be accepted more easily. On the other hand easy-to-use technology does not necessarily need to be cheap, which can be seen at a variety of products, e.g. by Apple. If the purchasing power is high, better equipped products with a higher AI level can be developed. Furthermore higher purchasing power leads obviously to higher market attractiveness and a higher profitability. Finally the purchasing power itself is dependent on the extent of possible public subsidies as well as the private wealth and on the

government's financial situation. All facts together determine the height of the retirement pension and other incomes of elderly.

10.2.4.3 Common Drivers

The grid shown above helps to determine the factors which are most likely to be the same in every future scenario. Common in this case means that their influence is predictable as they are certain and important. In this case the common factors consist mainly of the performance level of the technology, the bandwidth and the desire of old people to stay in their well known home atmosphere.

The performance level will for sure be a lot more advanced to the level today in 2008. Moore's law is still valid and thus technology is improving constantly. Its influence is also very important as the power of the devices decides on the design of the product's capabilities. The bandwidth of the internet connections decides on what amount of data can be transmitted in what time dimension. It is very sure that the bandwidth will improve. Although not all households will be equipped with the fastest connections available, the broadband coverage will be sufficient for the data to be transmitted for home and health services.

On the side of the social drivers the desire of older people to stay in the home environment they are used to is very certain and also very important for the development of intelligent home products assisting especially older people to facilitate daily life. It is obvious that people are reluctant to leave their homes to move into old people's home. If age prevents them from being capable to execute daily tasks which can easily be substituted by an intelligent technology, they are willing to use that service.

10.3 Future Scenarios

The following chapter describes three main scenarios. The first scenario illustrates a very pessimistic point of view towards the future. The second scenario concentrates more on an optimistic point of view and the third scenario identifies the most likely scenario and will be investigated more in detail to deduce a prototype of the intelligent home system in 2020.

10.3.1 Scenario 1 - Pessimistic Scenario

The first scenario is based on a pessimistic point of view towards the future. It is assumed that the key drivers will not change or will become even worse until 2020.

Research Level of Artificial Intelligence

Until 2020 AI has been investigated with constant or even less effort and advancement than today. It is already capable of recognizing patterns, giv-

ing advices and interacting with other devices but does not have emotional intelligence. Theoretically AI could be integrated in lots of devices, but it is still not market-ready, too expensive for average earner and reducing costs by mass production will take at least 3 to 5 more years.

Wireless Standardization

In this future's development there will still be lots of different wireless standards which will not or only partially cooperate with each other. There are lots of companies still using their own standards fitting best for their specialized products.

Technology Acceptance

The pessimistic development of the technology acceptance indicates that most of the elderly people will not be willing to buy an intelligent home system and avoid the usage of most of the provided technological device. They will only use devices they have used for their lives, which will not extend more complicated devices than their mobile phones. In that scenario only simple devices can be sold with only a few features.

Purchasing Power

In this scenario it is assumed that the main part of the elderly people will not have enough money to spend for expensive technological devices much less for a whole intelligent home system. In average they will only pay for devices they crucially need as for their kitchen or for health monitoring which will probably be supported by the public health system.

Privacy

The wish for privacy and protection of private data will become stronger, caused by scandals hyped by the media for example. The elderly customers will not trust in the providers' promises of trustable and secure intelligent home systems which are additionally enforced by technological antipathy mentioned above.

Roundup

In this pessimistic scenario of the future the main part of the elderly population will neither be willing to spend money for unnecessary devices nor will they have the income to pay for such expensive technologies. They will be very cynical about technologies especially AI and will decline to provide their personal data. Therefore the main customers' group will basically be households consisting of younger persons who are open minded and earn good money.

10.3.2 Scenario 2 - Optimistic Scenario

The second scenario describes an optimistic point of view towards the future. It is assumed that the key drivers will develop like expected and on the one hand without reversals on the other hand without unpredictable booms.

Research Level of Artificial Intelligence

In the first scenario AI has been investigated with high efforts and advancement. It is capable of recognizing patterns, giving advices and interacting with other devices. This kind of AI has already emotional intelligence to interpret human actions and interact and cooperate with other intelligence devices it is not originally designed for. The intelligence technology will be sold integrated in many different devices as a standard feature and has acceptable prizes due to mass production, like today's microprocessors.

