ECONSTOR
Make Your Publications Visible.

A Service of
ZBW
Leibniz-Informationszentrum Wirtschaft
Leibniz Information Centre for Economics

Herstatt, Cornelius; Kohlbacher, Florian; Bauer, Patrick

Working Paper

"Silver" product design: Product innovation for older people

Working Paper, No. 65

Provided in Cooperation with:
Hamburg University of Technology (TUHH), Institute for Technology and Innovation Management

Suggested Citation: Herstatt, Cornelius; Kohlbacher, Florian; Bauer, Patrick (2011) : "Silver" product design: Product innovation for older people, Working Paper, No. 65, Hamburg University of Technology (TUHH), Institute for Technology and Innovation Management (TIM), Hamburg

This Version is available at:
https://hdl.handle.net/10419/55508

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

WWW.ECONSTOR.EU

Mitglied der Leibniz-Gemeinschaft

Technologie- und Innovationsmanagement

Working Paper / Arbeitspapier

"Silver" product design – product innovation for older people

Prof. Dr. Cornelius Herstatt
Dr. Florian Kohlbacher
Dipl.-Kfm. Patrick Bauer

September 2011
Working paper No. 65

Technische Universität Hamburg-Harburg

Schwarzenbergstr. 95, D-21073 Hamburg-Harburg
Tel.: +49 (0)40 42878-3777; Fax: +49 (0)40 42878-2867

www.tu-harburg.de/tim

“Silver” product design – product innovation for older people

Abstract Aging populations challenge companies across different countries and industries to respond to the changing needs, demands and expectations of their growing shares of older customers. This opens room for improving or developing innovations – products as well as services – that correspond to the diverse expectations. New product development for older customers or “Silver” product design is one way to approach the “silver” market - without explicitly excluding younger customers. Research in this field is still in its infancy. Silver product design focuses on individual autonomy, representing an elementary aspect of good life, disappearing in a more or less continuous manner over the life cycle of a human being. Offering solutions that will allow people to maintain or recover autonomy and to use products and services in an independent manner therefore seems to be a promising avenue for companies innovating across different industries. The general concept of autonomy can be perceived as a boundary-spanning argument and a common denominator for starting development initiatives leading to innovations targeting the silver market. Cross-case analysis based on four different product innovations addressing typical needs of older people are used to present how firms in different industrial contexts and user-settings address such needs, which have their roots in a need to stay autonomous and independent. Technological, marketing and strategy-related observations as well as communalities and differences of the cases are being discussed and very first implications for managing the front end of silver product development sketched.

Keywords: Demographic change, aging, older users, silver market, innovation management, silver product design, individual autonomy

Introduction

Today, aging and shrinking populations can be seen in almost all industrial nations, and are understood as one of the most challenging global trends (Coulmas and Lützeler 2011). Globally, the number of persons aged 60 or over is expected almost to triple, increasing from 737 million in 2009 to 2 billion by 2050. In developed countries as a whole, the number of older persons has already surpassed the number of children (persons under age 15), and by 2050 the number of older persons will be more than twice the number of children. Further this trend also affects countries of the developing world (Figure 1). In developing countries as a whole, even though just 8% of the population is today aged 60 years or over, this share will more than double by 2050, reaching 20% that year. This structural change will have strong effects on society and the economy. On the micro-level, for example, companies need to understand and adjust to changing needs of both older customers and older employees. (Kohlbacher, Gudorf, and Herstatt 2010; Kohlbacher and Herstatt 2011)

