Smart Work

Healthier work and life at a construction site - a digital approach for a better corporate health management

Master Thesis

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by
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St. Pölten, May 11th, 2019

Declaration

I declare that I have developed and written the enclosed Master Thesis completely by myself, and have not used sources or means without declaration in the text. Any thoughts from others or literal quotations are clearly marked. This work was not used in the same or in a similar version to achieve an academic grading or is being published elsewhere.

St. Pölten, May 11th, 2019

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Signature

Preface

Writing the master thesis was an enriching process that helped me to hugely expand my knowledge. This process could not have been achieved without the help and advice of many people and therefore, firstly I would like to thank my master classmates for sharing their knowledge with me. Secondly, I would like to thank my supervisor FH-Prof. Romana Bichler, PT MAS for her guidance, assistance and advice. Last but not least, I would like to thank my family for being my support especially my wife for her encouragement and patience.

This thesis would not have been possible without the participants who took part in the usability test. Therefore, a big thank to Dr. Lukas Küster for his support.

Abstract

Staying healthy is the ultimate goal for all people. Companies want healthy and motivated employees. Successful corporate health management offers the opportunity for that. The challenge is the implementation of an approach with different activities. Starting from activities related to movement and ergonomics, nutrition, addiction, and progressing to information and communication management in companies. Health management with uniform activities for all employees rarely succeeds because many such offers lose their charm for employees. Given this it is better to respond to the existing needs of a target group with specific high quality activities. Digitalization is moving into corporate health management. This can overcome temporal and local barriers and create exciting opportunities for a new interaction paths.

The purpose of this master thesis was to examine the acceptance of a digital corporate health management approach for a specific target group. The development of the prototypical mobile application was based on interaction design and usability. The development of the application had two phases, design and implementation. Design features, functionality and a gamification approach were chosen through different methods. A Low Fidelity prototype was developed in the pre-study phase. This prototype was the basis for the development of the application. By combining the theoretical background of user experience, usability and user centered design with the design and development phase, a High Fidelity prototype was developed and tested with specific users.

The most important findings of the usability test were that all users preferred to interact with the application and were very pleased with the prototype. Also, regarding the motivation in form of a gamification approach turned out to be a good motivational tactic.

Kurzfassung

Gesund zu bleiben ist für alle Menschen das höchste Ziel. Auch Unternehmen wünschen sich gesunde und motivierte MitarbeiterInnen. Ein erfolgreiches betriebliches Gesundheitsmanagement bietet die Chance hierzu. Die Herausforderung ist die Implementierung eines Ansatzes für verschiedene Aktivitäten. Angefangen von der Organisation von Maßnahmen in Bezug auf Bewegung, Ernährung und Sucht bis hin zu Informations- und Kommunikationsmanagement im Unternehmen. Ein Gesundheitsmanagement mit einheitlichen Maßnahmen für alle MitarbeiterInnen, hat nur selten Erfolg. Im Versuch, es allen recht zu machen, verlieren viele Angebote ihren Reiz für die MitarbeiterInnen. Besser ist es mit spezifischen, hochwertigen Maßnahmen auf die bestehenden Bedürfnisse einer Zielgruppe einzugehen. Die Digitalisierung hält im betrieblichen Gesundheitsmanagement Einzug. Dabei können zeitliche und örtliche Barrieren überwunden werden und spannende Möglichkeiten für neue Interaktionswege entstehen.

Das Ziel dieser Masterarbeit war die Evaluierung der Gebrauchstauglichkeit eines digitalen Ansatzes für ein betriebliches Gesundheitsmanagement. Insbesondere sollte diese Untersuchung auf eine spezifische Zielgruppe ausgerichtet sein. Die Entwicklung der prototypischen mobilen Anwendung basierte auf den Themen Interaktionsdesign und Benutzerfreundlichkeit. Die Entwicklung der Anwendung bestand aus zwei zusammengehörigen Teilen (Designentwicklung und Implementierung). Die verschiedenen Entwicklungskomponenten für Design, Funktionalität und Gamification Ansatz wurden durch verschiedene Methoden ausgewählt.

Auf Grundlage eines Low Fidelity Prototypen aus der Vorstudienphase wurde die Anwendung entwickelt. Durch die Implementierung sowohl des theoretischen Hintergrunds als auch der Ergebnisse der Designentwicklung wurde ein High Fidelity Prototype entwickelt und mit bestimmten Personen getestet.

Das Ergebnis weist eine hohe Akzeptanz und Zufriedenheit der Benutzer mit der Interaktion der Anwendung. Auch der Gamification Ansatz erwies sich als gute Motivationstaktik.

Table of Content

1 Introduction

The purpose of this thesis is focused on designing, developing and evaluating a prototypical mobile application for a digital corporate health management approach. Moreover, the challenge is the implementation for a specific target group with various corporate health management activities. Starting from the organization of measures concerning movement, nutrition and addiction up to information and communication management in companies. Furthermore the strengthening of the health behaviour and health literacy is in focus. It is a well-known fact that the digitalization find one´s way into the corporate health management. All this indicates a overcome of temporal and local barriers and a new formation of interaction paths.

This chapter describes the background of the topic and introduces the research question and the motivation, followed by a short overview about the structure of the study.

Nowadays, we live in the technology age where computers, smartphones and tablets have become an integral part of our lives. In particular, smartphones are our daily companions and helpers. Mobile technologies integrate seamlessly into our everyday life. Therefore, our interpersonal communication and our information brokerage is progressive. Staying healthy is the highest goal for everyone. For this reason, also companies want healthy and motivated staff. A successful integrated corporate health management system offers a win-win chance for both parties. Therefore, a uniform corporate health management offers no success for an increase in the acceptance. Furthermore, many choices lose their appeal. Therefore, it is important to integrate specific, high-quality measures for a specific target group. In order to increase the utilization behaviour.

The aim of this work is to answer how far a mobile application developed for a specific target group can increase the acceptance for a corporate health management approach among the workers.

In order to answer the research question an digital interaction design for a corporate health management approach should be developed. Particularly, a gamification aspect is in focus. Most of the research efforts are focused on making quick iterations of how to provide a rich user experience for end users to keep them using the application. From the beginning, the design and gamification concept was in focus to enable a great usability which is easy to learn and allows the users to use it during their daily working routine. Finally, design screens should be created to enable the development of the mobile app by developers.

The empirical method of a user test should be used. The usability test should be done at the workplace of the potential users. In the end an evaluation should be carried out by the user experience questionnaire (UEQ).

Part of the authors' enthusiasm in selecting this topic was the experience in working with it in the previous courses of the master degree. It represents an opportunity to work on a project that is needed in the working world.
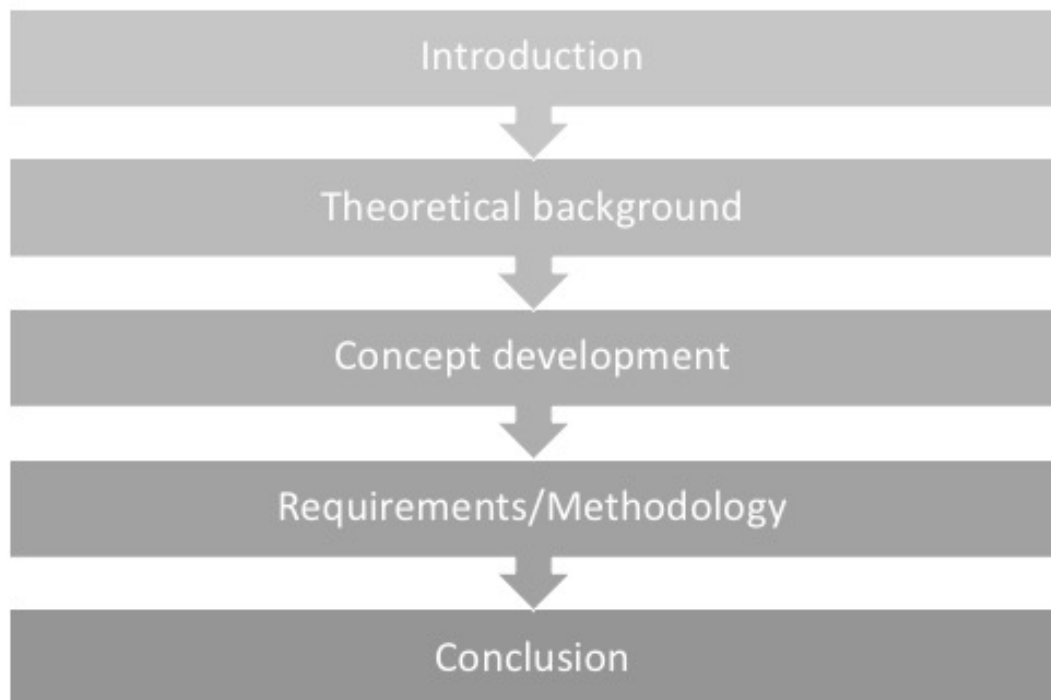
The thesis is divided into five chapters.

Figure 1. structure of the thesis

The first chapter of the study introduces the topic and presents the research question and motivation of this work. It also gives an overview for the structure of the thesis.

The second chapter concerns the theoretical background, which is divided into three subsections. The first covers the corporate health management area, especially, the topic of health promotion and health literacy. The next introduces the development components. In addition, a closer look at usability, user experience, user centered design and visualized communication is scrutinized. The last subsection presents the gamification topic. It starts with a definition of the term and further develops into game properties and game elements.

The third chapter covers the concept of development. This chapter contains all the details concerning the design process such as functionalities and navigation as well as a detailed view of the gamification concept.

In chapter four the requirements and methodology is explained. This chapter is also divided into three subsections. First, an insight into the research question and the research method is given. Chiefly, the participants, usability test and questionnaire are illuminated more precisely. After that, the results of the evaluation are described.

Last but not least, chapter five presents a conclusion as well as possible future work that could be developed to further the study.

2 Theoretical background

This section covers the main development of components as well as theoretical fundamentals, which are important for understanding the presented issue. In addition, the development concept is influenced by the following topics. An extensive insight into corporate health management and a specific focus is placed on health promotion and health literacy. The second part of this chapter delivers an overview of component development. Usability, user experience, user centered design, and visualized communication are core components of this project. Last but not least, the theoretical background of gamification and pertinent terms and definitions are explored in respect to this project. All of these individual topics should be covered in order to have a common starting ground.

2.1 Corporate health management

The company corporate strategy is the base of a corporate health management. Therefore, the corporate health management supports the company to achieve its strategic goals and visions. Only healthy employees can contribute to the well-being of the company. In particular, they have to feel comfortable to get involved and to provide their incentive, knowledge and experience for the company. If this condition is fulfilled, the corporate health management works in the absolute direction of corporate strategy.

The term "health" has a different meaning and place value for every person. In most cases, the importance of health is only recognized when a disease becomes noticeable. Therefore, many people cannot assign a clear and meaningful definition to this topic. Health is defined by the World Health Organization (WHO) as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity (WHO, 1946, p. 1).

The aim of the core concept of a corporate health management is to create and design systematic, sustainable health promoting structures and processes. Moreover, to include the empowerment of members in the organization to a personally-responsible health-conscious behavior (Deutsches Institut für Normung e.V (DIN), 2012, p. 7).

During the establishment of the structures and processes, topics like health promotion and measures for health promotion are forwarded by a corporate health management.

As a part of modern company strategy, corporate health management combines the following objectives:

- prevention
  Aims at preventing diseases in the workplace.
- productivity
  Aims at maintaining and boosting general health and productivity of employees.
- improvement
  Aims at improving motivation and well-being of employees during work.

For this reason, a well-established corporate health management can act on all operational management levels and can modify business goals, management culture, work climate, company processes and working conditions (Badura, Ritter, & Scherf, 1999, p. 17).