Wireless Standardization

In the optimistic point of view towards the future there will be one main standard which meets all necessary demands for range, data transfer rate and health requirements for daily use. This standard includes same frequencies and network protocols. Combined with modern AI the intelligent devices would even be such flexible coping with unpredictable interactions with unknown devices by their own. Therefore practically all devices form different providers can communicate and cooperate with each other. Hence the need for complete designed home systems with central units will decrease and the usage of much more flexible ad-hoc networks will become wildy accepted.

Technology Acceptance

Due to daily usage of modern technological devices for years and permanent acceptance of new upcoming technological devices the Generation 50plus in the year 2020 will be used to all kinds of technological devices in their daily life. This may differ a bit between urban and rural areas but on the whole the main part of elderly people will have become used to it. The assumption for this scenario is actually that the elderly people are not only used to intelligent technologies but even are fascinated by new technologies.

Purchasing Power

In that scenario it is assumed that the main part of the elderly people will have enough money to spend for technological devices respectively the price for intelligent devices will not exceed today's prices for mobile phones and computers. According to their technological acceptance, mentioned above, which

Privacy

The elderly people got used to submit their personal data electronically. They trust in the almost negligible probability of data abuse or hacking attacks. It would be comparable with the today's usage of bank and credit cards at cash points or for shopping. Although there are some cases of abuse the Generation 50plus does not carry weight compared to the number of uses a day.

Roundup

In the future environment of the optimistic scenario new intelligent technologies can establish and develop easily. The technological enthusiasm leads to a high profitability and therefore high market attractiveness, with lots of involved industries and high competitiveness between the vendors. This leads to more financial funding of R&D and increase the technological development in performance and AI research. Low limitations in privacy aspects additionally support this development.

10.3.3 Scenario 3 - Main Scenario

Now a scenario shall be described, which is perceived as the most probable one to happen. It is neither very pessimistic nor very conservative. The characteristics of the key drivers give a very realistic picture of the future, as they are quite moderate. That implies that the development of the main drivers will rise in a constant positive slope without going into extreme. In the following the key drivers are described in the manner how they will influence the later product. Additionally other drivers will be added to complete the picture of future intelligent living.

Research Level of Artificial Intelligence

The level of AI will definitely improve to a certain extent. The intelligent system will be able to recognize simple behavior patterns and interpret them in a reliable way. It will learn the preferences of the inhabitant and adapt. It will be able to draw basic conclusions from the recorded patterns and thus will improve constantly. It will even be able to trigger simple mechanical tasks such as making coffee. It will have basic communication skills and contain functions like reminder, calendar, search, administration, information etc. Therefore it will be able to recognize the voice including the users' dialects and voice volume. All applications and functions will run automatically with little hassle and intuitive usability. It will partly act as a personal assistant and support, help and look after the inhabitant in his daily life.

Wireless Standardization

The devices in the intelligent environment will communicate on a wireless basis. The reach of the network will still be limited to a few kilometers, however, this is sufficient for the domestic area. There will be a common standard used by all providers of devices. This makes it possible to integrate a variety of products into the home network. Further, the devices will be able to create ad hoc networks which means that they integrate automatically into present systems. The standard and the ability for ad hoc communication allow for a high level of usability.

Technology Acceptance

The acceptance of technologies will have risen significantly in the future scenario. Particularly the generation between 50 and 70 will be comparably technology affine. They will already be used to technological devices due to former and current work. They will be willing to live in intelligent home environments. They are not reluctant to AI as the level of AI operates in such an extent, which is still understandable and controllable for humans. The technological devices will be easy to handle and thus even foster the acceptance by the user.

Purchasing Power

The pension system in 2020 will have improved and answer the demographic change by implementing a more efficient and new structure. Therefore the pensioners will receive a appropriate amount of money each month for a normal living standard, neither luxurious, nor poor. There will also be a part of the target group still working and obtaining a stable income. Thus the purchasing power will be slightly higher compared with today 2008. Additionally, health and living quality will play a more important role in people's life. Due to that fact and regarding the money to their disposition they will be willing to invest on health and comfort related products. Further, it is likely that the government will support this attitude by financially supporting intelligent living accommodations. This can happen by various incentives such as tax reduction or subsidies.