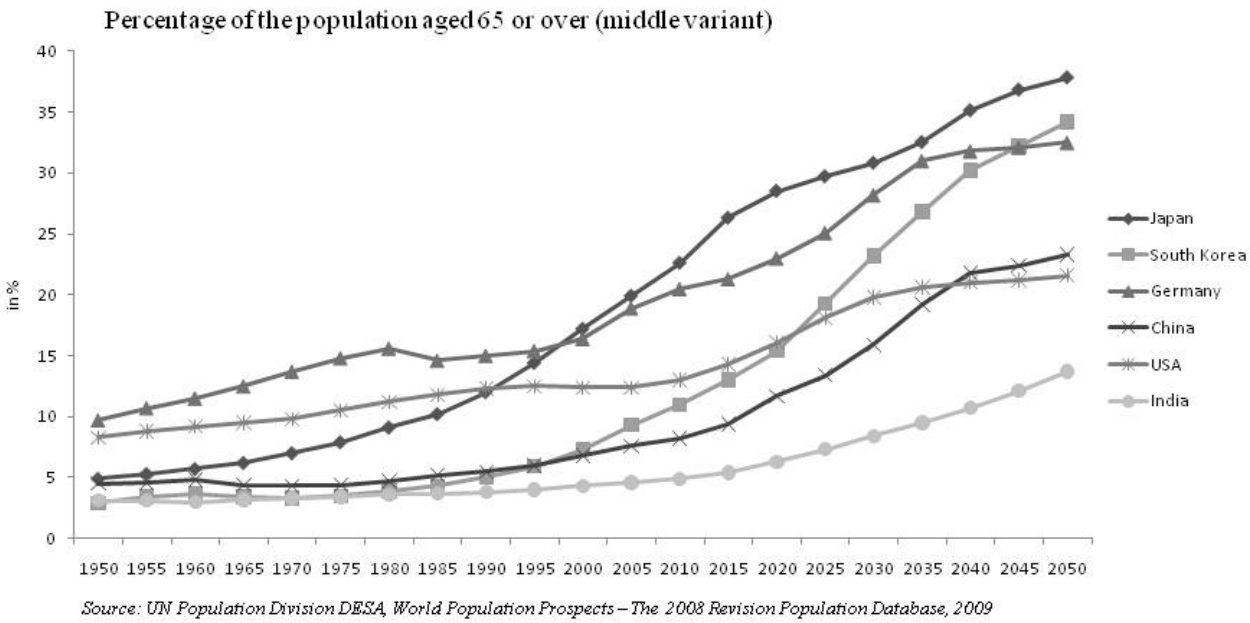

Figure 1: Population aging is a global trend

A growing share of older customers and employees bear risks but also opportunities for firms, institutions and the economy overall (Kohlbacher and Herstatt 2011). Risks include potential labor shortages, loss of knowledge and a shrinking customer base; opportunities comprise chances to explore and benefit from emerging markets, such as the so-called growth market ”aging” or “silver” market (Kohlbacher 2011).

This paper addresses the challenges and opportunities that a growing share of older customers brings for innovation management and new product development. We present case studies of firms in different settings who systematically explore opportunities to develop innovations for seniors. We use an explanatory multiple case study approach, and present different B2C “silver” innovations. Although different with regard to markets, customers and solutions, in all cases presented, a particular need turned out to be the starting point: We observed autonomy – the capacity of a person to freely decide and run his or her own life as

independent as possible – to be core, and the most important, common denominator of all these projects.

Older customers and innovation: The "silver" market

Despite their growing share, many of today's products and services are not designed to the needs of old people (Gassmann and Reepmeyer 2006; Lunsford and Burnett 1992) and the product development and technology/innovation management literature is still surprisingly silent on this topic. While first useful practical recommendations exist in the work on transgenerational design (Pirkl 2011), universal design (Gassmann and Reepmeyer 2011), and design for inclusivity (Coleman, Lebbon, and Myerson 2003), dedicated research on new product development for older people is still lacking.

People change over time (while growing old), and so do expectations, possibilities, and needs (Fisk et al. 2009). Firms consequently have to adapt to these changes by developing products and services that optimally respond to them (cf. e.g., Kohlbacher and Hang 2011; Kohlbacher and Herstatt 2009). As there are large differences within different segments of senior users to be expected (Niemela-Nyrhinen 2007; Wang et al. 2011), serving the silver market as a whole with standardized solutions seems to be almost infeasible. Aging is a multidimensional process (e.g., Bengtson, Gans, and Putney 2008; Moschis 1996), and customer needs diverge with age, leading to highly heterogeneous distributions of consumer preferences (e.g., Moschis 1994). Companies who want to leverage the business potential of older customers – the silver market – consequently need to account for the specific, but also very heterogeneous, needs and capabilities of this clientele. In this regard the silver market is not to be understood as one "big", homogeneous market on its own but rather a conglomerate of many (sub-) markets – partly – overlapping existing ones.