Figure 2. corporate health management model
(adapted from Matusiewicz & Kaiser, 2018, p. 63)

Due to demographic change, the main challenge of a company is to maintain employees' health, production and motivation. The rising number of absent staff, due to sickness, means high costs primarily because of continuation of payments (Matusiewicz & Kaiser, 2018, p. 83). Moreover, new employees make demands for a high work/life balance. The implementation of a corporate health management is an opportunity to meet all these challenges.
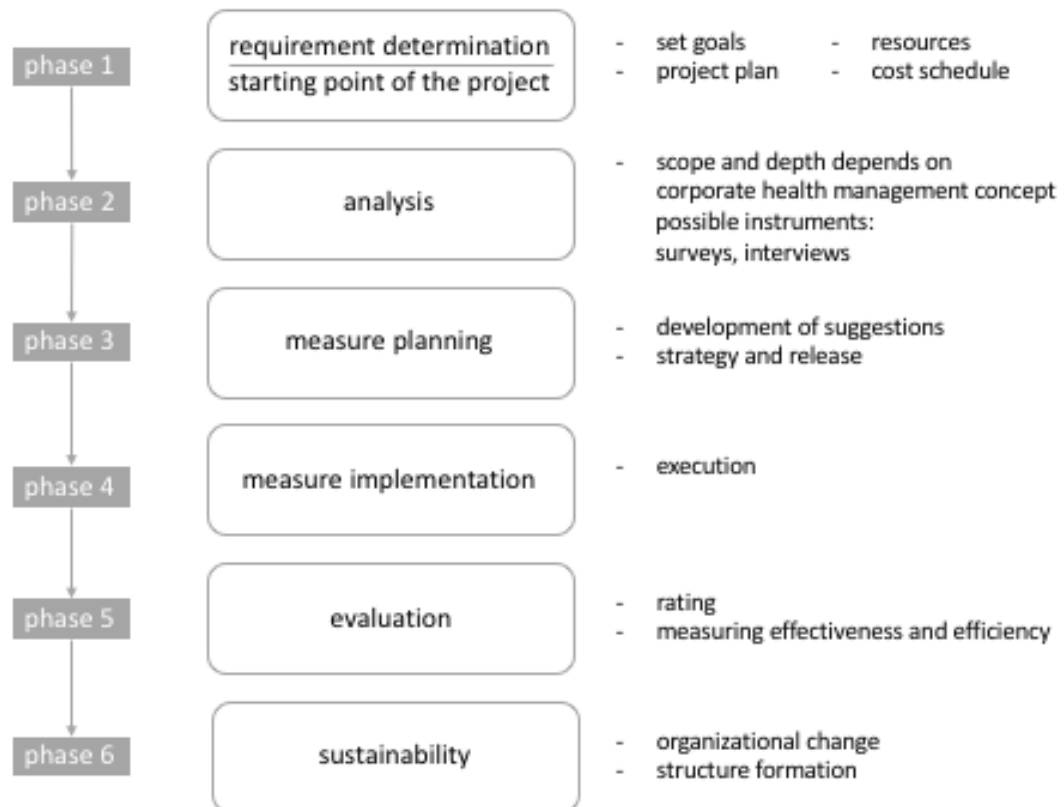

Figure 3. six phase model of the German college for prevention and health management (adapted from Matusiewicz & Kaiser, 2018, p. 85)

The German college for prevention and health management developed a corporate health management model to achieve the handling of these increasing challenges (Matusiewicz & Kaiser, 2018, p. 84). The model consists of six phases. The first five phases describe the introduction of corporate health management and the last phase addresses sustainability of the entire management cycle.

Digital corporate health management combines digital techniques with analog tools. The focus is on easy information, availability of, and access to health promotion information. Additionally, the gamification approach promotes corporate culture. A new way to effect group dynamics is created (Matusiewicz & Kaiser, 2018, p. 2).

2.1.1 Health promotion

Most people associate the term health promotion with individual behavior prevention. Correspondingly, the main focus is on nutrition, movement, coping with stress and consumption of abstinence substances. Individual behavior prevention is incorporated in health promotion (Gudrun, 2017, p. 25). However, it is only a small part of it.

On the one hand, the effectiveness of individual approaches are limited but on the other hand there are legal restrictions prohibiting corporate intervention in individual life styles of employees (Pieper & Schröer, 2016).

Corporate health promotion includes the correction of an individual's behavior. Furthermore, the aim is to structure work on the health promotion model based on technical, organizational, psychosocial and participatory measures and concepts (Gudrun, 2017, p. 26).

The Ottawa-Charta from 1986 describes health promotion as a process of enabling people to gain control over their own health status. The goal is to reach a state of complete physical, mental and social well-being, to identify and to realize aspirations, to satisfy needs, and to change or cope with the environment. Health should be a resource for everyday life and not only an objective of living. Furthermore, health should also be a positive concept emphasizing social and personal resources, as well as physical capacities. Summing up, health promotion is not only the responsibility of the health sector but also goes beyond health lifestyles to well-being (WHO, 1986).

Health promotion can be interpreted in many ways. Another way to describe this term is found in the Luxembourg declaration.

The main focus of the Luxembourg declaration is that only through the combined efforts of employers and employees can the health and well-being of people at work be improved (ENWHP, 2007). It is thereby necessary to combine the work organization with the working environment and to promote active participation. And last but not least, to encourage personal development.

In order to achieve the aim "healthy employees in healthy organizations" it is absolutely essential to adhere to the following guidelines (ENWHP, 2007):

- participation
  All employees have to be involved.
- integration
  Health promotion has to be integrated in all areas of the organization.
- project management
  All measures have to be aligned across a problem solving cycle. (e.g. needs analysis, setting priorities, planning, implementation, continuous control and evaluation)
- comprehensiveness
  The strategy of risk reduction is combined with the strategy of the development of protection factors and health potentials.

The Luxembourg declaration and the Ottawa-Charta are also focused on preventing ill-health at work and enhancing health-promoting potentials and well-being in the workforce. The following comparison table shows the advantages and disadvantages of the previously presented models.

term	explanation	advantage	disadvantage
Luxembourg declaration	integrative concept	promotion of consensus	neglect of conceptual and qualitative differences
Ottawa-Charta	qualification for an active participation	reduction of social inequality	contradictions to corporate structures

Table 1. summary of the discussed concepts (Gudrun, 2017, p. 28)

2.1.2 Health literacy

From the beginning, the topic of literacy is a very complex concept. Generally, it can be divided in two elements. On the one hand, there are task-based elements and on the other hand, there are skill-based elements (National Assessment of Adult Literacy, 2003). The focus of the task-based literacy is on how far a person can perform key tasks like reading a basic text and writing a short statement about it. In contrast, skill-based literacy focuses on the understanding and abilities an adult possesses in order to execute a task. The range for such skills starts from basic levels like identifying words and leads to higher levels such as inferring from a continuous text. To sum it up, it results in an accomplishment gap between those who are able to perform challenging literacy tasks and those who are not (National Assessment of Adult Literacy, 2003).

Figure 4. health literacy framework (adapted from Parker, 2009)

The reason for giving so much attention to this topic is to show that even the most basic skills are responsible for the development of knowledge and the improvement to achieve personal targets. Considering this background, it is not surprising that health literacy level is associated with health outcome (Nutbeam, 2009).

Health literacy is the ability to find health information, not only to understand and to evaluate the information but also to put it into praxis (Sørensen et al., 2015). The result of this procedure is to fit the complex requirements of a modern society in relation to health perception.

Furthermore, health literacy is the totality of all cognitive and social skills necessary in motivating and empowering people to design their own way of life (Kickbusch, Pelikan, Apfel, & Tsouros, 2013).

The topic of health literacy can be incorporated in the working environment. Especially, trust and self-determination are requirements for the implementation.

The following development concept can encourage companies to significantly raise effectiveness of health literacy.
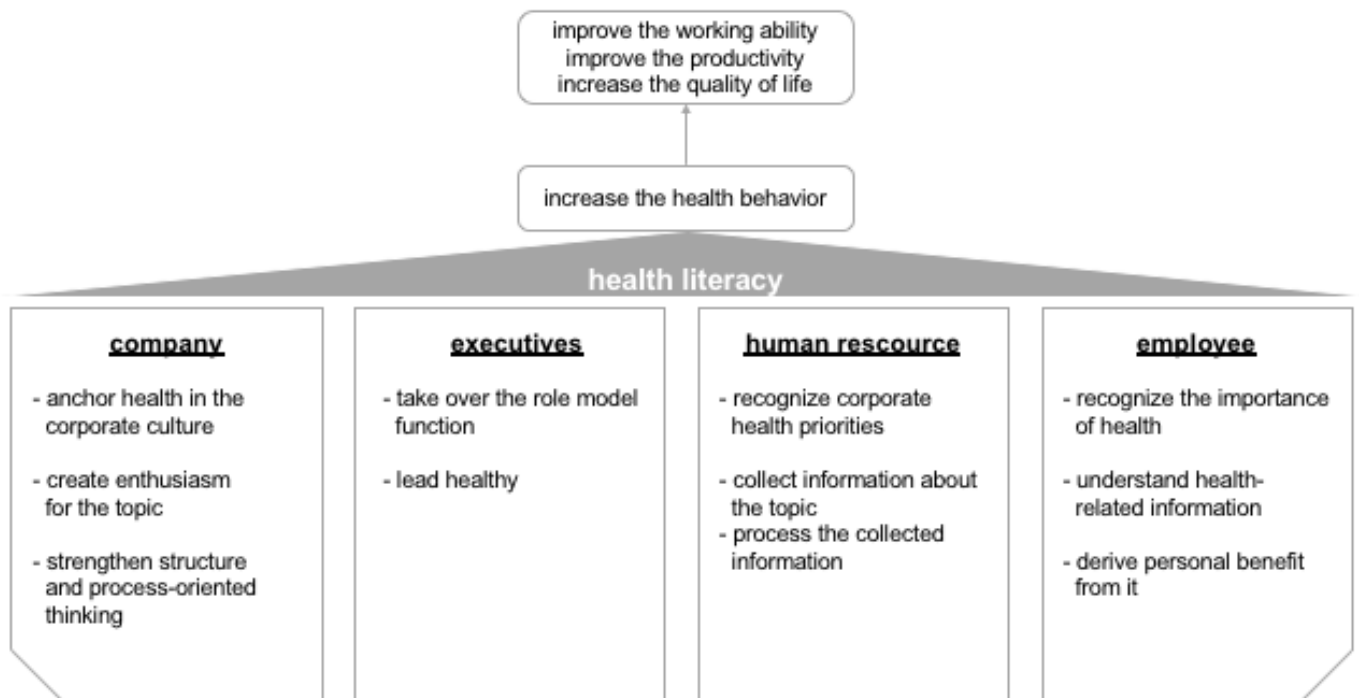

| improve the working ability |
| improve the productivity |
| increase the quality of life |

increase the health behavior

health literacy

company	**executives**	**human rescource**	**employee**
- anchor health in the corporate culture	- take over the role model function	- recognize corporate health priorities	- recognize the importance of health
- create enthusiasm for the topic	- lead healthy	- collect information about the topic	- understand health-related information
- strengthen structure and process-oriented thinking		- process the collected information	- derive personal benefit from it

Figure 5. development and impact of health literacy
(adapted from Pfannstiel, 2018, p. 192)

In order to obtain a stable effect, it is necessary to implement periodic training for all employees at all staff levels. Particularly, all concepts and programs are part of the corporate health management and have to be specifically developed for each company.

The main focus should be on the recognition of health for a personal work environment. Moreover, it is important to understand the context of health-related information and to derive a personal benefit. By the same token, in this context it is also very important to apply suitable measures to working life and also for daily routine (Pfannstiel, 2018, p. 193).

2.2 Development components

The aim of this chapter is to provide an overview of the terms usability, user experience, user centered design and visualized communication. These terms are relevant to the following in order to understand the developing concept. The subdivision of the terms should not represent opposing concepts. Rather, it should represent the necessity of taking into account all terms in order to develop a digital approach.

2.2.1 Usability

Usability respectively user-friendliness are characteristics of a technical system. In addition, it allows users to reach their use goals effectively, efficiently and satisfactorily. It becomes important whenever a person interacts with a user interface of a technical system. Possible fields of application are software at the workplace or even products which are used during leisure time. The focus is on systems with a user interface (International Organization for Standardization (ISO), 2010).

Regarding the definition of the International Organization of Standardization (ISO): the effectiveness is the accuracy and completeness with which a user achieves a specific goal. Efficiency describes the effort used to reach a specific goal. Satisfaction: describes the freedom from impairments and a positive attitude towards the use of the product.

Another definition of usability comes from Norman Nielsen. He describes usability as a quality attribute that measures how easy the interaction with a user interface is (N. Nielsen, 2005).

Usability is not only a single property of the user interface with a dimension. It persist of five different quality components. The aim of the five attributes are to define the usability of a product (N. Nielsen, 2005).

The following table describes the meaning of the different quality components.

quality component	description
learnability	How easy or hard it is for a first time user to complete a task.
efficiency	How fast a task can be completed by a familiar user.
memorability	How easy a familiar user can get his application knowledge back after not using it for a long time.
errors	How many mistakes does a user make during the use of the application and how simply can he continue his work after an error.
satisfaction	How is the feeling of a user during the using of the application.

Table 2. quality components (N. Nielsen, 2005)

The following schematic figure shows the relationship between usability and the next component which is user experience.
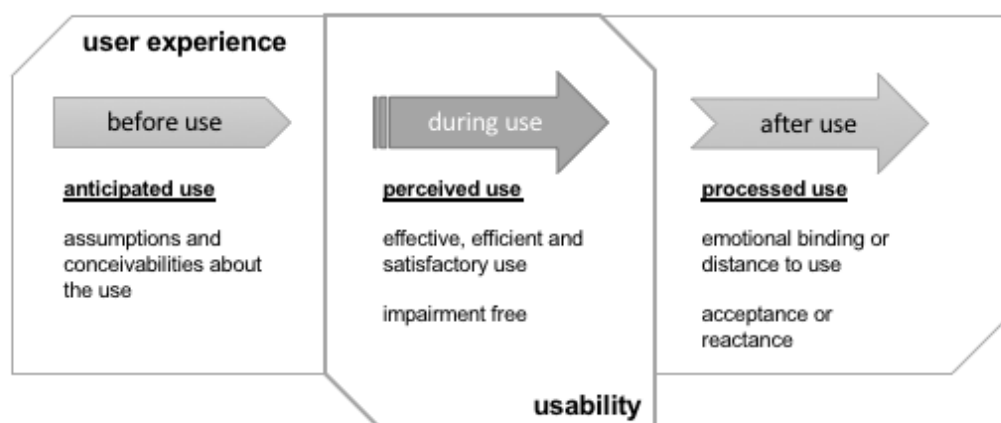
Figure 6. relationship of usability and user experience form view of ISO
(adapted from Florian Sarodnick & Henning Brau, 2016, p. 22)

2.2.2 User experience

User experience (UX) is a term which is often used in the field of Human Computer Interaction (HCI). But a universally accepted definition is lacking (Mirnig, Meschtscherjakov, Wurhofer, Meneweger, & Tscheligi, 2015). In the next section a few commonly used definitions of UX are presented.

