

RISK PERCEPTION OF THE ELDERLY – ANALYZING THE ADOPTION OF INNOVATIVE MOBILITY SYSTEMS

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ABSTRACT

The increasing number of the elderly requires firms to develop innovative products that satisfy the specific needs of this target group. These needs are mainly the results of age-related changes like physical and psychological restrictions. Physical changes in terms of the mobility are of particular importance and require supportive aids in order to retain the independence of the elderly. However, the elderly often associate several risks towards innovations in general and innovative mobility aids in specific because they are often reluctant to deal with this issue. Based on a literature review, this paper analyzes age-related changes and their effects on the risk perception of the elderly as possible barrier when adopting innovative mobility systems. Implications for practitioners are discussed.

Index Terms – Risk perception, the elderly, adoption, innovation, mobility aid system

1. INTRODUCTION

As a result of the demographic change, firms focus on the elderly as new potential target group. With increasing age the physical and psychological performance of the elderly decreases which affects crucial everyday activities. Hence, elderly specific innovations, especially in the area of mobility aid systems are developed. Innovative mobility aid systems covering short distances are of particular importance in order to maintain the mobile independence of the elderly in their everyday life and to ensure their social integration [1].

When a mobility aid becomes vital, the elderly tend to use traditional and familiar mobility aid systems even though these systems have functional or handling deficits. However, when it comes to innovative mobility aid systems which attempt to overcome these problems, the elderly often associate a high perceived risk. This may result in the rejection of the innovative mobility aid. That is why firms need to consider and reduce the perceived risk serving as potential adoption barrier in order to ensure the product's success [2].

Existing studies are segmenting the elderly, trying to characterize a heterogeneous group [3] and investigating their purchase behavior as well as their innovativeness [4, 5]. However, up to date, no study has investigated the adoption behavior of the elderly in terms of the perceived risk. Against this background, this study aims at analyzing the risk and its dimensions perceived by the elderly during the adoption of an innovative mobility aid system. The paper is organized as follows: First, the adoption of innovations, the risk perception as well as age-related changes are considered theoretically. Second, based on the theoretical foundation of age-related changes, risk dimensions are identified and analyzed which are relevant for the elderly in the adoption process of innovative mobility systems. Third, implications are made for practitioner how to reduce the perceived risk in order to support the adoption and, hence, market the innovative mobility aid successfully. This study contributes and broadens existing research on the successful adoption of innovations by the elderly.

Furthermore, the results can be transferred to related research areas like innovative assistance systems.

2. ADOPTION OF INNOVATIONS

According to Rogers [6] adoption is defined as a “decision to make full use of an innovation (...)”, that is, the adoption decision occurs before the purchase and actual use. The process to come to an adoption is called adoption process. The **adoption process** consists of several stages from gaining initial knowledge of an innovation to making a decision to adopt an innovation and, hence, realize the adoption intention by purchasing the innovation [6]. Within adoption research several process models exist [7]. These models are mainly based on the accepted innovation-decision process model from Rogers. That is why these models are similar to each other with only small variations in terms of the order and the content of the stages. The five stages of the innovation-decision process model from Rogers are depicted in Figure 1.

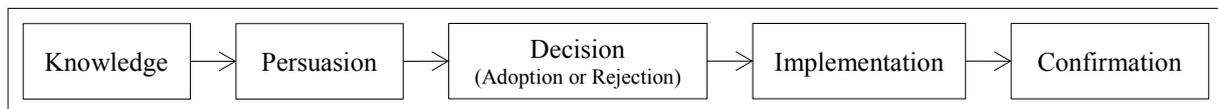


Figure 1. Innovation-Decision-Process Model [6]

The adoption process starts with the **knowledge stage**. In this stage an individual receives information about the innovation and, hence, learns about its existence. Furthermore, the individual gains information about the innovation’s functions and how to use it. The next stage is the **persuasion stage**. In this stage the individual becomes cognitive and emotional involved with the innovation. The information is analyzed using innovation evaluation information. As a result the innovation is assessed and the individual forms a favorable or unfavorable attitude towards the innovation. This leads over to the **decision stage**. This stage comprises activities like further information search and results in the decision to adopt or reject the innovation. The **implementation stage** contains the actual purchase and use of the innovation. An individual purchasing an innovation is then called adopter. In the **confirmation stage** the individual seeks reinforcement for the purchase in order to avoid dissonances [6].