Privacy

Privacy and data protection will still play an important role. People want to be in charge of the personal data administration. Thus data such as biometrical data will have to be authorized by the owner before accessed by third parties. In the intelligent living environment data will be generated through: monitoring, data entry by the user or by the doctor. This implements that private data will still be protected from commercial usage by companies. Also the private data will be safe from intruders by a higher level of cryptographic standards.

10.4 The iHome

Within the third scenario which appears to be the most realistic, because it takes neither a very pessimistic nor optimistic view, this section will describe a possible product of the future. The product is the intelligent home system's central unit that can be enhanced by other intelligent devices and can be installed into any existing household. As from now this product will be called iHome and its integrated personal assistant will be called My Intelligent Assistant (M.I.A.).

In the following sections its features will be described in more detail, followed

by an analysis of the market surrounding and players who will have an interest in offering it. At the end the analysis describes the value chain, and observes how the different providers are correlated.

10.4.1 Product Features

The first section will describe possible devices of the iHome product classified into devices for security, control and monitoring. In the following part the integration of all devices in the iHome system will be explained. Also the so called Personal Assistant will be introduced, which represents the ubiquitous iHome interface to the user. Especially the last part meets the desires of the elderly generation and how they could be supported.

10.4.1.1 Main Features

The product for an intelligent home will consist of a set of basic devices that will help in assisting with the usual daily activities at home. These are basically already existing automated machines that will be then equipped with intelligence though, like refrigerators or body-weight scales. The product will be highly flexible as it can be augmented by further components that meet individual needs. Due to the wireless standardization and the high advance of AI research assumed in the third scenario the iHome will be a combination of intelligent devices which interact in a self organizing network based on wireless communication. They connect to the iHome network, and can communicate with the other intelligent devices, filter relevant information and provide own sensory data to the others. For example special medical devices assisting elderly people can be integrated without problems into the whole system.

In case of a central unit's defect it will set itself back into a save mode respectively in case of emergency it switches itself off. The other devices will recognize the central unit's disengagement, but will still be able to work together as normal. Furthermore every intelligent device will still be able to interact with the occupants in a not such comfortable way compared to the central unit but still on an very easy way for low technology gifted users.

The independency of the central unit will provide more flexibility for the occupants to integrate every intelligent device they want. This will also warrant that customers are not forced to buy a complete iHome system like today's PC systems. Therefore customers could also buy single devices by degrees avoiding unnecessary financial burdens.

While different devices will be controlled by voice or haptical input, there will also be some devices that react to gestures using cameras as sensors. Data available to one device will be communicated to all others, that could need this data and also in order to assure the functionality of the whole thinking system.

10.4.1.2 Security Devices

A basic feature of the iHome will be concerned with security in and around the house. Devices will consist of surveillance and alarm systems that will protect the house from burglars, but will also warn inhabitants in case they are about to accidentally break something. For example a garage camera system will be able to monitor entering cars additionally to the parking assistants built into them. Communicating with each other the subsystems can perfectly guide the driver even into small parking spots.

In case of burglary, connected devices will not only be able to detect breakings of windows or doors, but also recognize people that are not registered in the system database as inhabitants. In the best case, profiles of illegal invaders will be made that can later used by the police. But even if no useful information can be collected about unauthorized people in the house, the inhabitants will be informed immediately if a burglar approaches the house.

In the field of monitoring internal sources of dangers, smart devices will share sensor data to avoid false alarms and make the system more reliable and trustworthy. Equally distributed smoke alarms will make sure that no fire will break out or gas is leaking. If there is someone cooking, the kitchen smoke alarm will know from its wireless connection to the oven, that there is no need to worry, as long as infrared camera systems do not detect an unusual source of heat. However, the other way around the oven can be informed by the smoke alarm that there are some unusual particles in the air that could come from burned food, and while there is nobody around, the oven will turn the fire down, while a Personal Assistant informs the responsible cook about the status.

Status reports will be generated regularly about all rooms using signals of all sensors to monitor the house and will warn in case some signals approach predefined threshold values. These status reports can be requested by mobile phone as well as via internet, also containing online pictures or videos. This way, inhabitants can stay informed about their home while away.