Nowadays, one of the most referred definition is that from ISO (Mirnig et al., 2015). The definition is released under the title ISO 9241-210 Ergonomics of Human Systems Interaction. Referring to ISO, UX is the perception and reaction of a person, which results from the use of a product, system or service (International Organization for Standardization (ISO), 2010).

Another definition for UX is from Dr. Donald Norman, a scientist who stamped this term and was one of the first who explained the importance of designing around the needs of users (Mirnig et al., 2015). Regarding to Dr. Norman, UX covers all aspects of the end users interaction with a product or service (Norman & Nielsen, 1995).
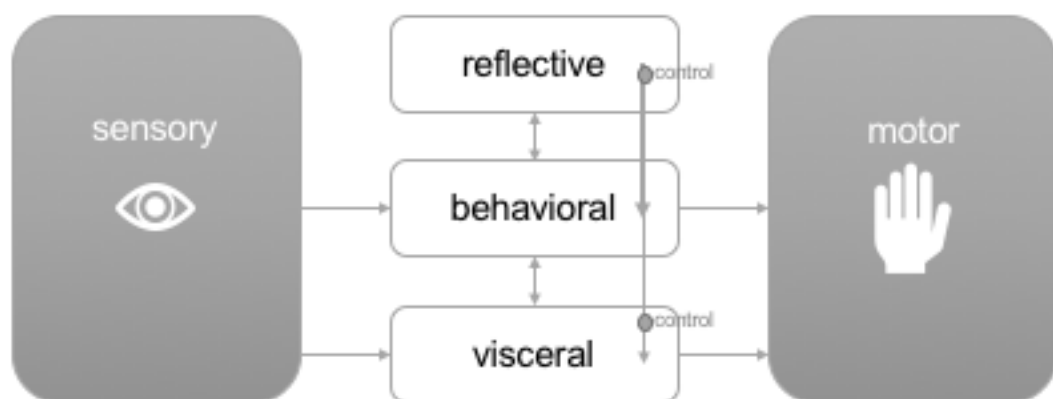
Figure 7. processing levels (adapted from Norman, 2004, p. 22)

A different definition aspect comes from Marc Hassenzahl. His definition for UX focuses more on the subjective aspect of the interaction with a product. In regards to his definition, in order to obtain a high UX it is necessary to get a primarily evaluative feeling while interacting with a product or a service (Hassenzahl, 2008).

A main aspect of UX is that during an interaction with a product or service a user's perception is built. This perception consists of effectiveness, efficiency, emotional satisfaction and the relationship quality (Kuniavsky, 2010). The effectiveness refers to the result of a product or service. The efficiency refers to the termination of a task. The emotional satisfaction refers to the perception of feeling. And equally important, the relationship quality refers to the expectations during the interaction.

The perception of a product or a service can be divided into two individual parts. On the one hand, the first part deals with the ability to complete a task and on the other hand the second part deals with how the status of a user will be changed during the interaction with the product or service (Hassenzahl & Tractinsky, 2006).

Considering all definitions for UX it is very clear that UX serves different purposes. Some of them go more toward scientific perspective and others focus more on practical and business orientation (Gross & Bongartz, 2012). For this reason, it is very hard to only find that one thing that UX is. Likewise, the term itself is related to a lot of different fields such as the experiential area, emotional area, and affective area. Furthermore, it is also assigned to hedonic and pragmatic aspects (Law, Roto, Hassenzahl, Vermeeren, & Kort, 2009).
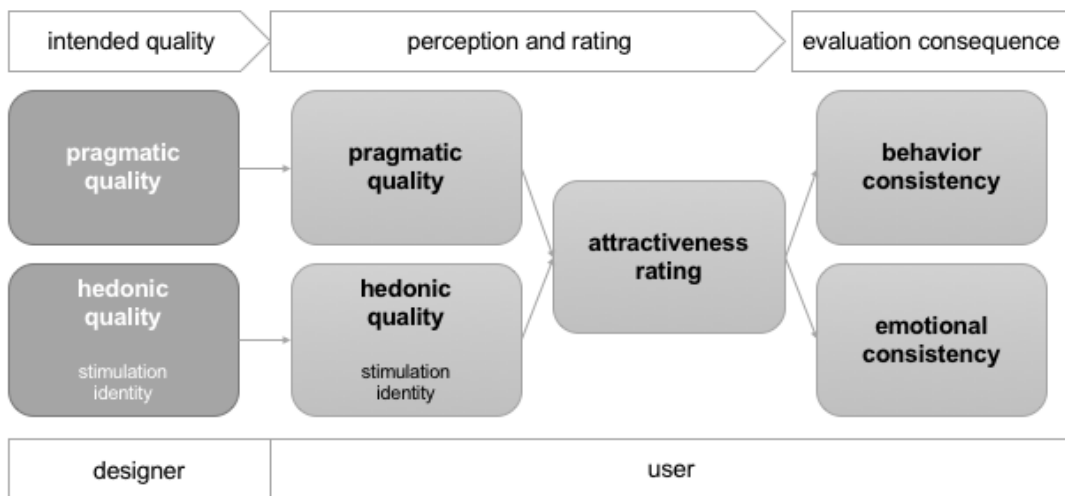
Figure 8. model of pragmatic and hedonic quality
(adapted from Hassenzahl, 2001)

The above aspects are distinguished from each other by their independent qualities. In the first place, there are products or services with a low pragmatic level. This means that the product or service is self-oriented. These products involve the user more productively in the procedure to finish a task. Therefore, the emotional effect is higher for the user. Correspondingly, there are products or services with a high pragmatic level. Products with a high pragmatic level are better in effectivity and efficiency. Nevertheless, the user does not build a connection to the product or service (Hassenzahl, Burmester, & Koller, 2003).

Similarly, the hedonic aspects can also be divided into two parts. Stimulation refers to the natural curiosity of each person and his pursuit for new things and variety. However, identity refers to the identification with a product or service and the ability to transport the image (Hassenzahl et al., 2003).

Regarding the design process for developing a new product or redesigning an existing one, the process itself consists of different development sections such as user research, designing, testing and implementation (Allabarton, 2018).

The ultimate goal of achieving a good UX is to develop products with appropriate characteristics resulting in good experiences when users interact with them (Sahar, Varsaluoma, Kujala, & Väänänen-Vainio-Mattila, 2014).

Concerning the design process, the starting point should begin with knowing the target user itself and their behavior (Macaulay & Busse, 2009).

2.2.3   User centered design

User centered design (UCD) is a process in which the user is engaged during the design process. Regarding the ISO, UCD is the involvement of users in the designing process of a product or service. Moreover, the aim of a UCD process is to understand the user and the task requirement. An appropriate allocation of function between the technology and the user is also important (International Organization for Standardization (ISO), 2010).

The goal is to consider and involve the user at all phases of the design process from the beginning phase up to the evaluation and validation phase. As to this process, there are a lot of steps which should be followed in order to obtain a high friendly-user satisfaction; it is important to lead interviews, to make usability tests and to implement surveys (Goodman, Kuniavsky, & Moed, 2012).

A well conducted user research phase before and during the process can make the difference between a useful/usable/successful product or service or a unprofitable and frustrating product or service. Furthermore, it is very important not only to look exclusively at the user but also to look at the whole context around the user.

With regard to the ISO, there are four general phases which should be considered to obtain a good result (International Organization for Standardization (ISO), 2010). First of all specification in the first phase, it is very important to specify the context of use. This means, to identify your target group and to clarify the purpose of use and the conditions of use. Secondly, requirement specification identifies the task requirements and clarifies the user's goals in order to be successful. Thirdly, design solution in order to develop a successful product, to be aware of the work in stages, beginning with a rough concept and ending with a complete design. Finally, evaluation, evaluate the product with real users by using usability tests.
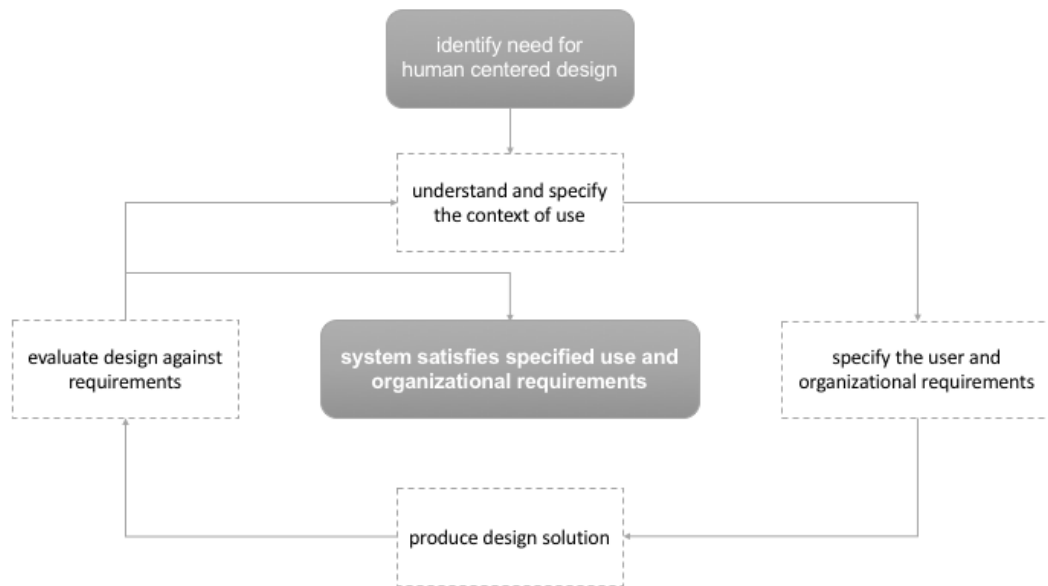
Figure 9. user centered design phases

2.2.4   **Visualized communication**

The basis of every design is the formal design medium. A formal design medium means that you have a concrete object but without defining the specifications for it no one would be able to imagine how this object would look. For example a red circle, nothing is defined but everyone has an idea of what the appearance should be. Based on this consideration a ranking results for the elements used in the formal design medium can be applied (Lankau, 2013).

In ranking, the size has the highest position; followed by color, shape, dimension, position, contrast and texture.

Although, the formal design medium is very media specific meaning that the timbre distinguishes from the body paint. Another example is that a visual composition is different from an acoustic composition. At the same time, there are common elements. Regarding the previous example, a composer has to know all compositional rules in order to create a new piece of music.

The aim of this chapter is to understand the importance of the peculiarity and mutuality of a sign system.
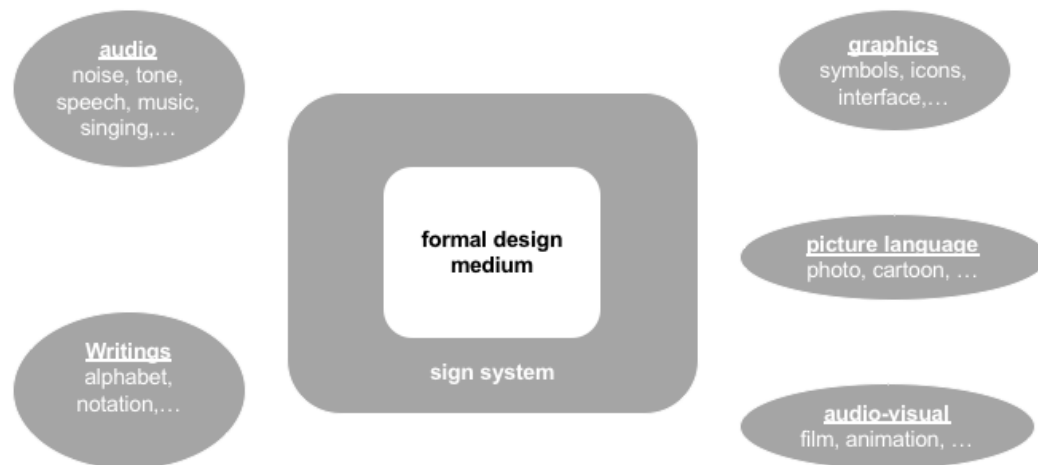
Figure 10. formal design medium (adapted from Lankau, 2013, p. 11)

In the same way, design guidelines are a well-founded set of rules which determine how certain design elements should be used in different application areas. Following this set of rules during the development of a product or service it leads to useable systems (Florian Sarodnick & Henning Brau, 2016, p. 123). The goal is to obtain, as well as design, requirements for communications.

In order to obtain a useable product or service the following guideline framework (the eight golden rules) can be a starting point (Shneiderman & Plaisant, 2009).

rule	description
1.strive for consistency	Throughout the system, be consistent with navigation, fonts, colors, layouts and terminology.
2.cater to universal usability	No matter who uses the interface they should be able to handle it.
3.offer informative feedback	Use a visual or audible feedback to show that an action has been performed.
4.design dialogs to yield closure	Organize individual sequences of action into groups and give constructive feedback when the user accomplished the task.
5.prevent errors	Avoid giving the user the possibility to make mistakes. Such as, allowing alphabetic characters in numeric fields.
6.permit easy reversal of actions	Give the user the opportunity to explore the system and to try out actions without having to worry about the consequences.
7.support internal locus of control	Don't change a familiar environment during the system.
8.reduce short-term memory load	Don't require the user to remember information from one screen to the next.