The described stages represent an ideal process of the adoption decision [8]. However, the adoption process must not necessarily end up in the adoption. The innovation can be rejected too [9]. Furthermore, there is the possibility that individuals skip certain stages or run through stages twice. That is, not all individuals pass through the adoption process in the same way concerning the time, number and order of stages and the result of adoption.

Besides analyzing the process of adoption, research also focuses on determinants that may influence the evaluation of an innovation and, hence, the adoption process. These determinants are called **adoption factors**. They can be distinguished in product, adopter and environmental specific factors. **Product-related** adoption factors comprise the perceived characteristics of the innovation by an individual, hence, are subjective and innovation inherent [6, 8]. Rogers [6] lists five product-related adoption characteristics: relative advantage towards existing products, compatibility with existing technologies and the individual’s values, experiences and needs, complexity of the innovation, trialability, that is, the possibility to try the innovation in advance, and, finally, observability, that is, how far are the results of the innovation visible to others, hence, how easily are the results of the innovation observed and communicated to others [6]. Other studies complete these five product-related characteristics by adding the perceived risk as influencing factor on the adoption process [10, 11]. **Adopter-related** factors concentrate on the characteristics of the

individual. These factors influence mainly the perception and evaluation of an innovation. They include social demographics like age, income, educational level and status [12, 45] as well as psychographics like innovativeness, risk tolerance, attitude and personality traits [8, 19]. **Environmental-related** factors comprise macroeconomic specific factors [8].

This paper focuses on the age as adopter-related and the risk as product-related adoption factor. The risk associated with an innovation is considered because it has a strong influence on forming attitudes and, hence, the adoption intention and the final decision [13]. That is why it is one of the most important adoption factors which is also able to serve as strong adoption barrier [14]. The age is considered because of the demographic change and the increasing importance of elderly as new potential target group. Furthermore, age-related changes have strong influence on the decision behavior, that is, for firms it is crucial to consider these changes when launching innovations.

3. PERCEIVED RISK

The **perceived risk** appears as a result from perceived uncertainty towards possible occurring negative consequences when adopting a product innovation [15, 14]. These perceived negative consequences are the result of cognitive and emotional evaluations of the innovation [16]. The outcome of these evaluations may be a perceived functional, financial, social, physical, psychological or time risk [17]. The **functional risk** refers to the fear that the innovation will not function as promised and, hence, will not fulfill the functional needs of the individual. The **financial risk** occurs when the price of the innovation is perceived as inappropriate or the financial burden is not bearable. It also involves for example a high monetary effort to maintain and dispose the innovation, hence, the individual connects a loss of money with the purchase and use of the innovation. The **social risk** refers to the fear that the purchase and use of the innovation is not accepted by the close environment like family and friends, hence, the individual is afraid of negative reactions or consequences when purchasing a socially unaccepted innovation. The **physical risk** involves perceived health hazards and safety risks when purchasing and using the innovation. The **psychological risk** refers to the uncertainty whether the innovation fits to the self-image, hence, whether individuals are able to identify themselves with the product. The **time risk** involves the time-related investment in purchasing or using the innovation [18].

The perceived risk and its dimensions vary in their amount within the different stages of the adoption process. Pohl [19] states that the perceived innovation inherent risk occurs first after the knowledge state when the individual learns about the existence of the innovation. In the next stage the individual intensifies its involvement with the innovation processing additional information cognitively and emotionally. The results can be two sided. On the one hand the evaluation of additional information can lead to a reduced perceived risk as the individual increases its knowledge about the innovation and initial risks are eliminated. On the other hand further information and, hence, the generated knowledge may create the awareness of so far unknown risks. Depending on the ability of additional information to reduce or increase the perceived risk, the risk-related assessment of the innovation results in a positive or negative attitude towards the innovation. If the individual has know-how from the beginning of the adoption process it is more likely that further information is assessed positively and the perceived risk is reduced. If the individual has only little know-how further information cannot be assessed properly and, hence, do not contribute to risk reduction [19].