10.4.1.3 Control Devices

The iHome will leave as little housework as possible with human beings.

Especially for work that needs physical force there will be assisting devices. For example opening and closing the shades in front of windows will be the task of devices with motors to do this. Connected to other devices like the alarm clock or monitoring cameras, the shades can open at the wakeup time and close at sunset. There will also be robotic devices assisting the inhabitants with basic maintenance. A cleaning robot will sweep the floor and vacuum carpets while there is nobody in a room, as power supply will be managed smartly. When the battery is low, the cleaning robot will drive to his home base to recharge. The dust collected by the automatic vacuum cleaner will

be dropped at a collecting point together with the usual waste. Located at a handily situated spot near the kitchen, all waste will be transferred outside regularly via pipelines.

A big issue of the future will be energy saving. The iHome will assist people to minimize the amount of energy wasted, e.g. by turning the lights off while nobody is in a room. Higher energy saving will be contained in intelligent regulation devices, e.g. for the refrigerator, so that it will only cool if it is not about to be opened just some minutes later. By pattern recognition the behavior of people using it can be analyzed and thus, cooling at full power during opening peaks, like at breakfast time, can be avoided. As there are a variety of devices sharing sensor data, it will be easily possible to get an overview of how much energy is used in which part of the iHome. This way status reports can be created for each user which will provide individual energy saving strategies.

Automation will be an extra feature if wanted due to cost reasons. Modern homes could possess automatic doors, e.g. garage door that realize when someone approaches them.

10.4.1.4 Integration of the Devices in the iHome

There will be a kind of *semi-central* unit. A central unit would be like the operating system of a PC which on the one hand controls all progresses and on the other hand interacts with the user. The iHome's central unit will be almost solely needed for the interaction with the occupants and will only know about the ongoing progresses without controlling them.

To interact more comfortably the central unit will have a personal assistant (PA) like the MS Office Assistant *Clippy*. In the main scenario the 3D-Visualization technology will be as far developed that this PA would be visualized with a hologram instead of a monitor as today. The visualization needs a device which will be installed on a wall or the ceiling in every room where the PA should be able to appear. The central unit will consist of one visualization device in each room, because obstacles like walls will inhibit the visualization behind.

Due to the level of AI technologies the central unit can be addressed and controlled via voice or hand gestures. It will understand different languages and dialects and as an intelligent system it will learn occupants' peculiarities concerning behavior, pronunciation and intention. For example this can include the understanding of irony by interpreting behavior like laughing after giving controversy statements.

The PA will be capable of:

- Organizing the personal calendar and appointments with option of analysis of daily routines for time-saving suggestions

- Learning from the past and trying to think ahead, e.g. the PA reminds you to buy flowers before a date or remembers elderly persons to take their medicine.
- Observing every day's actions and recording them - This can help to find things the occupants forgot, which is important especially useful for old people.
- Submitting data from other intelligent devices, e.g. the PA will submit the content of the fridge, the temperature or air quality sent by the intelligent air conditioning.
- Recognizing occupants and non-intelligent devices, like dishes, furniture or clothes via picture recognition
- Submitting occupants' instructions to the connected intelligent devices, e.g. if the occupant is going to have a shower in the morning he or she can ask the system to prepare a coffee in ten minutes.
- Providing advice for health issues like for common illnesses, fitness goals, nutrition and other vital parameters using monitor functions.
- Entertaining the occupants by considering specified or observed interests e.g. providing yoga trainings, gymnastics or searching for interesting news on the internet
- Looking after the children by entertaining or educating them, e.g. the PA can help pupils with their homework or research.

Taking possibly suspiciousness towards AI into account an intelligent device always asks the user before changes are made. The user can also interrupt any ongoing action.

As every person has a different taste, the inhabitant can choose his PA out of a pool of various personalities, which can easily be downloaded in predesigned shape, dialects and behavior.

Equally to today, every provider of intelligent devices will have an online presence like a website. By using the online connection of the iHome system every device will connect frequently to its provider's website on its own and will check for new software updates or firmware upgrades. Provided the inhabitant agrees, the intelligent devices will also be able to submit user specific data to the provider for customer analyses.

10.4.1.5 Special Devices for Elderly People

Especially for elderly people there will be several components offered within the product spectrum of the iHome.