Table 3. the eight golden rules (Shneiderman & Plaisant, 2009)

Another starting point for this topic is the guidelines framework from Don Norman. The design principles are especially a reference for graphical interfaces (Norman, 2013).

design principle	description
1.visability	The function of the product or service should be recognizable at first glance.
2.feedback	Notifying the user about the accomplished tasks. So that the user can continue with the activity.
3.constraints	Restrict the way a user can interact with the product or system. Such as, highlighting push-able buttons and grey marking buttons who are not supposed to be pushed.
4.mapping	Incorporate a relationship between controls and their effects in the real world. For example, arrow keys which represent the direction.
5.consistency	Integrate similar operations and elements for achieving similar tasks.
6.affordance	A user should immediately understand how to use a property at the first glance.

Table 4. design principles (Norman, 2013)

The importance of all presented topics in this subchapter are inconceivable. Due to the sharp evolution of technology, more and more human computer interactions are being integrated in our personal lives. Due to this increase, the importance of useable products or services is also becoming more and more significant. To conclude, the main denominators regarding the component development components is user involvement. Foremost, never forget that the user should do something with the interaction. Subsequently, and maybe the most important point is not to forget that the user has to feel comfortable while using the product or service.

2.3 Gamification

It is a well-known fact that gamification uses most of the characteristics of games and was born out of the idea of playing instinct of humans. The following subchapter covers the relatively new term gamification. At the beginning, an extensive insight into the definition is given. Furthermore, the properties and the different elements important to a gamification concept should be explained.

2.3.1 Terminology

Due to the relatively short existence of this term, there is no clear definition for gamification. Varying explanations are found in different publications. For this reason, the following sector should provide an overview of the most important ones.

The first definition, defines the term gamification as the use of game elements and game design techniques in non-games areas. The main focus lies on three mentioned aspects (Deterding, Khaled, Nacke, & Dixon, 2011).

Game elements are tools which are needed for a gamification approach. The aim is to develop a service concept which uses certain game elements, whereas game design techniques describe a special form of presentation and execution. The principal purpose is to bond the user with the gamification offer. The secret of a good gamification concept is that foreign areas refer to anything that does not happen for the role of playing. The reason for activity is rational and outside the game. In addition, the foreign context has a certain importance and intention. The main feature depends on independence from the game (Werbach, 2012).

Another point of view of gamification is to see it as a process of game thinking. Through the application of game mechanisms, users are connected through participation which should lead to solving different problems or tasks. Because of the conversion of a normal activity to a game, the output is a certain behavior change (Zichermann & Cunningham, 2011).

	game thinking	game elements	game play	just for fun
gameful design	✓			
gamification	✓	✓		
serious game/ simulation	✓	✓	✓	
game	✓	✓	✓	✓

Table 5. design concepts differences (adapted from Marczewski, 2015)

Another approach to describing gamification is the increasing importance and institutionalization of video games and their influence on everyday life (Deterding et al., 2011). According to Deterding et al. (2011), the main feature of this description is that through video games the user could be motivated with consistent intensity over a prolonged period of time. Special development for the purpose of entertainment is directly related to success.

In order to do a task, a gamification concept can be helpful to force the user's participation and motivation. The aim of this gamification approach definition is to satisfy the intrinsic motivational needs of the user (Aparicio et al., 2012). The following table shows a method of how to implement effectively a gamification approach.

steps	description
identify the main objective	The main task that should be supported by the gamification concept.
identify the transversal objective	Searching for an interesting objective for the users to implement in the game mechanics to increase the motivation.
game mechanics selection	Find the right mechanics that fit the needs of users in relation to their intrinsic motivation.
effectiveness analysis	An analyze of gamification in relation to satisfaction, fun and quality should value the implementation process.

Table 6. implementation method for a gamification concept
(adapted from (Aparicio et al., 2012)

2.3.2   **Game properties**

According to the previous definitions, a gamification concept defines the introduction of game elements in non-gaming activities in order to improve user experience. The main focus is on using only selected objects and elements from video games such as a reputation system or a view of ranking system (Deterding et al., 2011).

The four properties illustrated in the following figure are required transform a activity into a game.
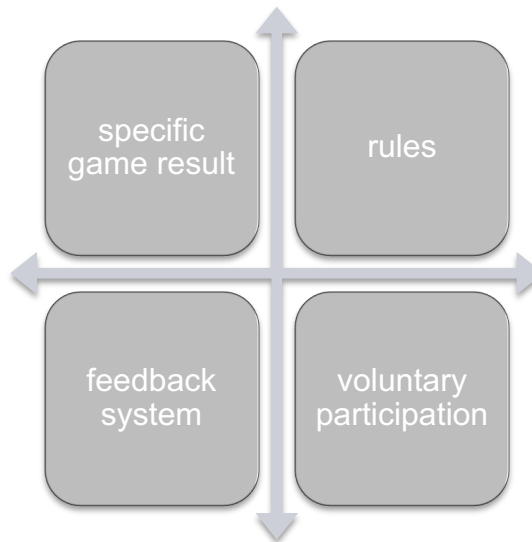
Figure 11. gamification properties (adapted from McGonigal, 2011)

The first property is about the target of the game. The attention and participation of users are connected to the specific game result. This property gives the game a sense of purpose.

The second property describes the borders within a target that should be solved. The main task of this property is to limit the ways of achieving the goal and through this limitation to stimulate the creativity and strategic thinking of the user.

The third property gives information about how close users are to the goal achievement. Different display options are available in order to show the progress. The aim of this property is to give the users the promise that the goal is achievable and to maintain the motivation for continuing to play.

The last property describes the voluntary participation. The focus of this property is that all users accept the target, rules and feedback system of the gamification concept consciously and willingly. This is also the basis for several users to be playing together.

2.3.3 Game elements

Due to a specific structure the elements of a game can be formalized. This structure is called mechanics, dynamics and aesthetics (MDA) framework (Hunicke, LeBlanc, & Zubek, 2004).
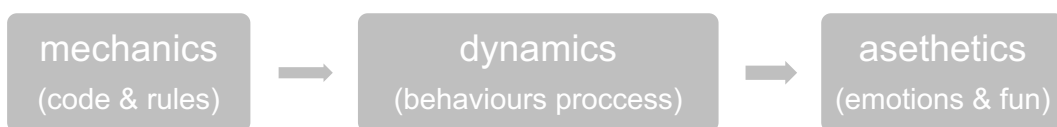
Figure 12. MDA framework (adapted from Hunicke, LeBlanc, & Zubek, 2004)

The first part of the framework describes certain components of the game in terms of data and algorithms. Additionally, this part also includes various actions, behavior components and control possibilities along with the content of the game they support the dynamics part of the framework.

The middle part of the framework denotes the behavior of the mechanism depending on the input of the user. Moreover, it creates aesthetic experiences for the users during usage.

The last part of the framework deals with the emotional reactions of the users during usage. These includes the imagination, the challenge and the discovery or devotion.

Every gamification concept follows different aesthetic goals and therefore every concept is unique. Equally, this is also the reason why each user prefers a different game (Hunicke et al., 2004).

According to the previous subchapter, gamification takes advantage of game mechanics in order to offer non-playful activity qualities which are more entertaining and appealing. In this context, the different levels of engagement are playing a major role especially community engagement which allows a deep interaction with the user. Dialogue with the users and the building of community structures are also promoted.

All this represents an effective tool for companies to provide information, to influence consumer behavior of the employees, to conduct the product and brand perception and to motivate the employees (Hunicke et al., 2004).

Ultimately, game mechanics provide numerous opportunities to engage a target audience with a specific topic (Meloni & Gruener, 2012).

As previously mentioned, the focus is often on the game mechanics, especially on the many different feedback options. The following table shows the most important game mechanics in order to increase the motivation of the users.

game mechanics elements	description
points	• step by step rating for the users • different point systems possible: experience points, skill points, redeemable points
levels	• indicator of progress • difficulty increase: not linear but convex
progress bars	• indicator for the achievement of a certain task
ranking lists	• simple comparisons between users
badges	• indicator for the achievement of a specific task

Table 7. game mechanics elements (adapted from Zichermann & Cunningham, 2011)

3 Concept development

The following chapter describes in detail the design process according to which the digital approach was developed. A short insight into the pre-study phase is given. The intention is to understand from the beginning the individual phases of the development. Moreover, the structure of the gamification concept and the procedure is explained. Last but not least, an overview of the development steps of the prototype is given.

3.1 Pre-study

The topic for this master thesis arose from the project which has been finished within the first three semesters of the master program digital healthcare. The aim of the project was to develop a tool exclusively for blue-collar workers in which different questions about various health topics would be queried and fitting interventions will be offered as a result. The main focus of the project was to offer for the specific target group the possibility to experience an increase in their health literacy. The project started in September 2017 and finished with a final presentation of the results in February 2019.
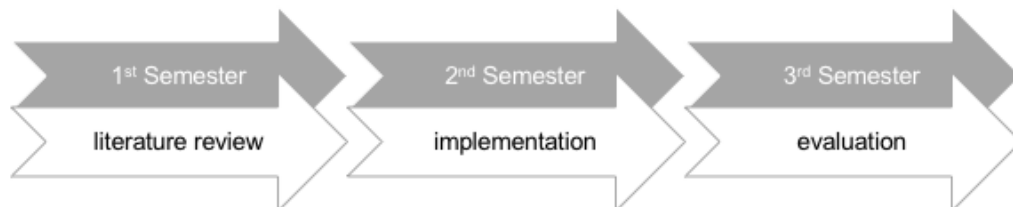
Figure 13. project process of the pre-study

The main objective of the pre-study project was to make the work-life of construction workers easier, safer and healthier. In relation to the literature review, we have found that there is a relevance for this topic from a global healthcare perspective, from the employers perspective and also from the employees perspective.

The focus of the implementation phase was to enable the possibility of simple accessibility and maintainability for a questionnaire tool with integrated interventions which are automatically derived. Moreover, the following topics could be limited as special topics to be embedded:

- movement and ergonomics
- nutrition
- psychological problems
- addiction
- sensation

The main focus of the evaluation phase was to evaluate the developed tool approach with users and to investigate their acceptance.

Based on the results and conclusion of the pre-study I decided to carry on investigating possibilities on developing and evaluating the smart work digital approach.

3.2 Design process

In order to realize the digital approach, an iterative design process was applied. The focus was to involve the user in every step of the design process. Incidentally, the process is also one of the main principles of user-centered design, which is mentioned in the previous theoretical background chapter. In relation to the theoretical background section, the focus of the iterative process is to optimize the process in terms of usability, as well as, to have an early focus on the end-user.
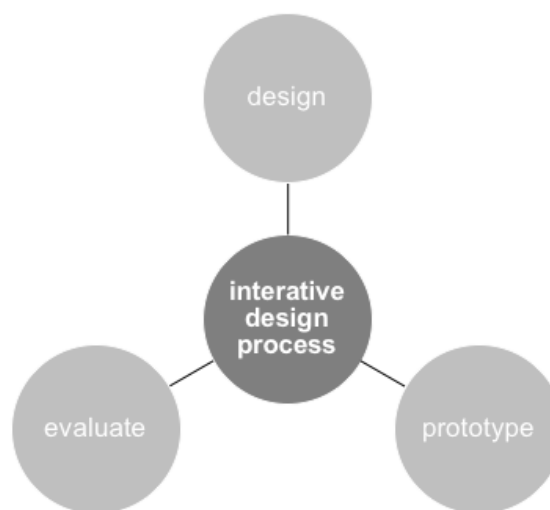
Figure 14. iterative design process (adapted from Norman, 2013, p. 221)

For this reason, first and foremost, the target group was determining and afterwards they get involved in the design process. After every iteration part, an evaluation was done to summarize the results.
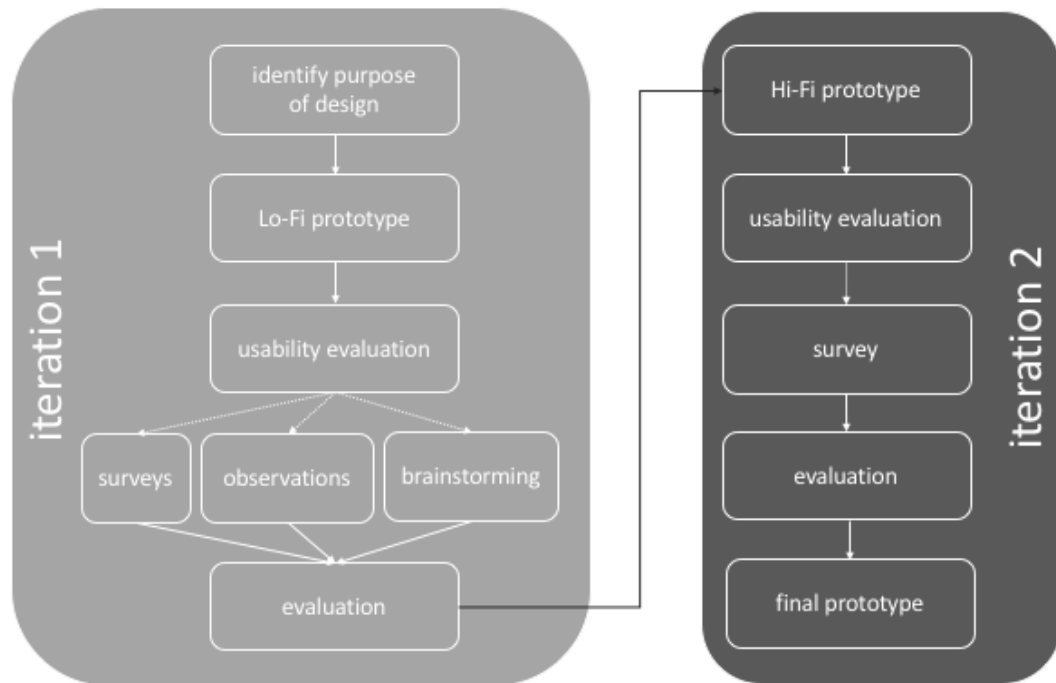
Figure 15. smart work iterative design process

The first iteration phase was carried out during the pre-study phase and therefore the second iteration phase is part of this work.