Submarkets are characterized by individual needs of people above a certain age which in itself vary significantly. The age-line for definitions of the silver market and its many other names ("mature", "grey", "senior", "golden age" etc.) has been drawn in the past somewhere between 50 and 65 (Laukkanen et al. 2007). Depending on the submarket and the specific characteristics that define it (e.g. age-based viewing, hearing and reaction time constraints) this line may be drawn more towards the bottom or the top of this spectrum.

But is there an overarching characteristic that all submarkets may have in common – despite their vast differences and nuances? We propose autonomy, or more precisely regaining lost autonomy and preventing future losses of it, as one common, important characteristic. Physical and psychological aging typically leads to loosing autonomy due to conditions such as constricted viewing, loss of hearing or decline in working memory (Fisk et al. 2009). Becoming dependent on others is the frequent consequence of such physical and psychological handicaps. We argue that most people strive to prevent this and do not want to become (overly) dependent on others.

Physical and mental restrictions are not limited to older people, of course, but typically affect people when getting old. Indeed the desire for keeping up a minimum level of personal autonomy seems to be a need shared by many if not most of all older people (Ford et al. 2000).

The concept of autonomy and its relevance for "silver" product design

Autonomy, which originated from the Greek "autonoma" (*auto* stands for self, *nomos* means law), can be defined as the capacity of a person to freely decide and run his or her own life as independently as possible (cf. Randers and Mattiasson 2003). As said before, typically with growing age, the functional and mental capabilities of humans begin to decline and by this their individual autonomy is reduced.

The negative side-effects of aging go ha nd in hand with becoming more and more dependent, since at some point in their life older people cannot perform tasks they used to do in their daily living (Raina, Massfeller, and Wong 2004). Decreasing sensory abilities complicate the use of products, e.g., opening of bottles, reading displays; lower cognitive capabilities inhibit the fast consumption and processing of data, e.g., comprehension of speech, using interfaces (Fisk et al. 2009).

Autonomy-enhancing solutions – improved or totally new products and services addressing this need for autonomy – can help to fill the perceived gap between a low(er) and a desired state of autonomy, at least for some time. An extreme but not rare example is people who cannot any longer feed themselves (because of muscle amyotrophic, for example). Being dependant on others to eat is a very incriminating, stigmatizing phenomenon. Not being capable to participate any longer in dinners with family or friends is another very unpleasant effect, which may lead to social isolation. An on-demand feeding machine like "My Spoon" developed and manufactured by the Japanese Secom Group, delivers a solution to respond to such issues.

Providing solutions to alleviate the loss of, or to restore, autonomy may also catch the attention of younger consumers, since they exhibit higher degrees of aging anxiety and fear dependence more than those who are already older (Lynch 2000). The other, practically very relevant case is younger people who feel responsible for their older parents or friends and who take a closer look at such solutions. They often play an advising and consulting role to the users of such solutions or may even directly purchase these solutions for them.

Case studies: Silver product design in different industries

The four following case studies exemplify how companies can develop innovative solutions to help older consumers maintain, enhance and/or regain their autonomy. These cases stem from Germany, Austria and Japan, three rapidly aging countries, and cover different industries.

Our first case is a recent development project in the area of tissue strengthening implants by Johnson and Johnson Medical (Germany), where the starting question was to what extent existing products of a certain business unit were affected by an increasing number of older customers. During the course of the project, the focus moved to the field of weakening tissue structures and the resulting risk of incontinence in higher age. Incontinence is confirmed to be a severe problem for millions of older people, which heavily affects autonomy of these individuals. This was the starting point for developing a product concept that was based on their exiting mesh technology and aims at tightening the ureter when pressure in the abdominal area increases.

The second case describes development work by Emporia (Austria) in connection with communication devices for older people. Over a number of years, Emporia has been developing mobile phones for senior users. As seniors are often not used to fancy design and complicated menu navigation, they are dependent on the help of others in order to use a mobile phone. Emporia has recognized this need and develops solutions with designs that focus on high usability and flattened functionalities adapted to the physical and mental capabilities of older people. To deliver these functionalities, Emporia´s R&D heavily interacts with typical users, testing each development step with silver customers.