The PA will offer adaptive medical services like reminders or advices. Connected to hospitals or medical care centers they can update automatically and e.g. integrate changes in medication after a person has seen a doctor who has decided on modification in the treatment. This way, elderly people will no longer need to care about their medication. The PA will advice the pill dispensing device to optimize its frequency and order different drugs if needed. On demand, a video or phone connection can be initiated with the physician in charge. The PA can also inform kitchen devices upon possible dangers, so that e.g. a person with circulatory or blood pressure dysfunctions can be warned e.g. if she wants to consume her sixth coffee that day. Also there will be warnings concerning the diet plan if the refrigerator notices that a great amount of some product has been taken out or passed the date of expiry. In case there are several people living in one household, the system will have to be built in a way that it recognizes which person consumes what.

For emergencies every intelligent device in the iHome can initiate a danger averting sequence. E.g. an intelligent camera would recognize that an occupant suddenly falls and does not get up. First it communicates with medical devices which monitors the occupants' vital parameters to decide if and which kind of accident happened and second it will contact to a voice system which tries to interact with the person. In the meantime it sends a warning to all nearby installed devices which set themselves into an emergency status. If the person is still not answering, the phone system will ring the neighbor, a predefined person or institution for accidents. Through the cameras and sensors it can provide all necessary information.

Permanently connected to each other and the outside world, smart devices will document many signals concerned with the health state of a person. They will regularly update databases in order to keep e.g. doctors informed. To overcome the growing shortage of health care staff over the next years, webcams also let doctors or nurses monitor people at home and interact with the patient via video conference. As this is an aspect of vital monitoring systems it will not be discussed in detail.

On the hardware side of assisting devices there are small to medium size robots for personal use. These are connected wirelessly, forming a ubiquitous robot network with the intelligent PAs. Being specialized to meet the needs of elderly people, these devices consist of features offering physical aid as well as more comfort. Examples for such devices are robots that help people getting in or out of bed, or bath tub. Beds will by the way be able to deform for a more comfortable position and lower towards the floor for getting out like non-intelligent hospital beds today.

Combined with camera systems these robots can proactively move towards the intelligent assistance of people. For instance a robot that transports a person up or down the stairs, will already move towards the person as soon as a person approaches the stairs. In addition, while some people expect people

to be wirelessly “tagged” for their protection and allowing locations to be tracked, camera systems will fulfill this task without having to equip people with emitters.

Also personal hygiene is a sector that will advance by the usage of robot assistants. Less flexible people can have showers that adapt to their body measures with automatically surrounding water jets. Smaller devices will be integrated to complement existing ones like walking aids. Equipped with sensors and cameras they will be able to warn elderly people in case a barrier is in their way which they may not see.

All systems together form a central intelligence that will detect any state deviating from the normal. In the case of fall detection this will cause the information of systems internally and externally, so that mobile robots can be ordered to approach a person after a fall, and documentation will be sent to care centers and family members immediately.

Meeting the elderly people’s desire for social connection especially to their family the iHome provides video communication using the PA’s holography technology to 3D-visualize the other person, if it is preferred.

10.4.2 Market Environment

The market structure from the view of a central unit provider shall be described in the following. The analysis will be conducted according to the principle of Porter’s Five Forces. The first step is to assess the rivalry within the sector, afterwards the suppliers, the consumers and their power are reviewed. The last two components are the danger of new market entrants and the threat which is generated by the substitution of the products.

In 2020 the market of providers of central units will be divided among a few big players. The development of the complex units is very costly and requires thus a huge stock of capital as well as expertise. This means that entry barriers will be relatively high. The threat of new market entrants can thus be considered as very weak. On the other hand the competition and the rivalry within the sector is on a medium level. There will only be a few players. It can for example compared to today’s operating system market where only a few players exist, in terms of capital intensity and know how. The products offered will be quite similar if characterized by their basic functions. It is therefore necessary to differentiate e.g. by value added service to keep a certain market share.

The suppliers, in the case of the observed business, will possess less power. They consist of chip manufacturer and developer. The suppliers can be switched and replaced relatively easy.