In order to obtain information from the target group, a low fidelity (Lo-Fi) prototype was created. Coupled with the help of different usability methods such as brainstorming, observations and surveys, the design process could be performed. All information collected from the different usability methods were returned in the design process back.

One of the first steps was to brainstorm about possible questions for the survey. With the help of an open mind brainstorming session initially a lot of possible questions and ways to implement them were gathered. The next step was to divide the topics into different sections. The final result of the brainstorming phase was to provide the subsequent steps for the survey.

Regarding the brainstorming phase, a user experience questionnaire (UEQ) usability test was selected to obtain information about the acceptance of the user using the digital tool. From the beginning, a close cooperation with the user target group was ensured. The preliminary target group for the first usability test was specified only according to the age of the participants.

The first usability test provided information about what users want to do with a digital tool, also which functions are used more frequently, which functions are unnecessary and what kind of functions are desirable.

In order to get more specific information about the needs of the target group during the usability test, the users were observed carrying out common predefined tasks. To get even more out of the users, they were asked to think aloud while they accomplished the tasks.

Therefore, a Lo-Fi prototype was developed. The following steps have been performed to obtain it:

- basic prototype design on paper
- basic prototype on paper with some main functionality
- basic digital prototype design
- digital click dummy prototype

Due to the evaluation of the Lo-Fi prototype, very relevant and favorable feedback could be integrated in the development of the high fidelity (Hi-Fi) prototype.

3.3 Prototype design

The main focus during the development of the Hi-Fi prototype was alternatively the implementation of the main functionality in contrast to the implementation of the gamification approach.

Figure 16. main pages of the prototype

As shown in the previous figure, the design is focusing on navigation based lists, so that, the main functionality is ensured through a clear design.

Due to a specific target group, a special consideration was affixed to the first impression. Therefore, a very common possibility of authentication was selected. The reasons for this were not only the fear of surveillance but also the hectic work routine of each blue-collar worker.
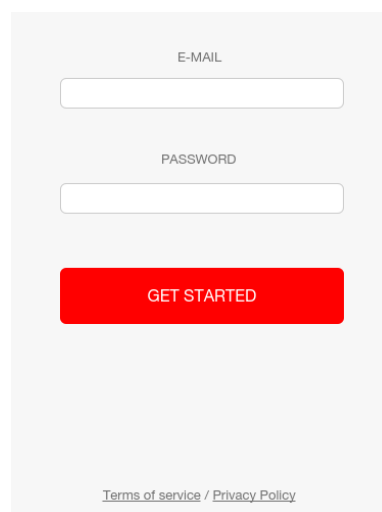
Figure 17. Login design

Furthermore, to ensure privacy for every member of the target group a self-imposed nickname can be selected.
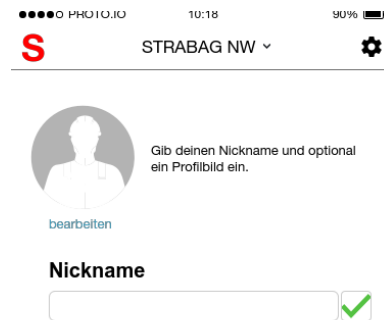
Figure 18. design of the setting option for the name

According to the pre-study phase, the implantation of the questionnaire and the integrated intervention measures played a major significance in the development phase of the Hi-Fi prototype.
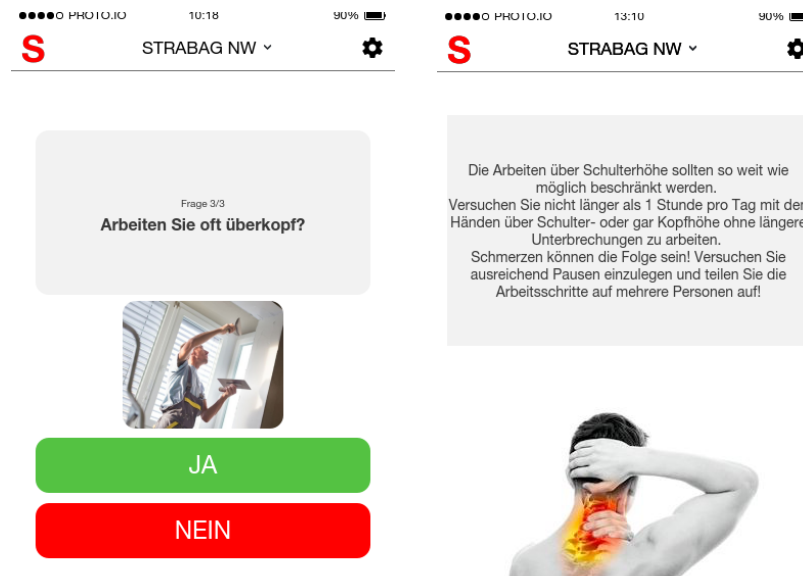
Figure 19. questionnaire (left) and measures (right) design

Simultaneously, to ensure the participation of the target group with the topics a summary quiz was implemented in the prototype. In addition to the knowledge transfer of the questionnaire and measure section, the summary quiz would be an easy way to take away short pieces of information about the different topics.
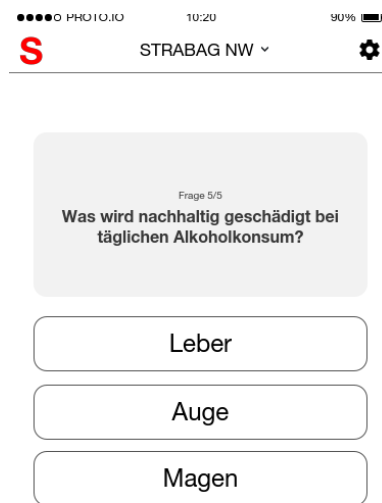
Figure 20. quiz design

Another main focus of the Hi-Fi prototype is the gamification approach. This section will only cover the design elements. The functionality of it will be explained in the following subchapter.
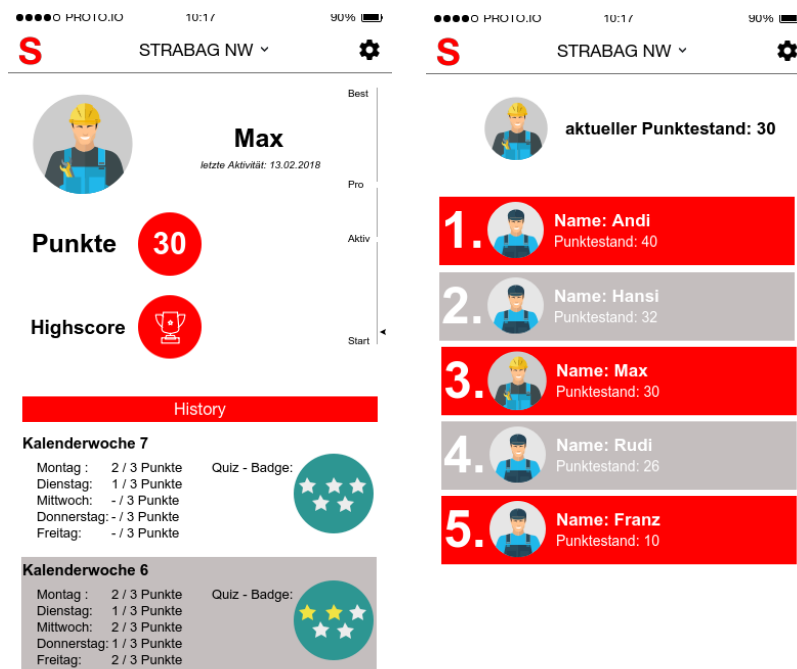
Figure 21. dashboard (left) and high score (right) design

In relation to the functionality of the gamification approach, the dashboard and also the high score design should communicate the current status. Before moving on to the gamification approach, a short overview over the main functionality is given.
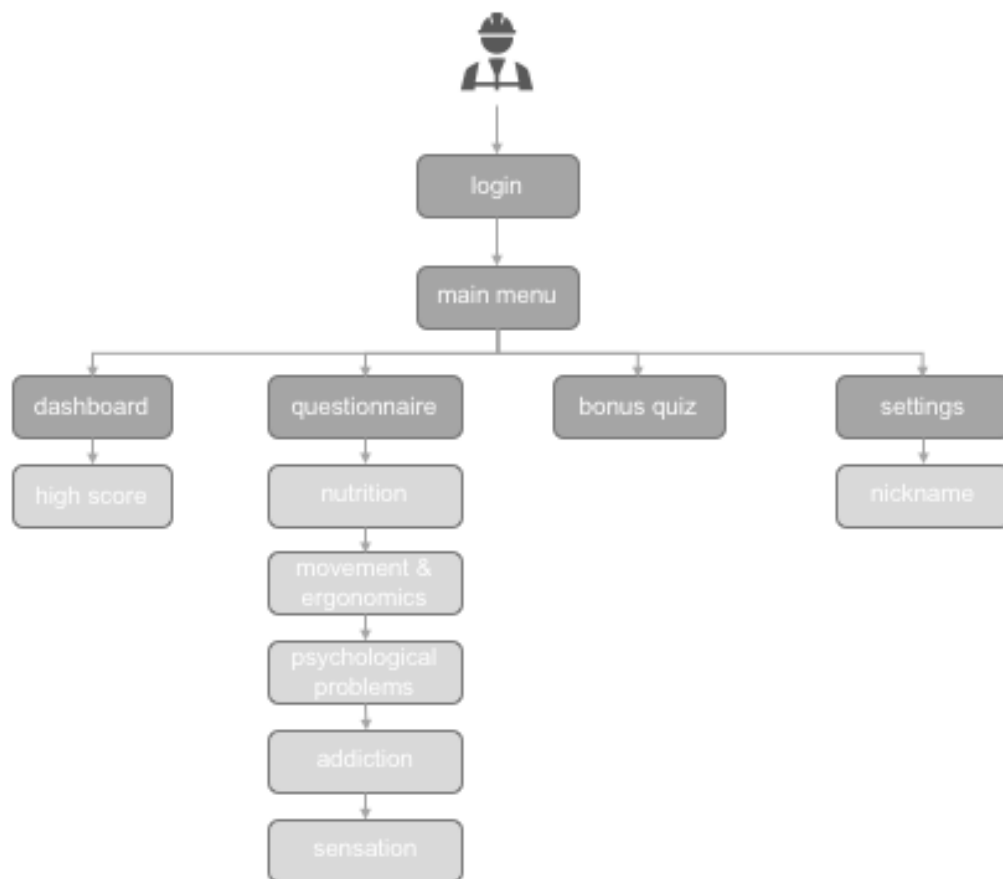
Figure 22. overview over the main parts of the smart work approach

The workflow of the smart work – digital corporate health management tool is hierarchical. The main selection steps are linked together. The first menu item on the dashboard gives an overview of the current status of the user regarding his using activities. The next menu item is the questionnaire which includes the subcategories for the individual topics. The main focus is on the daily interaction of the user with one of the individual topics. In combination with the individual topic questions the appropriate measures stand together.

The connection between question and measure is the answer of the blue-collar worker. The following figure describes this connection.
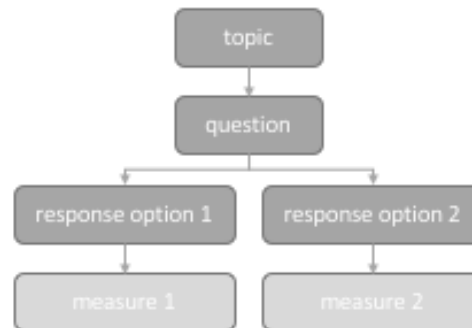
Figure 23. workflow process

The next menu item which is the bonus quiz covers the possibility of the user to repeat, through a gamification approach, the content of the individual topics from the questionnaire. The main focus of this combination between questionnaire, individual measures and bonus quiz is that the user is able to achieve the best learning success.

The last menu item regulates the default username. This selection is important for the gamification approach.

