

# **A Human-Centered Design Approach for the Development of a Digital Care Platform in a Smart City Environment**

Implications for Business Models

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Digital solutions are being sought increasingly in the care sector for making services more efficient and to be prepared for demographic change and the future care service and staff shortage. One possibility here is the implementation of a digital care platform that is target group-oriented and built according to the needs of the individual stakeholders. To build this platform successfully, it is also necessary to take a closer look at the business model. This paper examines the mentioned points by applying a human-centered design approach that focuses on all perspectives and allows a deep understanding of the opportunities and challenges of a digital care platform in a smart city environment. A digital care platform was found to be promising for various involved stakeholders due to the value proposition. Consequently, the stakeholders benefit from e.g. the simplification of processes and data management, less bureaucratic effort and intensified care services for the elderly.

CCS CONCEPTS • Smart city platforms • Smart and self evolving services • Theoretical foundations on Smart City applications and standards

**Additional Keywords and Phrases:** Human-Centered-Design Approach, Digital Care Platform, Smart City, Business Models

## **1 INTRODUCTION**

The health and care sector is increasingly confronted with intelligent and digital developments [1]. New innovative technologies, such as ambient assisted living, are thus becoming frequent targets of innovative product development to modernize the health and care sector [2]. In addition, ideas are emerging on how to counteract demographic change through technical innovation [3]. In this context, the smart city concept offers an approach that can help municipalities and cities to mitigate the care crisis and the aging of society [4]. The aim here is not only to find effective digital solutions but also to ensure supply structures in both urban and rural areas. Here, for example, care platforms can close gaps in care by identifying users' needs in a targeted manner and then bringing them together with providers and users via an intelligent mediation system [5].

Other research has also shown how demographic change challenges can be tackled with smart city concepts and develop positive synergies. Monzon, for example, emphasizes the multi-faceted nature of smart cities and the need to improve the quality of life for residents. Moreover, the main challenge is to overcome the challenges that exist in the lives of users [6]. This challenge includes demographic change and age-friendly urban design [7]. The focus of smart cities is also increasingly shifting to platforms to enable solutions for challenges arising from the process of demographic change. What is emerging here is an approach to smart cities and communities characterized by collaborative cooperation [8]. The Smart Care Service project, funded by the state of North Rhine-Westphalia (EFRE.NRW) and the EU, encountered the following questions during the project: How should a care platform be designed to create added value to existing solutions for users, providers, and municipalities? How should business models for a care platform be designed so that the platform can establish itself successfully on the market?

To answer these questions, the human-centered design approach is presented, which is used in the development of a care platform. Subsequently, the requirements for a digital platform from local authorities, service providers, and users are presented. In addition, the three points of the business model are discussed, including customers, access channels, and value proposition.

These chapters will explore the extent to which a human-centered design approach is needed to develop a care platform. Cities should be involved to benefit from a care platform. Along with a digital care platform, cities should enable the efficient use of resources to balance supply and demand. In addition, how to address the needs of care providers on the platform as well as those of users will be explored. Public health care requirements for the elderly in smart city environments will become more significant in the future. In times of increasing digital networking and the expansion of digital infrastructures, digital care services, and face-to-face services for people with assistance needs will be combined.

## **2 METHODOLOGY**

In this chapter, a human-centered design approach for the development of a care platform is presented. For this purpose, the approach is first explained in general terms. This is followed by a description of the methods that were selected within the framework of the human-centered design approach in relation to the specific use case and an explanation of how they were used accordingly.

### **2.1 Human-Centered Design Approach**

There are several design methods and approaches that are used in practice, such as the user-centered design approach, the user experience design approach, design thinking, and the human-centered design approach. These approaches are usually used to bring the requirements of users and stakeholders for a product or service into line with the technical framework conditions. The approaches follow the aim of improving the development process of products and services and avoiding

errors in the alignment of corresponding products and services [9, 10]. The term human-centered design is defined in ISO standard 9241-210 (2019) as an “approach to systems design and development that aims to make interactive systems more usable by focusing on the use of the system and applying human factors/ergonomics and usability knowledge and techniques” [11].