The customers on the other side will be in a stronger position as they will decide on what system they purchase. If they decide for one it is not very likely that they will switch to another within the following years. Additionally

it will be not necessary to administrate the home with a central unit if only few home components are in use – this could be the case for younger people who are only willing to purchase few supporting devices. So the customer side is a rather crucial issue.

On the demand side central unit providers will also be confronted with the challenge of dealing with substitutes. As all stand-alone devices will possess at least a small level of intelligence and will to some extent be able to communicate among each other as well as with the user. Therefore, as already mentioned, not every customer will be in need of a central unit if only few devices are in use.

The market environment seems to be very tough especially in terms of the need for the central unit. Concerning that it is to say that the central unit will become more necessary the more devices there are in the intelligent home. Additionally with the rising age of a user the probability of the purchase of an administrative tool is increasing.

10.4.3 Value Chain

The value chain in the intelligent living industry will be horizontally multi-dimensional. From the viewpoint of the central unit provider it will look as follows.

The vertical value chain of the central unit provider will include the manufacturing of the computer, i.e. assembling the physical components to build up the infrastructural architecture of the main device. The core activity follows with programming the central unit. That means that the company will add most of the value by providing an intelligent software tool in form of a domestic assistant. Other smaller firms that concentrate on manufacturing the stand-alone devices will be partnering with central unit providers. Thus it is possible to offer a complete home system to the customer. The coalition of the providers will have traits of a strategic alliance or a virtual company. There will be a smaller group of companies that form the core strategic alliance. These companies will all be providers of basic devices very likely to be purchased by a vast number of households. These devices include for example cleaning and security systems. The central unit providers will additionally build up a virtual network by partnering with manufacturers of niche products. The reason is that thus they will be able to serve individual customers' needs. Home systems built up in such a network will especially serve the needs of elderly people. The devices will be offered according to the disabilities of the old people which naturally differ individually.

Besides the main producer there will also be other players in the value chain. The first levels will be represented by computer chip manufacturers. They will produce the components added into the systems. At the very end of the value chain there will be service providers. They will provide special offers around

the iHome system. For example there will be support services or platform providers.

All in all one can say that the value chain will be characterized by two main influences. First of all, a single form will not vertically integrate the complete value chain. But still flexibility and efficiency is granted by forming networks and bonding with other players in the industry.

There will on the one hand be separate value chains for each of the sub sectors, such as the central unit providing or the manufacturing of stand-alone devices. On the other hand it is quite likely that those value chains interact in terms of strategic alliances or virtual companies.

10.5 Visualization of the iHome

In the following the main areas (kitchen, living room, bedroom, office room, dining room, bath room and corridor), of an intelligent equipped house shall be visualized.

The pictures show the inhabitant Clara in different situations interacting with her personal assistant M.I.A.

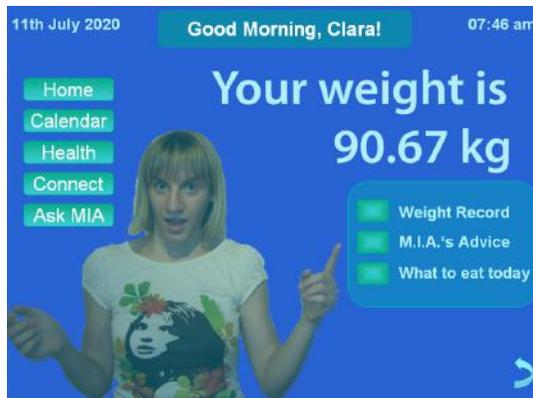


Figure 10.6: M.I.A. - My Intelligent Assistant
Souce: Own Illustration

M.I.A. is visualized on a screen and available 24/7. M.I.A. sees everything Clara does and is always ready to help or to interfere in emergency cases.



Figure 10.7: M.I.A. Bathroom Interface
Souce: Own Illustration

Here you can see Clara in the morning, talking to M.I.A.. The assistant gives her information about her current weight in the picture. In addition to this she gives advice what to eat for e.g. reducing the weight and keep a healthy diet. It is possible to interact with M.I.A. i.e. to ask for further information on the diet. Beside this M.I.A. can tell her other biometrical data like body temperature or blood pressure with simple additional measurement tools.