Risk can serve already as **adoption barrier** in the knowledge stage when the individual perceives high risk and simultaneously has no interest in the innovation and, hence, no motivation to seek further information. In this case the adoption process cancelled in an early state. However, the perceived risk within the knowledge stage can also motivate an individual

to seek further information. This information is then, as before mentioned, processed and evaluated in the persuasion stage. When the information evaluation results in an increasing perceived risk, it also can serve as adoption barrier in the persuasion stage and lead to a rejection of the innovation in the decision stage. The perceived risk is especially relevant in the persuasion stage because individuals are already involved with the innovation and may already formed a strong attitude towards the innovation which highly influences the adoption of the innovation.

4. AGE-RELATED CHANGES

Moschis [20] defines aging as “changes in human functional capacity resulting from changes in cells and tissues that in turn cause deterioration of the biological system and its subsystems and susceptibility to disease and mortality.” Hence, age-related changes affect the physical and psychological performance of the elderly as well as social alterations. Physical changes include sensory changes, that is, changes in vision, audition, olfaction, haptic and taste as well as changes in mobility [21]. The visual sense, the sense of hearing and the mobility are most important to communicate and interact with the environment [21, 22, 23]. Psychological changes comprise cognitive and affective changes like information perception, processing and remembering [15]. Social changes refer to the alteration in social relations, roles and behaviors.

The decrease in the **visual** abilities affect the color vision, contrast sensitivity, glare sensitivity, temporal resolution, visual acuity and visual search of the elderly [24]. The color vision and contrast sensitivity of older people deteriorate sharply and it becomes difficult for them to distinguish between different colors [25, 26]. That is why the elderly prefer bright color shades and strong contrasts [27]. As a consequence older people also struggle with bad lighting conditions because their light/dark vision is limited. Due to the increased glare sensitivity the elderly avoid dazzling light sources and reflecting backgrounds. Among the elderly long-sightedness is very common too. That means small details or letters are difficult to read for them. In addition the elderly have a limited field of view [28]. Besides these changes, the elderly also have to cope with their orientation because to see three-dimensionally is getting worse as distances cannot be estimated properly anymore [29].

Basically, there are two common changes in **audition** when getting older. These changes include sensitivity to higher frequencies and difficulty to distinguish specific sounds in a noisy environment [24, 27]. As a result of the increased sensitivity to higher frequencies the elderly have for example problems to understand a female voice in comparison to a male voice [29]. The second type of change results from a decreasing efficiency to process information. That is why the elderly face problems to percolate relevant information [23]. Hence, a sensory overload can occur. That is why the elderly attempt to concentrate in specific sounds, however, this may lead to a sorting of important information.

The loss of **mobility** often changes the consumer behavior of the elderly [30]. The reasons for that are changes in their motoric skills, musculature, flexibility and bone strength. Older people experience impairments in their gross motoric skills as well as in their fine motoric skills [27]. The reduction of musculature leads to a decreasing strength, endurance performance and reaction time. Daily activities become difficult to handle for the elderly (28, 31). These actions are also often connected with pain when moving because of the decreasing flexibility [26, 32]. In addition, with age frequent bone fractures occur.

When aging, **cognitive** deficits occur in terms of information reception, processing, and recall [29]. Age-related attention and concentration problems occur and cumber the information reception [33]. Furthermore, the response time of the elderly decreases and, hence, they need more time to recognize objects [34]. In case several stimuli emerge at once and affect