The approach is closely related to the user-centered design approach. In contrast to the human-centered design approach, however, not only the users are included in the development process. In addition to the users, other stakeholders who come into contact with the product or services can also be taken into account. In terms of the care platform, this means that in addition to people with assistance needs and their relatives, providers of products and services as well as, for example, health insurance companies, counseling centers, and other stakeholders can also be integrated into the development process [11].

The human-centered design approach is particularly used in projects where user acceptance and ease of use are some of the most crucial aspects for the success of the project [12]. In contrast to a reactive approach, the human-centered design approach proactively aims to design and optimize a product or service based on the people who come into contact with it. Therefore, a deeper understanding of these groups of people and their needs is attempted at the outset. Based on these needs and requirements, the product or service is to be developed interactively in interaction with users and stakeholders. The focus is on the added value that is to be created for the groups of people [13].

The human-centered design approach is also composed of six principles. According to these principles, the product or service to be developed can be explicitly based on the understanding of the users as well as stakeholders, the use, and the environments in which it will be used (Principle 1). To this end, these groups of people are involved throughout the design and development phases (Principle 2). The design should be driven and optimized through regular assessments (Principle 3). It is an interactive development process in which, for example, feedback loops are integrated, since often users cannot formulate from the outset how they specifically imagine the result (principle 4). The entire user experience should be considered in the design and not just the pure usability (principle 5). In addition, the project team should be composed of partners from different areas and disciplines (Principle 6) [11].

The process of the human-centered design approach does not only refer to the phases up to the marketing of a product or service, but it encompasses the entire development life cycle. ISO standard 9241-210 (2019) describes how a human-centered design approach can be designed (see Figure 1) [11].

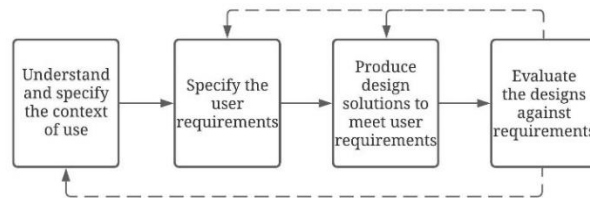


Figure 1: Human-Centered Design Approach [10, 11].

The process also consists of four basic phases, whereby the design of the individual phases is tailored to the specific use case. First, the context of use will be analyzed by collecting information on the needs of potential users and stakeholders. The next step is to define requirements for the product or service to be developed. Subsequently, a first draft or concept is created, for example in the form of a drawing, a mock-up, or a prototype. During the subsequent evaluation, it is checked to what extent the requirements are drawn up and could be implemented in the second step. Furthermore, an

evaluation of whether any new requirements have yet to be recorded and added is recommended. For this purpose, discussions are usually held again with potential users and stakeholders, during which the mock-ups and prototypes can be tried out and the concept can be adapted interactively accordingly [11, 13].

## 2.2 Application of a Human-Centered Design Approach to the Development of a Digital Care Platform

In the following, we present the methods that have been used so far in the context of the human-centered development of a care platform. This includes a competitor analysis, a qualitative analysis, and a quantitative analysis.

### 2.2.1 Competitor Analysis

For the project of developing a care platform, potential competitors were identified and analyzed at the start of the project in 2020. The goal of the analysis was to get an overview of which services in the context of care platforms already exist on the market. In addition, the strengths and weaknesses of potential competitors were identified and the areas with starting points for offering users additional added value were investigated [14].

Methodologically, a benchmark analysis was performed for this purpose following Fleisher and Bensoussan [15]. The process of the competitor analysis is shown in Figure 2.

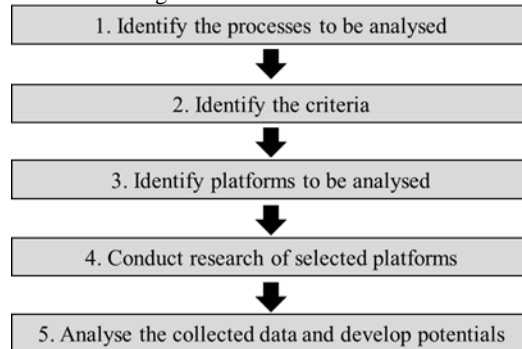


Figure 2: Competitor Analysis (see [15]).