The third case describes the product development of an age-friendly notebook by a leading consumer electronics firm in Japan, Fujitsu. The "Raku Raku notebook" (raku = easy) is a PC for silver customers which draws from the product concept of the "Raku Raku Phone," which was a huge success in Japan and won seniors with easy-to-use interface and less complex functions. In November 2008, Fujitsu came out with the "Raku Raku PC," targeted at silver beginners. Two models are available, a desktop and a laptop version. Both are equipped with an easy-to-use keyboard, mouse and menu, using touch-screen technology, so that older people using a PC for the first time can easily understand it. The letters and icons of the menu are 25% larger than on the usual ones. The most often used and vowel keys are marked by colors and function keys such as the space key have the Japanese function written on them. When turning the Raku Raku PC on, the menu shows the most important programs such as e-mail or internet. In addition, Fujitsu offers a home installation service and the Raku Raku PC Help Line, a customer support, which is free for the first year of product usage (Kohlbacher and Hang 2011; Kohlbacher and Hideg 2011).

Our fourth and last case presented here, is the Robot Suit HAL (Hybrid Assistive Limb), which has been developed by University of Tsukuba Professor Sankai. This device helps handicapped and older people to move their limbs as well as workers to carry heavy weights by wearing an "exoskeleton" type robotic suit. HAL enhances and strengthens the limb motion of human bodies by detecting the weak bioelectrical signal through the body from the brain which generates the nerve signal to control the musculoskeletal system. The system of HAL captures nerve signals via motoneuron through a sensor attached on the skin of the wearer. Based on the signals obtained, the power unit is controlled to move the joint in sync with the wearer's muscle movement, enabling to support the wearer's daily activities. The product was launched onto the market in 2009 by the university spin-off Cyberdyne Corporation, with seed money from a major Japanese corporation, Daiwa House (Kohlbacher and Hang 2011). Table 1 summarizes the important findings from the case studies.

Table 1 Cases based on an autonomy-enhancing effect

Case	Johnson & Johnson Medical	Emporia	Fujitsu	Hal Robot Suit
Product	Urogenital implants	Cell phone	PC/notebook	Robot Suit
Customer focus/ autonomy restraining factor	Customer has to use incontinence products such as pads or diapers	Customer has problems with regular phone menu navigation and comprehending the interface	Customer has problems with regular PC menu navigation and comprehending the interface	Customer has problems in moving his/ her limbs and/or lifting heavy objects
Autonomy-enhancing effect (examples)	Customer regains continence can move freely, and does not feel stigmatized	Phone can be used by the senior directly without help from others, by simple interface. In addition, phone allows seniors to stay in contact with family and friends and avoid isolation	Using the PC supports older people in staying connected with and using services and functions being offered via Internet. Remote service supports senior user when problems occur	User can lift heavy objects, and muscles are supported while moving
Product innovation	New	Adapted	Adapted	New
Technological newness	Existing technology base transferred	Existing technology base transferred, combined with partly new technology (e.g., noise control)	Existing technology base transferred	New technology (e.g., sensory, triggers, etc.)

Case comparison: The relevance and dimensioning of autonomy

Comparing the four cases presented here, we find both common factors and differences in terms of how autonomy is implemented both from the technical as well as the marketing perspective. On the technological side, one has to generally differentiate between technology and functionality and their corresponding complexities. Whereas "a function is an attribute to the product, substantive technology is the knowledge by which the product is created" (Kogut and Zander 1992). In our cases, the degree of technological newness included to provide solutions can be regarded as varying from relatively low-tech to high-tech. One example draws on technologies that are well-understood and have been implemented before in combination with other products (J&J); others include new technologies which have been developed partly for other applications first (Emporia and Fujitsu) and then transferred. In one case, the technology has been proprietarily developed (i.e., the Hal-suit). Furthermore we observe that in addition to the different levels of technological newness and complexity, the product offerings also differ in the functional complexity they exhibit from the perspective of the user. In some cases this functional complexity is lower than in comparable products offered to the "mainstream market," due to fewer usage options being provided (Emporia and

Fujitsu). In one case (Hal-suit), totally new functions are being offered, which have never been combined in a product before. Again, in another case functionality remains untouched, but is offered to a new target group corresponding to their needs (J&J).