different sense organs, the elderly have problems to process this information properly. The reason for that is the impaired ability to divide their attention and the declining speed of the central nervous system [35]. The elderly also have problems to distinguish between important and unimportant stimuli. Often they tend to distract themselves by irrelevant stimuli [27, 36]. Hence, for the elderly it also requires an increased attention to perceive all relevant information [37]. The processing of information is also affected by aging as the performance of the brain areas which are responsible for cognitive processes decline. That is why when processing information, other brain areas become involved for compensation. However, this leads to a decreasing efficiency when processing information, hence, information processing decelerate [38]. As a result complex tasks and language are difficult to handle for the elderly. [24]. However, these problems do not occur when they are familiar and experienced with the received information. Phillips and Sternthal [36] state that “if experience is considerable, it enhances the elderly’s information processing efficiency, which compensates for the slowness of processing.” That is, experienced based knowledge is retained [31]. In addition the decelerated information processing causes a decreasing of memory [29]. The capacity to maintain information active in the memory reduces [24]. That is why the elderly often experience problems to remember context (time) and modality (visual, acoustic) after perceiving information. Concomitant, the recall of information becomes more difficult. Markowitsch [39] state that the elderly need significant stimuli to remember and recall information. Finally, the decelerating information processing causes learning difficulties because new information is not properly connected with existing knowledge [33]. However, with sufficient time the learning performance of the elderly is still good [36, 46].

As compared to cognitive changes, **affective** changes are not that well studied in terms of aging. However, emotional changes experienced by the elderly can highly influence their reactions and attitudes towards stimuli [40]. Studies show that the optimal level of arousal decreases with age, which means that older people can be aroused more quickly [41]. However, this leads to a high probability that the level of arousal is exceeded. That is why the elderly often have problems processing such strong emotions and, hence, try to avoid them. As a consequence, they decrease their willingness to take a risk [42].

Besides physical and psychological changes **social** changes occur at various stages in life caused for example by a changing family status or a new job position. With increasing age, the number of social relationships and the expected social roles are changing [29]. These changes influence the consumer behavior of the elderly because with changing social roles, established consumption needs, patterns and priorities are redefined [20]. Appropriate social roles for people in later stages of life include for example those of the empty nester, caregiver, retiree, grandparent or widower [23, 26, 43]. However, in total the number of roles decreases with age and the remaining roles are performed with less intensity [29]. Often the elderly change their behavior to conform their anticipated roles [44]. The empty nest and retirement provide more time and cause a change in income [29]. After the children have left the house, the spouse becomes more important and decisions are increasingly made together [23]. For widower the children become the most important person in life who advises their parents on making purchases due to the fact that some information are too complex for the elderly [26]. In total, the interpersonal relationships decrease with age and family members as well as friends get a higher priority [29].

5. RISK PERCEPTION ADOPTING INNOVATIVE MOBILITY SYSTEMS

The age-related changes can influence the risk perception of the elderly and the perceived relevance of the risk dimensions which in turn affects the adoption of innovative mobility systems. Taking the persuasion stage which comprises the evaluation of the provided

information about the innovation, it is shown in which manner the six identified risk dimensions are influenced by the age-related changes.

Within the **persuasion stage** the psychological processes, including cognitive and emotional processes, are of importance. Especially occurring cognitive deficits influence the evaluation of available information because of a deceleration in information reception and processing. As a result complex technical or handling information of innovative mobility aid systems are not fully understood and the elderly have problems to evaluate the mobility innovation properly which may lead to a high perceived risk. Furthermore, innovations in the area of mobility aids are associated with strong emotions by the elderly. The emotional confrontation with growing older, being dependent from others or losing quality of living may also evoke strong negative or ambiguous feelings resulting in a high perceived risk.