After intensive research and the presentation of the research results to the project team, twelve care platforms were selected based on their estimated level of awareness. These were platforms in Germany that entered the market between 2010 and 2015. The platforms were then analyzed intensively based on a catalog of criteria drawn up in advance, consisting of over 50 criteria from six subject areas. In addition to a survey of the services of the individual care platforms, the focus of the analysis was also on other business model areas, such as the value proposition, the target groups, the channels selected for addressing customers, and the financing measures of the selected platforms. Data on the individual platforms were collected from the websites themselves and press articles, project reports, and social media presence [10, 17]. Results of the competitor analysis are provided in chapter 3.2.

### 2.2.2 Qualitative Expert Interviews

Building on the competitor analysis, qualitative expert interviews were conducted. The aim of the analysis was to identify the needs, wishes, and implementation ideas of potential users and providers of a care platform. The focus was on the added value the platform would have to offer in contrast to existing solutions to be used by people with assistance needs

and their relatives and for providers to offer their products and services on the platform. This is an important aspect for both the development of the care platform and the business model.

For this purpose, qualitative guideline-based expert interviews were conducted in 2020. These offer more openness compared to standardized interviews so that the interviewees are increasingly encouraged to describe their perspectives and contribute ideas [16]. In qualitative social research, there are a variety of different guided interview forms, all of which use the guide as a data collection instrument. Due to the research project and the objective pursued by it, expert interviews were selected as a suitable method. With this method, the focus is not on the interviewees themselves, but rather the experts represent their respective topic area or context, for example, as a care service provider, care advisor, provider of care or AAL products, etc. [16].

The guideline for the guideline-based expert interviews was developed methodically with the help of the SSP principle of guideline creation according to Helfferich [18, 19]. On the one hand, this was intended to create a certain openness within the interviews, but on the other hand also a rough framework for the interviews. After the guide was developed, it was tested again using pre-interviews. A part of the wording was slightly modified and some terms were replaced to be easily understood. The final guide consists of eight categories with a total of approximately 32 questions.

In selecting the experts, an attempt was made to reflect the heterogeneity of the research field as much as possible. However, due to the limited duration of the research project, a selective rather than a theoretical sampling was carried out. For this purpose, criteria were defined in advance as to which experts were to be interviewed. For the research project, the experts needed to come from as diverse a range of thematic areas as possible to incorporate different perspectives on the development of a care platform. In addition, the interviewees should be in regular contact with people with assistance needs and their relatives and thus with potential users of a care platform. In addition, the experts or the companies where the interviewees work should be eligible as potential providers on a care platform. After selecting the experts and arranging the appointments, the interviews were mainly conducted in person at the experts' premises. Since all interviewees agreed, they were also recorded using a dictation machine. A specially prepared data protection declaration was prepared for this purpose, based on the EU General Data Protection Regulation. A total of 15 experts were interviewed.

The experts came from the fields of nursing and social counseling, health and long-term care insurance, housing counseling, welfare associations, financial service providers, senior citizens' representatives, and mail-order pharmacies [17, 20]. The interviews were between 45 and 90 minutes in length. After the collection of the data material, the interviews were analyzed with the help of the software MAXQDA and methodically with the help of the content analysis of Gläser and Laudel [21].

The results of the qualitative expert interviews are provided in chapter 3.3.

### *2.2.3 Quantitative Analysis*

Due to the Covid-19 situation in 2020 and 2021, a qualitative survey of persons with assistance needs and their relatives was not conducted. Instead, a quantitative survey of persons predominantly over 50 years of age was conducted in cooperation with the German Seniors' League in the fall of 2021. The survey aimed to gain a better understanding of the potential target group for a care platform and their specific wishes and needs in the care sector. With the help of the information obtained, the platform concept created based on the other analyses was to be reviewed once again and adapted if necessary. In addition, channels for later addressing the potential target group were to be identified. The questionnaire consisted of a total of 20 topic-specific questions on needs in the area of care and assistance, in the area of digital care consultations, as well as financing and funding options and the information channels used on the topic of care. The survey

was primarily aimed at seniors who use the Internet. The survey was, therefore, conducted online to survey future users of the care platform.

A total of 466 people were surveyed. Of these, 38.6 % indicated to be male and 29.8 % to be female. Of the respondents, 320 (68.7 %) provided age information. Accordingly, most of the participants were between 71 to 80 years of age (38.8 %), over 80 years (26.3 %), or between 61 to 70 years (25.6 %). Most of the respondents were also married (63.9 %) and lived in two-person households (64.3 %).