Figure 10.8: M.I.A. Office Interface
Souce: Own Illustration

In this picture Clara is working at her desk. M.I.A. is also present and can always help out with searching things online, organizing phone calls, informing

about appointments.



Figure 10.9: M.I.A. Entrance Interface
Souce: Own Illustration

If Clara leaves the house M.I.A reminds her of things she might have forgotten, like pills, keys, etc, and says goodbye to her. While the Clara is away, M.I.A. looks after the house in terms of temperature, security and even looks after pets if there are any.



Figure 10.10: M.I.A. Dining Room Interface
Souce: Own Illustration

If Clara doesn't want to cook or doesn't even know what to cook here is the

perfect solution: M.I.A. automatically takes the information from biometrical data taken in the morning, includes it in Clara's diet plan, approved by her doctor, and checks what is available in her kitchen fridge. From this information M.I.A. prepares a lean and healthy meal for Clara.



Figure 10.11: M.I.A. Bedroom Interface
Source: Own Illustration

If Clara is tired after a long day – M.I.A. show her TV programs or even read a good night story. During the night M.I.A. is in sleep modus, too. It has an alarm function though and always wakes Clara up in time. For waking up M.I.A plays her favourite music, the latest news or whatever she wants.



Figure 10.12: M.I.A. Kitchen Interface
Source: Own Illustration

Never again it will happen that someone forget to switch off an electrical device in the kitchen. M.I.A. will remind Clara and thus reduces the risk of fire in the house.

10.6 Conclusion

“However good our futures research may be, we shall never be able to escape from the ultimate dilemma that all our knowledge is about the past, and all our decisions are about the future.” (Ian Wilson, scenario planner)

This report describes a very optimistic - but to see things from the authors’ point of view - also a very probable scenario of the year 2020. Still, as the quotation says the future is unpredictable. There is a bunch of examples which described the future science fiction-like that were badly wrong. On the other hand the detailed analysis and the short time span which forms the basis of this report improve significantly the prediction’s correctness. However, there are always unforeseeable impacts like e.g. catastrophes, new inventions or solely a new attitude of a big part of the population.

So the main question is what could be assumed for sure and which pre-conditions are needed for these assumptions. The main precondition would be that there will not be great regresses as wars or diseases which would endanger our present prosperity concerning Europe. Without this background it will be almost impossible to fund research in sectors like AI, voice control or 3D-visualization. Provided this background the advancement in the home

system's development will not be stoppable. This is caused by the constant rising trend of integrating more and more features in single devices. If a direct integration is not possible or only needed by a small group of consumers the producer integrates additional devices wirelessly. Reasons for this trend are both the increased need for mobility in busy times and the basic need for simplification of people's daily lives. With a high probability neither of those needs will vanish within the next twelve years.

The only question remaining is how fast the technological research will advance for allowing modern home systems. Moore's Law gave a good approximation of technological advance for the last ten years and therefore was one of the basic assumptions for this report.

So to respond the quotation of Ian Wilson above:

“As I look forward, I'm very optimistic about the things I see ahead.” (Bill Gates, entrepreneur and founder of Microsoft)

References

- [350] J. Auf dem Hövel. *Abenteuer Künstliche Intelligenz - Auf der Suche nach dem Geist in der Maschine*. discorsi Verlag, 2002.
- [351] L. Baker. Use of the Internet and E-mail for Health Care Information, 2003. URL <http://jama.ama-assn.org/cgi/content/abstract/289/18/2400>. accessed on 28.06.2008.
- [352] S.J. Brownsell, G. Williams, D.A. Bradley, R. Bragg, P. Catlin, and J. Carlier. Future systems for remote health care. *Journal of Telemedicine and Telecare*, 1999.
- [353] H. Buslei, E. Schulz, and V. Steiner. Auswirkungen des demographischen Wandels auf die private Nachfrage nach Gütern und Dienstleistungen in Deutschland bis 2050. *Deutsches Institut für Wirtschaftsforschung*, 2007.
- [354] F.G.B. De Natale, A.K. Katsaggelos, O. Mayora, and Y. Wu. Signal Processing Technologies for Ambient Intelligence in Home-Care Applications. *EURASIP Journal on Advances in Signal Processing*, 2007.
- [355] Deutsche Telekom AG. Entwicklung des Breitband Marktes, 2007. URL http://www.studie-deutschland-online.de/do5/sdo_2007_de.pdf. accessed on 28.06.2008.
- [356] A. Dillon. User acceptance of information technology. *Encyclopedia of Human Factors and Ergonomics*, 2001.
- [357] Federal Statistical Office. Prices in Germany. *In the Spotlight*, 2005.