3.4 Gamification approach

The gamification approach for the smart work development relies on three basic ideas which were treated in the previous theoretical background chapter. The rules of the game are the main focus of the gamification approach. In particular, competition between users should be strengthened. Another idea is that the gamification approach is not based on a real full game; however, individual game mechanics are used. Last but not least, the game mechanics used should not serve for entertainment. The focus of the used individual game mechanics are the general improvement of the user experience. Moreover, the motivation of each user should be strengthened; in order to obtain this increase, the game mechanics are also reinforced through feedback. This feedback refers to the actions of the user and serves as a reaction for it. Besides this, the focus is on getting new information on the basis that further decisions can be made and further actions can be performed. The following figure describes the relationship between the game mechanics.
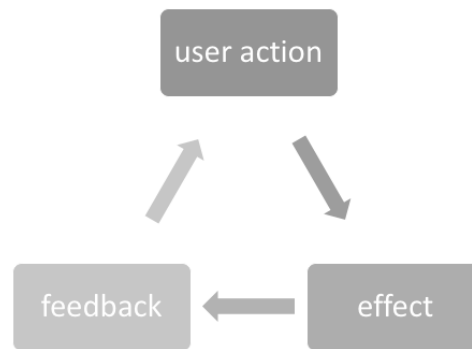
Figure 24. game mechanics relationship

Furthermore, the following table describes the used game mechanic elements for the smart work development.

game mechanic elements
points
status
competition

Table 8. game mechanic elements

The main focus of the point game mechanic element is that through active accumulation of points constant progress is guaranteed for the user. For each answered question from the questionnaire the user gets one point. The user can collect a maximum of three points per day. As a result, he can collect a maximum of fifteen points per week. At the end of the week, if the user does not answer all questions the missing points will be subtracted from the current high score. In order to understand the first part of the gamification approach better a workflow figure is given below.
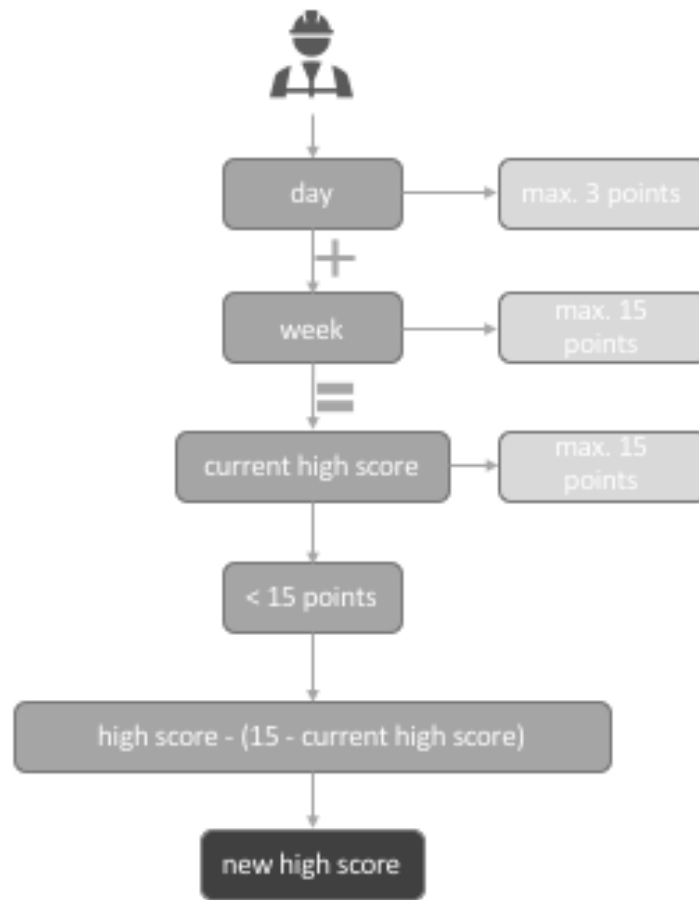
Figure 25. game element workflow

The second part of the gamification approach is the status game mechanic element. In connection with the collected points, each user can also receive special badges. These badges are equal to special points. The main focus is on strengthening the self-confidence of each user and encourages the competition between other users.

At the end of the week each user can voluntarily participate in the bonus quiz, and therefore he can earn a maximum of five extra points.
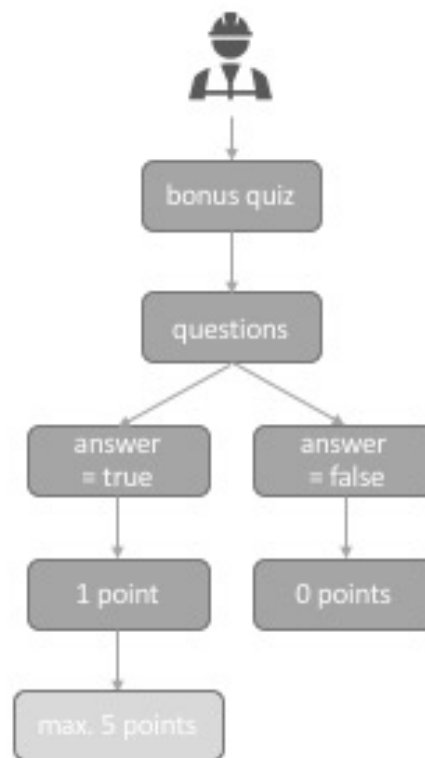
Figure 26. bonus quiz workflow process

The last part of the gamification approach is the competition game mechanic element. In regards to the previous two elements, this element reflects the quality of the user's activity. The main focus of this element is the competition with other users. Consequently, the competition should motivate the user to deal intensively with the content of the individual topics.

With reference to the theoretical background chapter, a classification of four user types can be carried out. The individual types can be distinguished by their interests and specific game focus during usage.

Figure 27. four user types classification (adapted from Bartle, 2003)

The classification of users of different types refers to the specific psychological aspects of their own personality. Therefore, each user type has their individual preference for game playing. The following table describes the different habits of each user type.

user type	description
achiever	• collect points and badges • foreground: personal success and reputation
explorer	• fascinated by hidden details and background information
killer	• action and comparison with other users important
socializer	• foreground: interaction with other users

Table 9. user types description (Bartle, 2003)

In relation to the different user types, the gamification approach for the smart work tool uses the following three types:

- achiever – regarding the point game mechanic element
- killer – regarding the competition game mechanic element
- explorer – regarding the status game mechanic element

In particular, for the development of the gamification approach the following behavior model was taken into account.
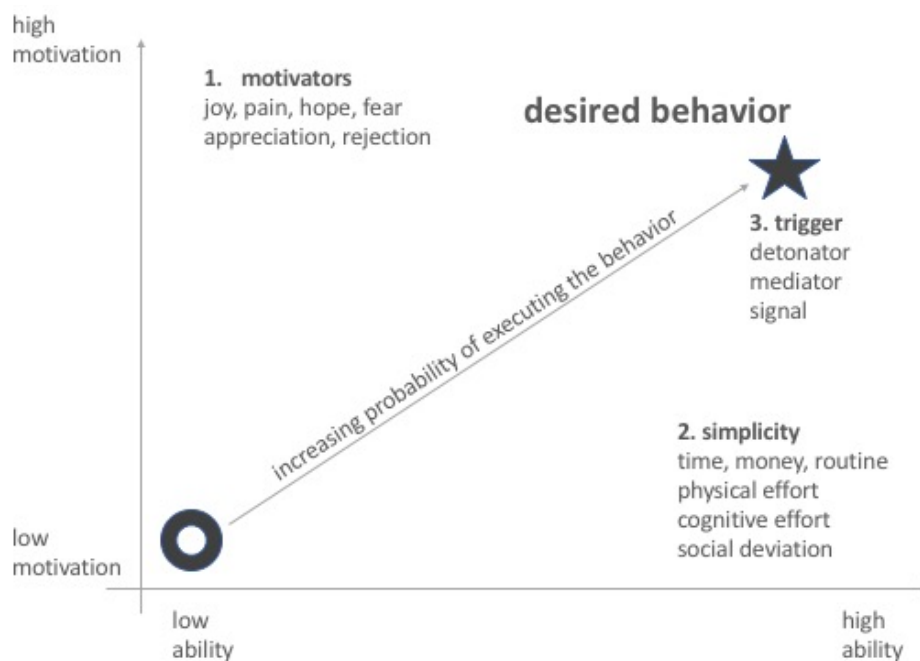
Figure 28. behavior model (adapted from Fogg, 2002)

The main focus of the implementation of such a behavior model is to increase the user experience. In order to achieve growth, the user must be motivated each time when he is required to perform a certain behavior; conjointly, every user needs a trigger for that.

4 Requirements / Methodology

The following chapter deals with the empirical part of this work. At the beginning, the examination design is explained. Afterwards, an insight about measurement and the suitable test is given. In addition, the user target group is described. Finally, the evaluation and the results of the empirical survey are presented.

4.1 Research question

The purpose of the evaluation was to investigate how far a digital mobile approach developed for a specific target group could increase the acceptance for a corporate health management approach.

With the help of the digital mobile approach presented in the previous chapter, the target group should have been inspired to use the application for a long-term period. Furthermore, the presented gamification approach should increase the attractiveness of the digital tool.

The hypothesis which should be investigated refers to the merchantability of the prototypical development.

4.2 Research method

The present investigation is a prototypical development of a mobile application. In order to pursue the research question, a validated usability test was used. The main purpose for the users was to test the application and to fill in a questionnaire at the end of the investigation. The test procedure was defined by clear tasks which every user had to go through. The usability test was carried out on-site under realistic test conditions for the target group.

Specially, the attention of the research method was intended to perceive pragmatic and hedonic measurement quality results.
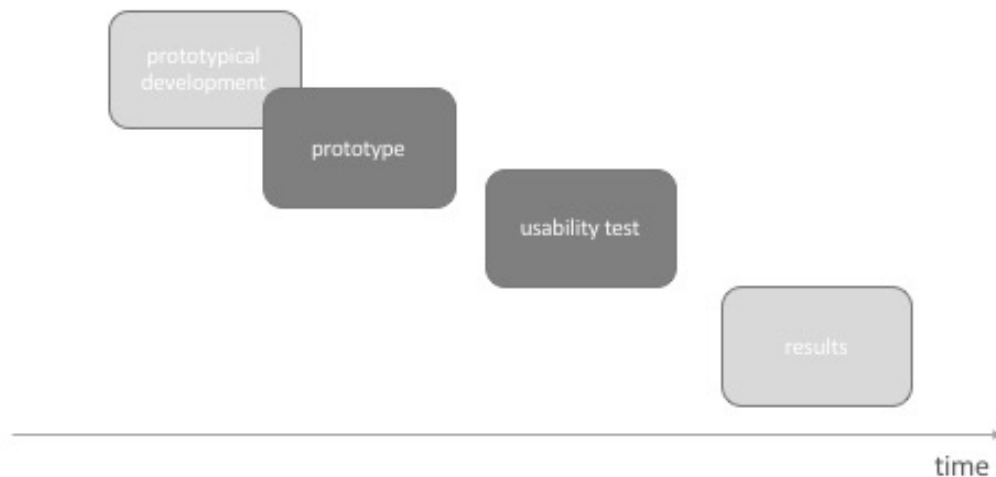
Figure 29. research method design

4.2.1 Participants

A total of 15 people from the construction industry have tested the prototypical product. At the same time, it was required that all participants come from the same Austrian construction company. The reason for that was the development of a harmonized corporate health management tool. In order to get a heterogeneous sample, the participants came from different divisions within the company, more specially from the building construction and civil engineering division.

The selected number of participants refers to the investigations of Jakob Nielson. According to his studies, a small number of participants can get almost as close to the user testing maximum benefit-cost ratio (J. Nielsen, 1989).

The time of evaluation was unique for each participant. Furthermore, participants received no financial compensation for the participation in the usability test.

The following restrictions criteria were applied regarding the selection process:

- age > 18 years old
- blue-collar workers from the building construction and civil engineering sector

They have been chosen by disposability, since the usability test was carried out during operational hours. There were no further limitations regarding working experience, knowledge in digital media or information technology.

The mean age was approximately 25 to 34 years. According to the self-assessment of the participants, 80% of them currently use the smartphone similarly for the use of applications.

4.2.2   Usability test

The usability test revolved around the topic of acceptance. Therefore, the usability test was carried out onsite location. In order to accomplish this, all the participants in the usability test were allocated into two appointments. The questionnaire guideline laid down the usability test procedure. The following figure describes the segmentation of the individual phases of the usability test.
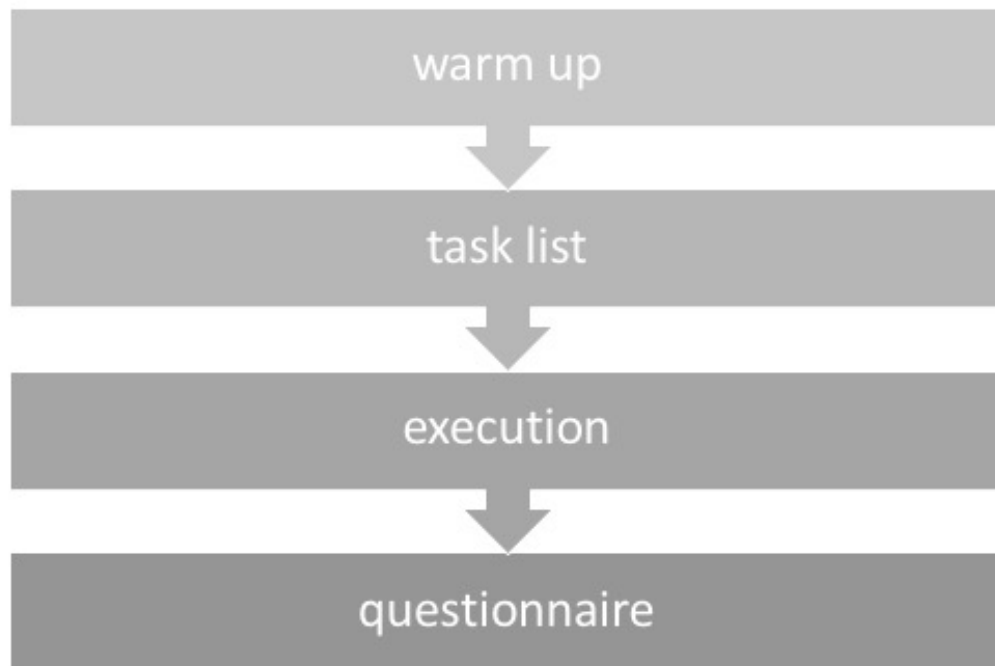
Figure 30. schematic representation of the individual phases of the usability test procedure

In the beginning, the warm up phase included the presentation of the aim of the investigation. Each participant had been welcomed separately to the test laboratory onsite location. Of course, a verbal explanation about the test procedure was given by the test coordinator, especially in regards to the handling of the digital prototype. Finally, the agreement to the use of anonymous data was verified by signature. Pertaining to this information, the test coordinator is the author of this study.