The results of the quantitative analysis are provided in chapter 3.3.

### **3 ASSESSMENT OF NEEDS**

In this chapter, based on the needs of cities, persons in need of care, and their relatives, as well as service providers, the relevance and importance of a digital care platform will be shown. For this, the findings of the human-centered design approach (see chapter 2) will be considered.

#### **3.1 Needs of Cities**

The demographic change will be a central topic in urban development as many people move into big cities that implement smart city concepts. This movement also includes the elderly and people with assistance needs, which poses challenges for smart cities on the rise, as an increasing number of these people will spend the last years of their lives in a smart city environment [22]. These challenges include barrier-free modes of transportation within a city, barrier-free living accommodations or loneliness in old age as well as cost-efficient living conditions “that answer to expectations and needs of the aging population of the city” [23]. A smart city has to, therefore, consider the special care needs of this vulnerable population group as municipalities and large cities are responsible for the care of these citizens, e.g. [24]. With the concept of Primary Health Care (1978) and the stronger anchoring of cities as places of human health as well as the focus on the local provision of health services (Ottawa Charter 1986), health promotion in cities gained great importance and could also be politically implanted [25]. Especially health care is a central motive because multi-morbid and chronic diseases occur predominantly in old age [26]. In 1995 the Social Care Insurance was created in Germany [27]. The Social Care Insurance most important principle (§3 SGB XI) states, that an ambulant care supply at home is in favor of care in retirement homes. Meaning that people with assistance needs should be treated and cared for at home as long as this is possible. This meets the wishes of those in need of assistance as they can live independently at home for a longer period. On the other hand, costs are saved, as inpatient care is often more costly for those in need of assistance and their relatives, as well as for cities [28]. A care platform can support this principle by offering predominantly outpatient care and support services, thus enabling people to live at home for longer.

Smart city concepts can set important milestones and ensure social inclusion by being socially responsible for their citizens – especially for older citizens. Social responsibility is the implementation of certain inner-city activities and areas of action that cities carry out in their responsibility and above the legal framework [29]. Therefore, social responsible activities are not a legal responsibility but a voluntary offer to citizens. Tetrova and Jelinkova order these activities in different dimensions: Next to the social dimension – that is focused on in this paper – activities can take place on an economic, ecological, ethic, and philanthropically dimension [29]. In the social dimension, health care for the citizens is in focus [29]. The aim of being social responsible towards citizens is the strengthening of the community as well as a timely reaction to spontaneous demands while offering high-quality services [29, 30]. In addition to social responsibility, smart cities that act in a human-centered manner are particularly interested in ensuring service quality and strengthening relationships between stakeholders and citizens in the area of economics. At the same time, resources are to be efficiently

used. Yarimoglu concretized the inner-city activities even further: Home care as well as daily care count as activities of cities' social responsibility, which is especially relevant for the elderly and people with assistance needs [30].

Rakitovac emphasizes the central role that cities take in the societal transformation as well as the responsibility that comes with it. Large cities and municipalities are pioneers to a more sustainable future [31] – which includes social responsibility for vulnerable addressees. Local authorities have financial resources to drive forward social change. The promotion and financial support of an efficient, digital care platform that increases the quality of life of elderly people and people with assistance needs can be a suitable means to promote health care in smart cities. The scope for design to support such projects is given in the municipalities: Within their possibilities, it certainly is practicable to be responsible for their citizens in their design [31]. In Germany – for example – this scope for design is limited due to Federalism and paying attention to Federal Law [25].

The demands on public health care for the elderly in smart city environments will in the future increase in relevance. In times of enhanced digital networking and the expansion of digital infrastructures, digital care services and face-to-face offers for people with assistance needs should be combined and brought directly to them. Especially important in this context is a timely organization of care services in case of an imminent undersupply [32]. Therefore, digital care platforms have the potential to tackle these challenges when they combine the different offerings and make them available on time.

In conclusion, the relevance of city stakeholders and authorities to promote social change and thus a care platform that changes people's interaction and addresses their needs can be highlighted. The needs of a city regarding a digital care platform can be summarized as follows. On the one hand, the health and nursing care of the population, especially the elderly population, is to be ensured. Since the resources of the cities are small, these must be distributed efficiently. This can be fulfilled by a platform, as it supports outpatient care for the elderly. Cities can create incentives that make volunteering more attractive and expand the resources available for outpatient care of the elderly. In this way, professional care services can be combined with informal care services, which is cost-efficient for cities.