- [358] Federal Statistical Office. Altersaufbau Deutschland, 2006. URL <http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Content/Statistiken/Bevoelkerung/VorausberechnungBevoelkerung/InteraktiveDarstellung/Content75/Bevoelkerungspyramide1W1,templateId=renderSVG.psml>. accessed on 21.06.2008.
- [359] Federal Statistical Office. Entwicklung der Lebenserwartung, 2006. URL <http://www.bpb.de/files/XH3MK2.pdf>. accessed on 21.06.2008.
- [360] Federal Statistical Office. Vorausberechnung Haushalte, 2007. URL <http://www.destatis.de/jetspeed/portal/cms/Sites/destatis/Internet/DE/Content/Statistiken/Bevoelkerung/VorausberechnungHaushalte/Content75/VorausberechnungHaushalte,templateId=renderPrint.psml>. accessed on 21.06.2008.
- [361] FFG. Finanzdienstleistungen im Alter. *Forschungsgesellschaft für Gerontologie e. V.*, 2006.
- [362] K. Green. A Display That Tracks Your Movements. URL <http://www.technologyreview.com/Infotech/20987>. accessed on 28.06.2008.
- [363] K. Green. A Record-Breaking Optical Chip, 2008. URL <http://www.technologyreview.com/advertisement.aspx?ad=infotech&id=35&redirect=%2FInfotech%2F21005%2F%3Fnlid%3D1169%26a%3Df>. accessed on 28.06.2008.
- [364] Heise Security. Schwache krypto-schlüssel unter debian, ubuntu und co., 2008. URL <http://www.heise.de/security/Schwache-Krypto-Schluessel-unter-Debian-Ubuntu-und-Co--/news/meldung/107808>. accessed on 30.06.2008.
- [365] Intel. Vierzig Jahre Mooresches Gesetz, . URL <http://www.intel.com/cd/corporate/techtrends/EMEA/deu/209836.htm?> accessed on 20.06.2008.
- [366] Intel. Executive interviews: Craig barrett the importance of global standards, . URL <http://www.intel.com/standards/execqa/qa0904.htm>. accessed on 20.06.2008.
- [367] S. Kleynhans and L. Fiering. Mobile PC Scenario, 2007 to 2010: Trends and Drivers. *Gartner Journal*, 2006.
- [368] M. Lucente. Interactive holographic displays: the first 10 years, 2003. URL <http://www.lucente.us/pubs/holo50/h50.pdf>. accessed on 28.06.2008.
- [369] National Institute of Advanced Industrial Science and Technology (AIST). Three Dimensional Images in the Air - Visualization of "real 3D images"

using laser plasma. URL http://www.aist.go.jp/aist_e/latest_research/2006/20060210/20060210.html. accessed on 01.07.2008.

- [370] A. Rammal, S. Trouilhet, N. Singer, and J.-M. Pecatte. An Adaptive System for Home Monitoring Using a Multiagent Classification of Patterns. *International Journal of Telemedicine and Applications*, 2008.
- [371] K. Schmitt. Deutschland hungert online nach Bandbreite, 2008. URL <http://www.silicon.de/hardware/netzwerk-storage/0,39039015,39186892,00/deutschland+hungert+online+nach+bandbreite.htm>. accessed on 30.06.2008.
- [372] B. Schneier. *The Psychology of Security*. 2008.
- [373] P. Tang and T. Venables. Smart Homes and Telecare for Independent Living. *Journal of Telemedicine and Telecare*, 6, 2000.

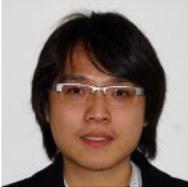
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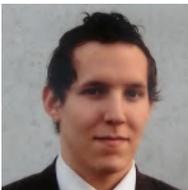
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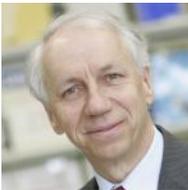
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