With regard to market research as a first, essential activity in new product development, all projects were based on a common ground: it is important to empathize with silver customers (cf. Coleman, Lebbon, and Myerson 2003; McDonagh 2008), who are on the verge of losing their autonomy, and take their (latent) needs into consideration. However, we found differences in the cases in terms of the approach towards market research methodology. If minor cognitive or psychological restrictions are the cause for decreasing autonomy, direct qualitative market research such as interviewing the silver customer is still possible and promising; with lowered mental and sensual abilities, ethnography and observations are more promising, because the observer will gain a first-hand understanding of the use context, while this knowledge can very likely not be elaborated by the persons in focus. If physical constraints affect the independence of older customers, indirect techniques such as using an age simulation suit (cf. Cardoso and Clarkson 2007) or integrating medical experts may be an alternative to more complex, direct methods. However, these decisions are not either–or choices, and each approach should be complemented by other methods for validation (multi-method approach).

Although very different in nature, we find the need for autonomy to be the overarching theme of our cases. Yet there are two distinct, implicational aspects of autonomy-enhancing products. The first, direct effect is connected to the use of the product itself: products need to be engineered in a way that they can be used independently, i.e., without help from others. This requirement is closely connected with questions of usability and product design. Emporia's phone and Fujitsu's Raku Raku products are prime examples whose success is based mainly on this type of autonomy-enhancement. The second aspect reaches further, and is related to a more comprehensive perspective that takes the product functions, product environment and related services into account: products should help users to keep their autonomy as long as possible. Products meeting this requirement enable seniors to maintain their mobility, freedom of choice and social participation. As opposed to the first aspect of autonomy, which helps seniors to use products independently, the second layer supports silver customers directly in maintaining and sustaining their autonomy and living their life (more) independently from other aiders or supporters. They increase quality of life, e.g., by allowing them to continue to live in their own homes instead of having to move into a nursing home ("aging-in-place" Chapin and Dobbs-Kepper 2001). While the first effect seems to be the case with Emporia's and Fujitsu's phones and PCs –, the J&J implants and HAL suit examples better fit with the second autonomy-enhancing effect.

Further, it is important to note that the products of our case-examples here are not exclusively restricted to the use by older people only. The J&J product, for example, was originally developed for younger women suffering from lowering of the uterus, causing incontinence. In this respect, products often simultaneously offer value for users who are restricted in their senses, cognition, or movement control, or prefer easy-to-use products without "being old". Another case in point here is the Raku Raku Phone: originally developed for older people, this cell phone with enhanced usability and universal design features did not only appeal to older consumers. This led to the development of new versions targeting a much broader group including young and old users (Kohlbacher and Hideg 2011). Further, the HAL robot suit example has many potential applications beyond the use by older people, e.g.

supporting workers in lifting heavy items or allowing nurses to lift and move immobile patients. Also, it might be employed for rehabilitation of patients with mobility defects or even for entertainment purposes. This effect can be observed from both our own case studies as well as from other examples of silver products: Many of them are positioned as solutions responding to specific autonomy needs of older people but not senior products *per se* since they attract attention from people in very different life stages.

Implications for managing the front end of innovation of silver product design

In the cases reported here we could repeatedly observe certain process-related activities as well as responses to certain issues at the front end of product design. Based on this and as a first conclusion we suggest three fields of tasks to focus on at the front end of developing silver products. (See Table 2)

Table 2: Innovation management has to account for key silver market specifics

Aspects	Key questions	Silver market specifics
1. Target group definition	Who will be the user of the product?	Often professional care givers or family members will be the ones actually using a product to support a senior. If the user of a product is a senior with mental or physical constraints, the product (user interface) design needs to acknowledge this.
	Who will make the buying decision for the product?	Silver innovations are often not bought by the senior users or care receivers themselves, but by institutional procurement or younger family members.
2. Newness and modularity of technology and product	Is the innovation corresponding to a completely new or an adapted existing solution?	Especially senior users can have a hard time handling entirely new products. Adapted products already in use by these persons can thus increase acceptance and effectiveness of use.
	Is the innovation modular enough to offer platform potential?	As users age, their preferences and needs change. A product platform that allows functionalities to be adopted over the life course of its users bears immense potential, as they will not have to switch to new products in later life but rather adopt stepwise to added functionality
3. Degree of autonomy-enhancement	Is the innovation targeted at supporting the independent use of a product?	In this case, the user of the product will always be someone with certain mental and/or physical constraints. The design of the product therefore needs to allow operability within these constraints (which need to be precisely identified first).
	Does the innovation provide a product that deliberately supports autonomy itself?	If the target user group of the product includes supported seniors, the same design principles apply. If the target user group is limited to caregivers, such design principles are not required but easy-to-use functionality might still be beneficial. In either case, the perception of senior users or care receivers might be that autonomy-enhancing products and/or attached services are actually cutting down on their autonomy (delegation of control to machines or caregivers). This should be avoided as far as possible through product design.