Activities of social responsibility can be combined with economic demands of efficiency and resource saving to tackle demographic challenges such as a shortage of skilled workers. A digital care platform can support citizens with these challenges because of its function to connect people with multiple service providers on time and because it increases collaboration between service providers. By involving citizens, cities are able to initiate assistance that is tailored to their needs.

### **3.2 Needs of Service Providers**

The needs of service providers for a digital care platform were conducted with a competitor analysis and qualitative expert interviews. The methodological proceedings have already been described in chapter 2 and are part of the human-centered design approach presented in this paper.

A competitor analysis [17] (see chapter 2) conducted in the project, which compared existing platforms, showed that existing platforms usually only have 1-2 offerings, e.g. care consultation, in their range of services. Furthermore, current digital care platforms rarely advise people with assistance needs on the topic of digital assistant systems like AAL-systems that could extend autonomous living for elderly people. Digital communication currently does not include photos or video communication. The analysis of the current care service market shows that the demand for a digital care platform that has a more diverse range of offerings and simplifies administrative and documentation work for care providers is high [17].

In the expert interviews, professional care providers, among others, had the opportunity to share their thoughts and needs on a digital care platform and evaluate the idea. Thereby, the service providers highlighted many positive considerations regarding a digital care platform that has yet to be developed. On one hand, caregivers could choose their

clients and schedule their working hours flexibly [17]. This would make the transition back into employment especially for parents on family leave easier.

On the other hand and – to care providers the most important demand – another advantage could be the simplification and reduction of the administrative workload for caregivers [20]. Caregivers explain that with the help of a digital care platform, administration and accounting would be significantly reduced which would give them more time for the actual care work and interaction with people with assistance needs. In a first step, thanks to an individual profile, client data and standard questions about illnesses, medication, and special needs are already known to the service providers. A digital care platform would also be a means to refinance care consultation [20]. Presently, care consultation is cost-free in Germany. Through a digital care platform, the service providers would have a chance to refinance the consultation [20]. Furthermore, data management would be simplified. Another aim of the digital care platform is the analysis and care of the handed client's data without restricting data security. This would require a comprehensive, human-centered data usage concept that has to be designed with this in mind. With a digital care platform, it could be possible to initiate cooperation between different professional care service providers. Employee absences are better coordinated which would lead to a reduction in the workload of caregivers [20]. This means that caregivers from different service providers can stand in for employees of another service provider – meaning that they work across companies – to ensure health care for the person in need. Additionally, the visual design and presentation of the service providers on the platform would be a form of marketing for the service providers.

### **3.3 Needs of Persons in Need of Care and their Relatives**

With the help of the expert interviews, the user perspective regarding a digital care platform could be evaluated and contextualized by experts. The questioned experts offered multiple reasons why people with assistance needs need a digital care platform to support the booking process for care services. First of all, people with assistance needs to get in contact with each other and other service providers as well [20]. Other phenomena associated with high age – such as old-age poverty and loneliness – can be counteracted with the connection and interaction with people who are in the same condition.

A digital care platform has the main advantage that it adapts the booking process for users to make it more spontaneous and flexible, so that care services may be booked anywhere at any time. Furthermore, the portal lists a multitude of cooperating service providers and recommends the most suitable provider to the person in need of care based on their preferences. Thereby, the platform has an orientation function and creates transparency on the unclear care market [20]. The confusion created by multiple and unclear care services on the market can be prevented. The user, therefore, is empowered to gather information in a dashboard that is senior-friendly and visually appealing. This lessens the information asymmetry in the care market and enhances participation [20]. Furthermore, interested parties gain an insight into the prices and financing possibilities. The demands of people with assistance needs and their relatives for a digital care platform are conducted with a survey by the project Smart Care Service in cooperation with the internet portal and non-profit association German Seniors' League. The results relating to the needs of people with assistance needs and their relatives will be presented and discussed.