During the entire usability test procedure, only one proband was present in the laboratory. This was to keep participants from influencing each other.

The second phase describes the task list. In order to perform the usability test separately, a list with seven tasks had to be processed. The full task list is provided in the appendix.

The next phase describes the execution phase. Every participant received a smartphone with the digital prototypical development. On the basis of the tasks from the task list, each participant had to test the prototype step by step. The duration of the usability test of each participant was between 10 – 15 minutes.

Afterwards, each participant had to complete a questionnaire. The next subchapter explains the relation between the execution phase and the questionnaire phase.

4.2.3   Questionnaire

To investigate the usability of the developed digital mobile approach, the UEQ questionnaire was applied.

The main focus of the questionnaire is to ensure that none of the potential hedonic or pragmatic criteria is excluded or favorized. The questionnaire consists of 26 bipolar items which differentiate the six main constructs (attractiveness, perspicuity, efficiency, dependability, stimulation and novelty) on a seven-level scale (Laugwitz, Held, & Schrepp, 2008).

UEQ scale	description
attractiveness	• overall impression
perspicuity	• Is it easy to get familiar with it? • Is it easy to learn how to use it?
efficiency	• task solving without unnecessary effort
dependability	• feel in control with the interaction
stimulation	• Is it motivating and exciting to use it?
novelty	• Does it catch the interest of users?

Table 10. UEQ scales description (adapted from Laugwitz et al., 2008)

The attractiveness scale is a pure quality rating dimension. The perspicuity, efficiency and dependability scales are goal directed scales. In contrast, the stimulation and novelty scales are not goal directed.

The following figure shows the structure workflow of the UEQ.
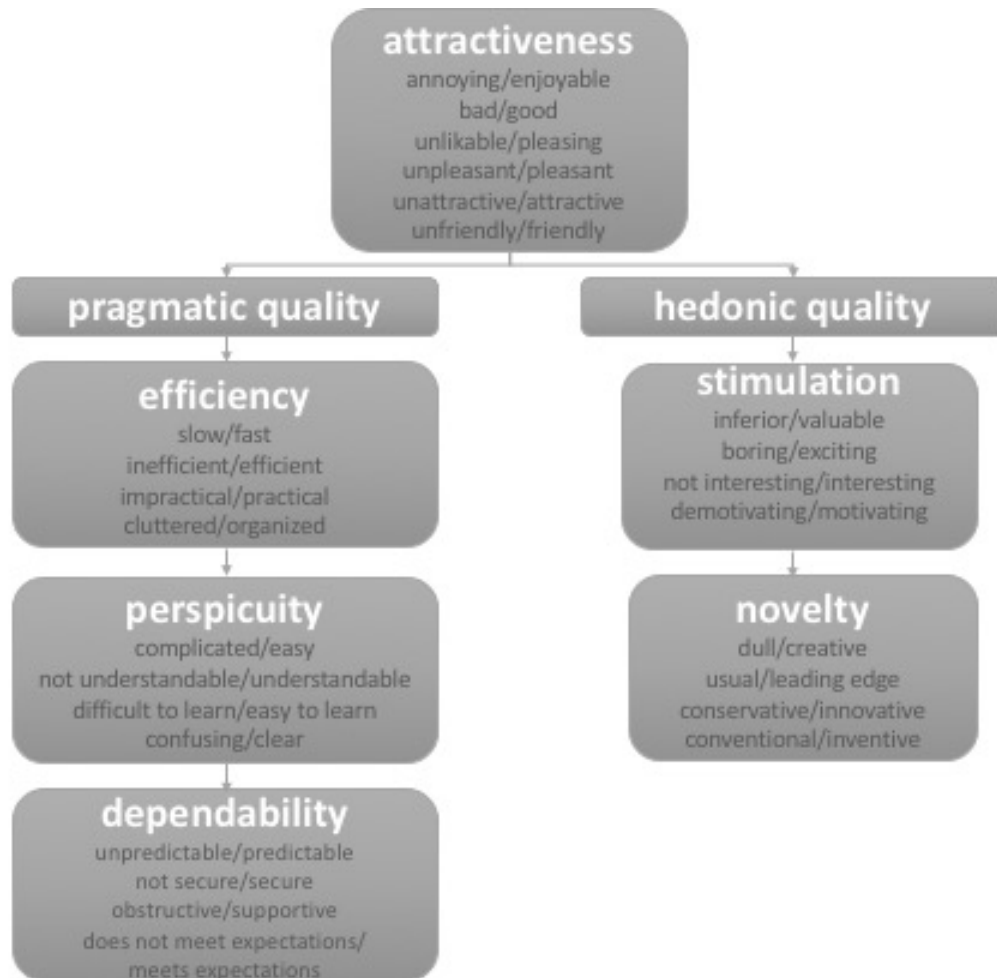
Figure 31. UEQ scale structure (adapted from Laugwitz et al., 2008)

The appearance of the questionnaire consists of pairs of contrasting attributes. Between the attributes, circles are placed which represent gradations between the two opposites. In order to express agreement for one of the attributes, a cross has to mark one of the circles.

The main focus of this questionnaire was to encourage the participant to make a spontaneous decision and to emphasize that each participant's opinion counts. The full questionnaire is provided in the appendix.

Figure 32. UEQ surface (adapted from Laugwitz et al., 2008)

4.2.4   Limitations

This study has limitations that need to be considered for the interpretation of the results and for future research. The main limitations of the present study are the limited sample size and the limitation of the test environment.

Regarding the sample size, the used one in this study does not represent a representative sample size. On the one hand, the size correspondents to the criteria of scientific usability tests described in the previous chapter but on the other hand due to the unbalanced gender distribution no adequate statement can be made. Furthermore, through the selected mode to test the application only a snapshot of the usability could be measured.

4.3 Results

In this chapter, the results obtained from the usability test questionnaire are presented. The study was conducted with a group of fifteen participants and was formed by blue-collar workers from the same company.

As it was mentioned in the study design, the participants tested the digital prototypical development in their usual working environment, and after that they filled out the user experience questionnaire.

The following section contains the demographic characteristics of the participants. Specially, gender, age, smartphone possession and smartphone utilization were collected.

The following table shows the gender distribution. The results show that only male construction workers were interviewed. The reason for this is lead back to the working area and the fact that in the cooperating company no female construction worker is employed.

gender	prevalence	percent
male	15	100%
total	15	100%

Table 11. gender distribution

The next figure shows the age distribution. The group consists of 25 – 34 year old construction workers which form the largest group within the random sampling. Altogether, the age distribution shows a balanced age ration of the participants.
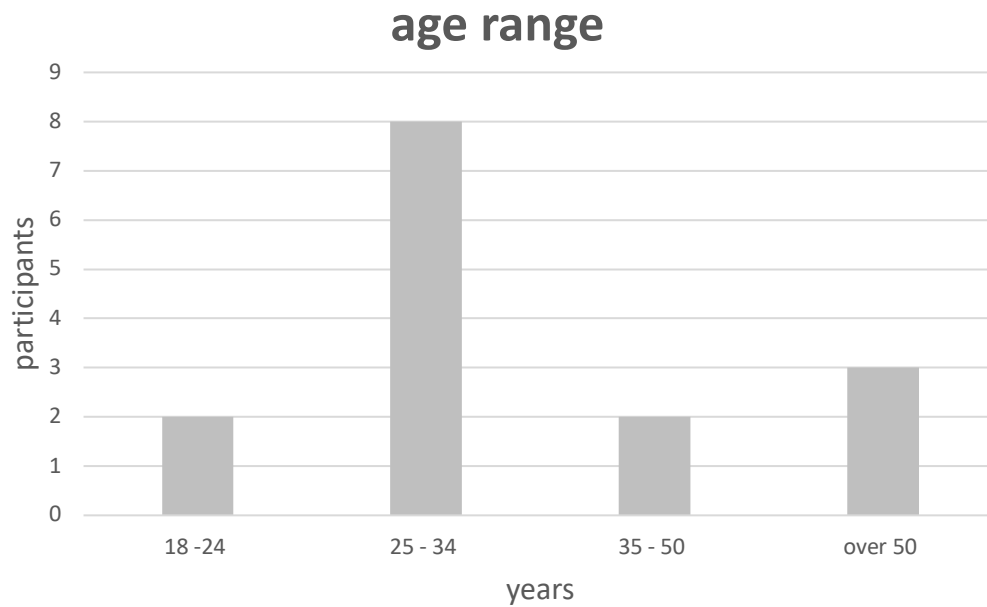
Figure 33. age range (participants n=15)

age	prevalence	percent
18 – 24 years	2	13,33%
25 – 34 years	8	53,33%
35 – 50 years	2	13,33%
over 50 years	3	20%
total	15	100%

Table 12. age prevalence distribution

The following table and figure represents the smartphone possession and utilization distribution. Although, every participant has a smartphone not everyone uses mobile applications automatically.

possession	prevalence	percent
smartphone	15	100%
total	15	100%

Table 13. smartphone possession distribution

smartphone utilization of the participants

- to phone
- use of applications
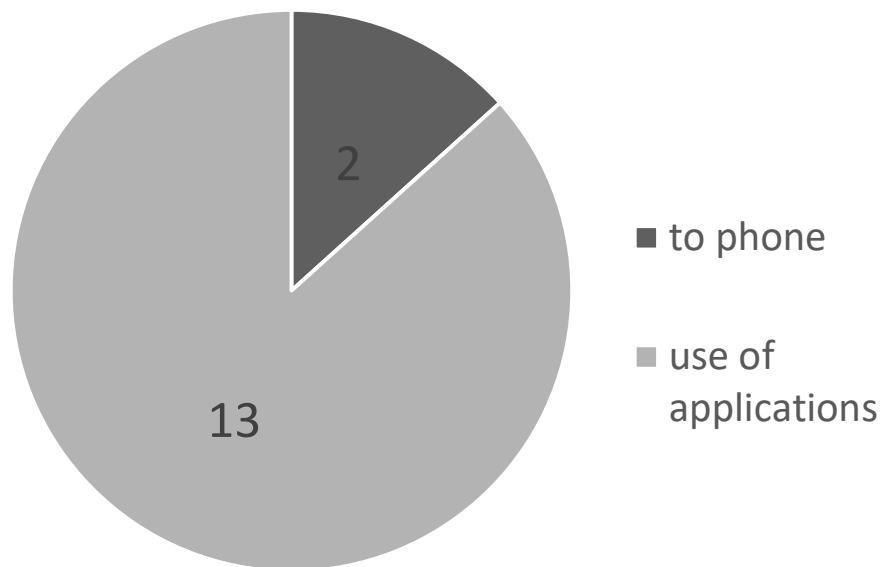
Figure 34. smartphone utilization distribution

To better understand the meaning of the analyzed data, the next section contains only selected findings of the UEQ questionnaire. The original table of all the results is provided in the appendix.

The following table shows the information obtained by the UEQ questionnaire about usage analysis of the prototypical development tool during the test period.

usability test scales	mean	variance
attractiveness	1,722	0,89
perspicuity	2,067	0,91
efficiency	1,517	0,73
dependability	1,583	0,82
stimulation	1,317	1,53
novelty	0,883	1,28

Table 14. UEQ results

According to the UEQ method, values between -0,8 and 0,8 represent a more or less neutral evaluation of the corresponding scale. Furthermore, values > 0,8 represent a positive evaluation and values < 0,8 represent a negative evaluation (Laugwitz et al., 2008).

The next section gives an overview about the correlation between the UEQ results and the user experience division aspects.

division aspect	mean
attractiveness	1,72
pragmatic quality	1,72
hedonic quality	1,10

Table 15. user experience division aspects

The scales of the UEQ can also be grouped, in addition to the attractiveness, into pragmatic quality (perspicuity, efficiency, dependability) and hedonic quality (stimulation, novelty). Pragmatic quality describes task related quality aspects, hedonic quality the non-task related quality aspects.

The following table shows in detail how the participants evaluate the attractiveness of the prototype.

scale	left attribute	right attribute	mean	variance
attractiveness	annoying	enjoyable	1,1	2,3
	good	bad	2,0	1,7
	unlikable	pleasing	1,7	1,0
	unpleasant	pleasant	1,9	2,1
	attractive	unattractive	1,9	1,8
	friendly	unfriendly	1,7	1,5

Table 16. attractiveness division aspect

According to the valuation guidelines of the UEQ method, the presented prototype in this study shows a high proportion on the attractiveness scale. Specially, the attribute "good" was rated very high.