1. Target group definition

For all innovations, a diligent clarification of potential target groups is critical for both market research as basis of product development and later on for all marketing activities. For silver market innovations, this clarification is especially critical. In the B2B, as well as in the B2C area, the user of a product is not necessarily a senior end-user. The person operating a certain product can often be a relative or other caregiver, in support of an older care receiver. This might be the case either in their private surroundings or in a professional institution. Obviously, this strongly differentiates the required specifications of the product from one that is used directly by an older end-user with limited physical or mental capabilities.

Clarification of the target user group of a product and its requirements alone however, does not provide sufficient information for the early stages of product development. The buying decision for a product in the silver market is often situated elsewhere and can as well influence the optimal specifications of a product from a marketing point of view. This can, for example, change the requirements regarding price, life-time and warranty or look-and-feel from what they would be if the target user of the product made the buying decision by himself or alone. In the B2B world, often the user of a product might have only limited say in the buying decisions of his employer and in the B2C world relatives are often the ones looking for innovative products to support their older relatives.

2. Newness and modularity of technology and product

When it comes to assessing the user acceptance and long-term customer retention potential but also profitability of a silver innovation, the newness of a product and the technology it uses, as well as its modularity – or platform potential – become key areas of attention.

While the average user will typically not be much concerned with the newness of the technology underlying a product, this can be quite different with the newness of the product functionalities. Especially older users often have trouble with the navigation of new product functionalities. This may influence their acceptance of a new product negatively. Therefore, a general tendency for higher user acceptance can be expected for product innovations based on existing products and product functionalities, compared with entirely new products and functionalities.

As discussed, when users get old, their requirements regarding product functionalities change and users are well aware of that, even before it happens (Lynch 2000). At the same time, learning how to use new products - which might be required due to new capability constraints - can pose a challenge for older users. Therefore, a silver product innovation which is based on an existing product platform or which creates such a modular platform has great potential to retain customer loyalty, as it allows product functionalities to be gradually adapted follow changing needs and capabilities to use of older users. (Orlov 2011)

In addition to this, developing a product innovation based on an adapted existing product or technology can bear significant synergy potential, positively influencing the profitability of the endeavor. This can be a strong guiding factor in looking for new and prioritizing potential innovation projects as we have seen from our examples.

3. Degree of autonomy-enhancement

The degree of autonomy-enhancement provided is a key determinant of a silver product's attractiveness. The larger the potential autonomy gain, the more potential users will be willing to invest both financially and in terms of learning effort or frustration tolerance regarding acceptance of the product. As autonomy-enhancement is continuous and of very heterogeneous nature, a general classification scheme of the level of autonomy-enhancement would probably be arbitrary and impracticable. However, the two identified types of autonomy-enhancement need to be differentiated.

To recap, while the first type of autonomy-enhancement relates to innovations which support or (re-)enable the use of any product (deliberately autonomy-enhancing itself or not), e.g. through design targeted at easier operability, the second type of autonomy-enhancement describes products that deliberately aim directly at specific autonomy-enhancements, e.g. regaining the ability to walk around unassisted. It should be noted that the two described types of autonomy-enhancement are not mutually exclusive. Rather, a product that directly supports autonomy in a certain area might as well include specific easy-to-use functionality. This is actually a key prerequisite if that product is to be used by older or otherwise restricted users to increase their autonomy. For a caregiver using such a product to support a care receiver this might not be required, but a clearly designed and easy to use product could be very well appreciated by him or her as well.

Also, it is important to notice that when care receivers are involved, new products and related services can lead to a situation where the senior individually does not experience them as contributors to their autonomy, but quite the opposite. Take as an example the aforementioned surveillance service installed into the home, where caregivers or family can check on a senior affected by dementia. Especially if the need for support– and the more severe consequences a condition would have without the product – is not obvious to the senior in the first place, this can feel to him or her as cutting down on their autonomy, rather than increasing it. It can be expected that this emotional perception of a decrease in autonomy can also be triggered by a product alone, even if it is not tied to a service involving caregivers. Especially when seniors have not had prior experience with high-tech solutions, the delegation of control from themselves to a "machine" can feel unpleasant and decrease their acceptance of the product. This needs to be carefully considered already in the design of such products and services.