In the majority, the respondents are internet-savvy people for which the internet is the most important source of information in terms of care services (32,2 %). Especially for people above 80 years and single people, the internet is the first source of information concerning care services, care providers, and care consultation. The question, of which digital platforms people use to inform themselves on care services, is especially interesting. It is striking that 62,2 % of the respondents do not use or know any digital platforms. 36,8 % use digital platforms for the search for information. They mention “Google”, “the internet” and “German Seniors' League” as top digital platforms – even though the internet and



Google are no digital (care) platforms. Although there are informational resources for seniors on the German Seniors' League website, you do not get options for booking care services there. Other mentioned digital platforms consisted of websites of social insurances, care, or welfare institution websites. Even though the respondents could be described as internet-savvy, they could in the majority not name many digital care platforms. The variety of information sites mentioned indicates that these people may need a single point of contact for searching, booking, and consultation relating to care services. Therefore, the need for a guide to help the elderly through the multitude of information channels and enable them to book spontaneous support services becomes clear.

#### **4 BUSINESS MODELS**

In the relevant literature, there are numerous different definitions of the term business model and (numerous) business model structures [33], e.g. the Business Model Canvas by Osterwalder and Pigneur [34] and the business models structures given by Zott and Amit [35], Björkdahl [36], Chesbrough [37], and Teece [38]. In general, the process of creating business models systematically captures all relevant aspects that are relevant to the product or service being developed [28, 39]. The goal here is, among other things, to achieve a sustainable positioning in the market. According to the Business Model Canvas, a business model consists of nine core elements: key partners, key resources, key activities, value proposition, relationships, channels, customers, revenues, and costs [34]. The value proposition in particular is a crucial component of a business model and describes, among other things, what added value is offered to customers by the product or service [34].

In the following, the business model aspects of customers, channels for addressing them, and value proposition are examined in more detail based on the results of the analyses depicted in chapter 2.

##### **4.1 Customers**

The results of the competitor analysis show that currently mainly relatives and in particular, the children of persons with assistance needs are addressed as customers on corresponding care platforms. However, the qualitative survey (see chapter 2) revealed that often the partners of persons with care and assistance need initialize the contact with care providers, advice centers, etc.

The results also show that existing care platforms rarely target younger people with needs for care and/or assistance. The quantitative survey of the German Seniors' League (see chapter 2) also revealed that people who are active on the Internet also like to make use of online services for themselves or their relatives in old age and mainly obtain information on the Internet. According to this, persons with assistance needs as well as their partners also come into question as customers and potential users of a care platform. They should, therefore, not be neglected both during the human-centered development of the platform and later when addressing users on the platform. According to the qualitative survey, additional consideration and addressing of these groups of people on the platform could also have a positive effect on the acceptance of the platform and also differentiate the care platform from other platforms.

##### **4.2 Channels**

The results of the competitor analysis of other care platforms showed that the platforms studied are advertised through newspaper articles and TV appearances, among other channels. 83 % of the platforms are also present on social media platforms. The option of using the platform via an app is currently offered by around a quarter of the platforms studied.

As part of the qualitative analysis, it emerged that word-of-mouth propaganda was a crucial aspect. This could be achieved by distributing relevant information about the platform in senior citizens' groups, senior citizens' representatives,

associations, clubs, or the health insurance fund. In addition, it is advisable to place articles in local, free newspapers or national newspapers and magazines. Furthermore, television advertising or Internet advertising could be placed. The popular public broadcasters as well as Facebook, Instagram, Youtube, and online ad networks for Internet advertising would be suitable for this. Mailing campaigns could also generate some reach. In addition, according to the respondents, it is important that the platform is quickly suggested in certain search queries via online search engines. For queries, a telephone number should be provided on the website in addition to an e-mail address.

As part of the quantitative survey conducted with the German Seniors' League, the participants were asked, among other things, which information channels they use to find out about offers and solutions in the area of care. This revealed that 57.5 % of respondents use the Internet as a source of information. These were followed by care services and friends/family, each with 36.5 %. Some of the respondents also use care support points (24.2 %), the living environment (11.6 %), and the medical supply store (11.2 %) as information channels. Subsequently, the respondents also had the opportunity to rank the information channels mentioned according to their importance. This revealed that 57.3 % of all participants and 34.5 % of the over-80s regard the Internet as the most important source of information. Family and friends, on the other hand, were rated as the most important information channel by 30.1 % of respondents. As part of the survey, participants also had the opportunity to enter further information channels via a free-text field. In addition to a large number of different answer options, physicians (especially family doctors), pharmacies, local authorities, television reports, free pharmacy magazines, colleagues, the community, and health insurance companies were indicated by several people as information channels in the field of care. The results of the survey show, particularly in the area of the very old, that the study is not representative of the age group. This is also made clear by the German Digital Index 2020/21, which concludes that around 72 % of the over-65s are so-called "offliners" and therefore, do not use the Internet [40]. However, the target group of survey participants was not designed to include the entire population. Rather, the survey was intended to address potential users of a care platform. For this reason, the survey was also conducted online.