The age-related changes also affect the perceived relevance of the risk dimensions when it comes to innovations in general and innovative mobility systems in specific. The **functional risk** perceived in terms of innovative mobility systems is the result of unfamiliarity, no or only little experiences and not understanding the mechanisms of the innovative mobility system. Hence, they have no imagination of using the mobility aid innovation themselves. The perceived **financial risk** is strongly dependent on the income of the elderly. However, it is also difficult to evaluate the pricing of the mobility aid innovation when the elderly have problems to understand the innovation and evaluate it. Furthermore, mobility systems belong to the health market which is characterized by a complicated care system. Mobility aids are mainly received from health insurances and require only little monetary contribution. However, the elderly are increasingly willing to pay for high quality mobility aids by themselves. The perceived **social risk** involves the desire of feeling socially integrated. An innovative mobility aid may look unusual or functions differently, that is, when using it, the elderly are concerned what other people may think of them and whether they accept it or not. The **psychological risk** occurs when the elderly cannot identify themselves with the innovative mobility aid. For the elderly in general it is difficult to accept getting older and depending on mobility aids, especially when they feel or see themselves different. Using an innovative mobility aid confirms aging. The elderly then perceive themselves as old and assume that other people perceive them the same way. The **physical risk** is of great importance for the elderly in terms innovative mobility aids because these aids are often developed with new technological functions which are hard to understand and evaluate. The elderly are often afraid to fall down or hurt themselves because of a difficult handling or new functions they cannot manage properly. Considering the changing social roles of the elderly, that is retiring or empty nester, the **time risk** may not be that relevant. However, a complex purchasing decision for an innovative mobility system requires also time-related involvement in order to make the right decision. In this case family members often support the decision process.

In summary it can be said that the six risk dimensions are reinforced by the visual, hearing, mobility, cognitive and affective age-related changes. However, if acute mobility restrictions are arising proven mobility aid systems, despite deficits, are used whereas innovative mobility aid systems are still attended with adoption problems. The relevance of the risk dimensions is even higher for innovative mobility aids and that is why it is important to consider age-related changes when developing and communicating an innovative mobility aid system in order to avoid a high perceived risk.

6. IMPLICATIONS

In order to overcome adoption barriers within the adoption process of innovative mobility aids firms need to counteract perceived risk and its dimensions by considering the age-related

changes designing and communicating the innovative mobility aid. Taking the before mentioned age-related changes into account the following implications for reducing the perceived risk can be made.

The perceived **functional risk** can be reduced by communicating credible and comprehensible information about the functional mechanisms of the mobility aid innovation. Furthermore, the design of the mobility aid innovation can influence the perception of the functional risk. A simple and uncomplicated design creates familiarity and is associated with a proper performance. Simultaneously the design should be unobtrusive to avoid a high perceived **social risk**. In addition when communicating innovative mobility aids the unique selling proposition should be emphasized because this may compensate concerns in terms of unacceptance by the close environment. The **psychological risk** can be influenced by addressing the changed social roles of the elderly when communicating the mobility aid innovation. That is, when using testimonials in the communication campaign, the elderly have to identify themselves with the person appearing in the advertising. For example, this person needs to correspond to the self-perceived age of the elderly. Hence, no stereotypes should be used in order to be authentic. Communication of the mobility aid innovation should meet their attitude to life, including health, activity, fun, family, independency, reliability or self-fulfillment. Furthermore, the elderly do not want to be addressed as separate target group, for example, using the term “senior”, but they want to be perceived as a full part of the society. That is why age-less marketing or intergenerational marketing is an effective way to convince the elderly. However, products that are specifically for older people, like a mobility aid, should be promoted avoiding negative associations with aging. Instead, positive association, like experiences, patience and expertise, should be emphasized. The **physical risk** is of great importance when it comes to innovative mobility aids and can be reduced by a simple and intuitive handling which avoids the fear of falling. An intuitive handling can be supported when the innovative mobility aid is easy to understand and functions independent from cognitive and physical performances. The control mechanisms of an innovative mobility aid should be clear and in a structured symbolic manner to support its understanding.

Communicating information about an innovative mobility aid is a balancing act between providing enough information on the one hand and too many information on the other. The cognitive capacities of the elderly should not be exceeded but they still should receive enough information to evaluate the mobility aid innovation properly. That is, the message design should be clear and structured and relevant information should be presented using images because in that way cognitive efforts are decreased and unconsciously associations are triggered. Furthermore, it is important to provide enough time for processing the information in order to ensure a proper understanding. Communication campaigns should also address and convince family members as the elderly heavily rely on their recommendations. Finally, to support the adoption of an innovative mobility system and to reduce a high perceived risk is to let the elderly try the innovative mobility aid so that they can gather experiences with its handling and functional mechanisms.

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