The next table shows in detail the pragmatic quality of the prototype. As already described above, this part consists of the perspicuity, efficiency and dependability scale.

scale	left attribute	right attribute	mean	variance
perspicuity	not understandable	understandable	2,2	1,2
	easy to learn	difficult to learn	1,5	4,8
	complicated	easy	2,5	0,6
	clear	confusing	2,1	1,8
efficiency	fast	slow	1,1	3,6
	inefficient	efficient	1,4	2,8
	impractical	practical	1,5	1,3
	organized	cluttered	2,1	1,4
dependability	unpredictable	predictable	0,9	1,4
	obstructive	supportive	2,4	0,8
	secure	not secure	1,4	2,1
	meets expectations	does not meet expectations	1,6	2,0

Table 17. pragmatic quality division aspect

The previous table demonstrates the easy handling, clear and organized surface and the supportive dependability of the prototype logic. In particular, the attributes that stand out are understandable, easy, clear, organized and supportive.

The last table shows in detail the hedonic quality of the prototype, which is composed of the stimulation and novelty scale.

scale	left attribute	right attribute	mean	variance
stimulation	valuable	inferior	1,4	2,3
	boring	exciting	1,1	1,6
	not interesting	interesting	1,5	3,1
	motivating	demotivating	1,3	2,4
novelty	creative	dull	0,6	3,7
	inventive	conventional	0,7	2,1
	usual	leading edge	1,5	2,6
	conservative	innovative	0,7	3,2

Table 18. hedonic quality division aspect

The previous table represents the pleasure and joy of the participants when using the prototype.

According to the results of the UEQ usability test, it can be concluded that the research question can be confirmed. The developed digital prototype for a corporate health management tool with a gamification approach has been shown an acceptable grade of usability. Even more, compared to literature, the reached scores can be rated as good evaluation results (Laugwitz, Held, & Schrepp, 2008).

5 Conclusion

The last chapter of this study recapitulates in short form the findings that were gained through this work. Afterwards, opportunities should be shown to continue or build on this body of research.

The main goal of this study was to develop a digital prototype for a corporate health management tool with a gamification approach as well as to measure the usability with a specific target group. The development phase was planned to be finished until January 2019, so that the gamification approach could be implemented into the Hi-Fi prototype. The test phase and evaluation of data was planned to be done until middle of March 2019. In fact, a small deviation from the time schedule had to be considered due to the on-site usability testing, the working environment, and limited availability of the participants. Finally, the evaluation phase was finished by the end of March 2019. The summarization of the usability test and evaluation phase ran expeditiously well.

At the same time, positive as well as negative findings could be established from the conducted usability test.

Positive findings concerning the use of the prototypes are as follows. Regarding the attractiveness score of the UEQ test, the overall impression of the prototype is very high. This results showed that a high rate of users enjoyed using the prototype. Moreover, due to the high perspicuity score it can be assumed that it is very easy to become familiar with the application. Furthermore, it is very straightforward to learn how to use the application and all of its functions.

The next positive finding was in reference to the efficiency score. The results of the present study demonstrated that the participants could solve their tasks without unnecessary effort.

Another positive finding was the high dependability score whereby the users feel in control of the interaction.

From the high stimulation score, it is apparent that the user are excited and motivated to use the mobile application.

On the other hand, there were negative findings concerning the problems users had while interacting with the prototype or some of its functions. The result of the novelty score demonstrates that the prototype does not catch the interest of the users enough.

Two main implications were identified as the results of this work. The first being, due to the results from the usability test the users were very pleased with the prototype and preferred to interact with the application. The second being, that there is still a bit of room for improvement, in particular, in the area of creativity and innovation.

One way to continue this research would be to be more involved with the topic of creativity and innovation in the healthcare sector, and to attempt to merge the functions of the application with the gamification approach. Furthermore, the basis created in this work could be used to implement the digital approach into a real working mobile application for iOS and Android.

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Appendix

A. questionnaire

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Fragebogen

Geschlecht: weiblich   männlich

Alter: 18 bis 24   25 bis 34   35 bis 50   über 50

Smartphone-Besitzer: Ja   Nein

Smartphone-Nutzung: Telefonieren   Nutzung von Applikationen

Bitte geben Sie Ihre Beurteilung ab.

Um das Produkt zu bewerten, füllen Sie bitte den nachfolgenden Fragebogen aus. Er besteht aus Gegensatzpaaren von Eigenschaften, die das Produkt haben kann. Abstufungen zwischen den Gegensätzen sind durch Kreise dargestellt. Durch Ankreuzen eines dieser Kreise können Sie Ihre Zustimmung zu einem Begriff äußern.

Beispiel:

| attraktiv | ○ | ⊗ | ○ | ○ | ○ | ○ | ○ | unattraktiv |

Mit dieser Beurteilung sagen Sie aus, dass Sie das Produkt eher attraktiv als unattraktiv einschätzen.

Entscheiden Sie möglichst spontan. Es ist wichtig, dass Sie nicht lange über die Begriffe nachdenken, damit Ihre unmittelbare Einschätzung zum Tragen kommt.

Bitte kreuzen Sie immer eine Antwort an, auch wenn Sie bei der Einschätzung zu einem Begriffspaar unsicher sind oder finden, dass es nicht so gut zum Produkt passt.

Es gibt keine „richtige" oder „falsche" Antwort. Ihre persönliche Meinung zählt!

Bitte geben Sie nun Ihre Einschätzung des Produkts ab. Kreuzen Sie bitte nur einen Kreis pro Zeile an.

	1	2	3	4	5	6	7		
unerfreulich	O	O	O	O	O	O	O	erfreulich	1
unverständlich	O	O	O	O	O	O	O	verständlich	2
kreativ	O	O	O	O	O	O	O	phantasielos	3
leicht zu lernen	O	O	O	O	O	O	O	schwer zu lernen	4
wertvoll	O	O	O	O	O	O	O	minderwertig	5
langweilig	O	O	O	O	O	O	O	spannend	6
uninteressant	O	O	O	O	O	O	O	interessant	7
unberechenbar	O	O	O	O	O	O	O	voraussagbar	8
schnell	O	O	O	O	O	O	O	langsam	9
originell	O	O	O	O	O	O	O	konventionell	10
behindernd	O	O	O	O	O	O	O	unterstützend	11
gut	O	O	O	O	O	O	O	schlecht	12
kompliziert	O	O	O	O	O	O	O	einfach	13
abstoßend	O	O	O	O	O	O	O	anziehend	14
herkömmlich	O	O	O	O	O	O	O	neuartig	15
unangenehm	O	O	O	O	O	O	O	angenehm	16
sicher	O	O	O	O	O	O	O	unsicher	17
aktivierend	O	O	O	O	O	O	O	einschläfernd	18
erwartungskonform	O	O	O	O	O	O	O	nicht erwartungskonform	19
ineffizient	O	O	O	O	O	O	O	effizient	20
übersichtlich	O	O	O	O	O	O	O	verwirrend	21
unpragmatisch	O	O	O	O	O	O	O	pragmatisch	22
aufgeräumt	O	O	O	O	O	O	O	überladen	23
attraktiv	O	O	O	O	O	O	O	unattraktiv	24
sympathisch	O	O	O	O	O	O	O	unsympathisch	25
konservativ	O	O	O	O	O	O	O	innovativ	26

B. UEQ results

Mean value per Item
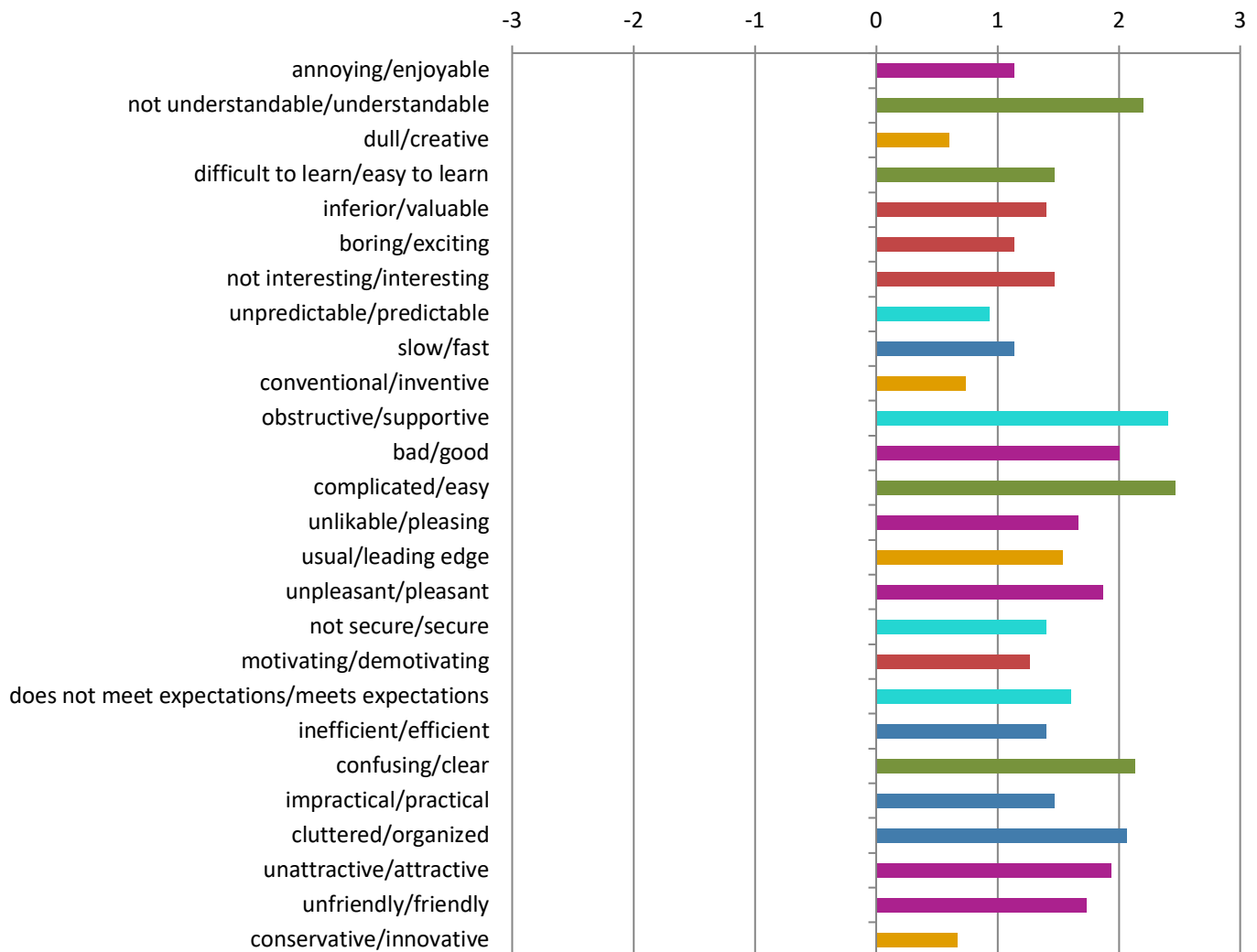
usability test scales	mean	variance
attractiveness	1,722	0,89
perspicuity	2,067	0,91
efficiency	1,517	0,73
dependability	1,583	0,82
stimulation	1,317	1,53
novelty	0,883	1,28

C. task list

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Aufgabenstellung

*I*medien & digitale technologien **/fh///** st.pölten
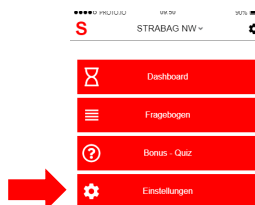
Aufgabe 1: Anmeldung

E-MAIL: smart.work@strabag.com
PASSWORD: Strabag2018

Aufgabe 2: Menüauswahl
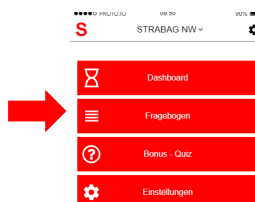

Wähle die Kategorie **Smart Work** aus.

Aufgabe 3: Nickname

Wähle die Kategorie **Einstellungen** aus und trage den Nickname ein.

Nickname: **Max**
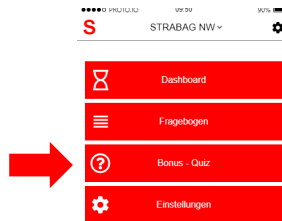
Aufgabe 4: Fragebogen

Wähle die Kategorie **Fragebogen** aus und beantworte bitte alle Fragen aus den einzelnen Unterkategorien.
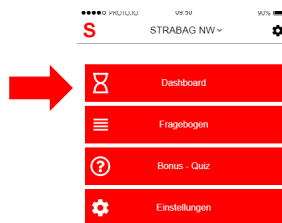
Folgende Reihenfolge bitte einhalten:

- Bewegung und Ergonomie
- Ernährung
- Sinnesempfindung
- Psyche
- Sucht

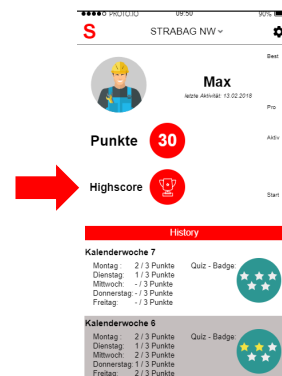Fachhochschule St. Pölten GmbH, Matthias Corvinus-Straße 15, 3100 St. Pölten, T: +43 (2742) 313 228, F: +43 (2742) 313 228-339, E: csc@fhstp.ac.at, I: www.fhstp.ac.at

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Aufgabe 5: Bonus-Quiz

Beantworte bitte alle Quizfragen.

Aufgabe 6: Übersicht

Wähle die Kategorie **Dashboard** aus und schaue dir die Übersicht an.

Aufgabe 7: Highscore

Schaue dir deine Rangliste an.