### **4.3 Value Proposition**

The value proposition is at the essence of a business model. It reflects the benefit or added value that customers achieve by buying the product or using a service [11]. The aim is to look at why potential customers use the care platform from their perspective. Chapter 3 already presented in detail the results on the identified needs of the municipalities, the care service providers, and the people with assistance needs as well as their relatives. In the context of the competitor analysis, areas were identified, such as advice on AAL systems, addressing older people, and the usability of the platform via an app, which are currently rarely or not at all covered by existing platforms. This is also reflected in the further analyses. In the qualitative analysis, the respondents described existing platforms as "insufficient". In the quantitative survey of people in the potential target group, the vast majority of respondents were not aware of any care platform.

The interviewed providers expect that a platform brings them added value above all if it would simplify the organizational, bureaucratic, and billing effort, formalities and applications could be processed quickly and transparently, and cooperation with other service providers in the event of care bottlenecks due to sickness absence. The potential users stated, they hoped that a care platform makes it easier for them to access accurate, bundled, and comprehensible information. The added value gained from a care platform consists of customized offers with transparent prices and quality assessments for booking. Thus, they expect a platform supporting them in their decision for or against a product or service. In addition, the platform is to promote exchange and communication opportunities with people in the vicinity or with similar assistance needs [41].

The value proposition in particular can serve as a basis for the development of financing models for a care platform. The higher the added value generated by the care platform for providers and/or users, the higher their willingness to pay [23]. If, in addition, municipalities achieve added value through the care platform, for example by demanding outpatient care and using resources in the care and health sector more efficiently, their interest and, if applicable, their willingness to support the development and maintenance of a care platform also increases.

## 5 CONCLUSION

A human-centered design approach was used to develop a care platform that offers significant added value to both users (people with assistance needs and their relatives) and providers of services and products on the platform. In this regard, a competitor analysis, qualitative guideline-based expert interviews, and a quantitative survey of potential users were conducted.

In conclusion, not only future platform users have a special interest in a digital care platform, but also smart cities and care service providers gain advantages by an additional service in the health sector. In addition to inclusion and ensuring care supply, the financial aspect and the way the platforms are designed is also an important factor to consider when designing a digital care platform. An overview of suitable business models was also provided. Additionally, ways of addressing potential users were discussed. The need for a functioning and efficient healthcare system in smart cities will steadily increase due to demographic challenges. It can be highlighted that this offers a good opportunity for municipalities and cities to enable efficient use of care options.

For the care platform to be successfully implemented, suitable business models must be developed. In the context of this work, the areas of customers, channels, and value proposition for a care platform were examined in more detail based on the analyses carried out. Additionally, further analyses based on this needs assessment can be carried out in the future. Further experts and municipalities could be approached for this purpose.

Therefore, measures must be designed and taken to prevent citizens from being undersupplied. These measures have the potential to address the high demand for care services through more diverse offerings. In addition, a digital care platform that supports the care of the elderly could positively influence the quality of life and attractiveness of cities.

Furthermore, it was determined how potential customers and providers can be addressed and what value propositions encourages the wish to participate on the platform.

In the background of the human-centered design approach, a mock-up is currently being developed based on the results of the analyses, which will then be evaluated. For this purpose, potential users of a care platform are to test and discuss the mock-up in workshops. The business model aspects of value propositions, customers, approach channels, and financing approaches will be further deepened based on the results of the analyses for a care platform. The human-centered design approach will be further implemented by conducting expert interviews with data protection officers who advocate a human-centered data usage concept. This helps to avoid potential challenges of a care platform, such as data security and privacy, and to meet the users trustfully at eye level.

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