Conclusion

We have shown that one way to approach the silver market without explicitly excluding younger customers is to focus on autonomy, representing a good life, disappearing in a more or less continuous manner over the life cycle of a human being. Offering solutions that will allow people to maintain or recover autonomy and to use products and services in an independent manner therefore seems to be a promising avenue for innovating companies across industries. The general concept of autonomy can be perceived as a boundary-spanning argument and a common denominator for starting development initiatives leading to innovations targeting the silver market. The concept has to be operationalized in combination with the application, of course – which calls for more research to be done.

Actual and potential applications are immense, and comprise a large variety of products and services in a myriad of contexts, industries and user-settings. Taking the needs and wants of older consumers seriously, and developing new products and services that cater to their

demands, not only offers attractive profit opportunities in a time of shrinking youth segments, but additionally benefits older people and increase their consumer welfare. At the same time, it can attract the attention of younger customers looking for products and designs which are less complex to use by means of rearranged or decreased functionality. Therefore a firm can profit from signaling its preparedness to respond to gradually diminishing autonomy, which seems to be unpreventable for all of us. Further it can attract attention of younger customers who support older family members or friends with physical or mental issues, limiting their individual autonomy

New product development for older customers is still in its infancy. We hope to have helped raise the awareness of this topic among academic scholars and practitioners and to have set the path that may trigger further research in an area that is likely to dominate the development of markets and economies around the globe for the rest of this century.

References

Bengtson, V., Gans, D., and Putney, N. 2008. Handbook of Theories of Aging. 2nd. Edition New York: Springer.

Cardoso, C., and Clarkson, J. 2007. User Simulation in Product Evaluation. In Design for inclusivity: A practical guide to accessible, innovative and user-centered design, ed. Roger Coleman, J. Clarkson, H. Dong, and J. Cassim, 197–210.

Chapin, R., and Dobbs-Kepper, D. 2001. Aging in place in assisted living: Philosophy versus policy. Gerontologist 41(1): 43–50.

Coleman, R., Lebbon, C., and Myerson, J. 2003. Design and empathy. In Inclusive design: Design for the whole population, ed. John Clarkson, R. Coleman, S. Keates, and C. Lebbon, 478–99. London: Springer.

Coulmas, F., and R. Lützeler, eds. 2011. Imploding populations in Japan and Germany: A comparison. Leiden: Brill.

Fisk, A. D., Rogers, W. A., Charness, N., Czaja, S. J., and Sharit, J. 2009. Designing for older adults: Principles and creative human factors approaches. 2nd. Human factors & aging series. Boca Raton: CRC Press/Taylor & Francis.

Ford, A. B., Haug, M. R., Stange, K. C., Gaines, A. D., Noelker, L. S., and Jones, P. K. 2000. Sustained personal autonomy: A measure of successful aging. J. Aging Health 12(4):470–89.

Gassmann, O., and Reepmeyer, G. 2006. Wachstumsmarkt Alter: Innovationen für die Zielgruppe 50 +. München: Hanser.

Gassmann, O., and Reepmeyer, G. 2011. Universal design: Innovations for all ages. In The Silver Market Phenomenon, ed. Florian Kohlbacher and Cornelius Herstatt, 101–16. 2nd. Berlin: Springer.

Kogut, B., and Zander, U. 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. Organization Science 3(3):383–97.

Kohlbacher, F. 2011. Business Implications of Demographic Change in Japan: Chances and Challenges for Human Resource and Marketing Management. In Imploding populations in Japan and Germany: A comparison, ed. Florian Coulmas and Ralph Lützeler, 269–94. Leiden: Brill.

Kohlbacher, F., P. Gudorf, and C. Herstatt. 2010. Silver Business in Japan: Implications of Demographic Change for Human Resource Management and Marketing. Tokyo: German Chamber of Commerce and Industry in Japan.

Kohlbacher, F., and C. Herstatt, eds. 2011. The Silver Market Phenomenon. 2nd. Berlin: Springer.

Kohlbacher, F., and Hang, C. C. 2011. Applying the Disruptive Innovation Framework to the Silver Market. Ageing Int 36(1):82–101.

Kohlbacher, F., and Hideg, A. 2011. The Raku-Raku Phone: Simple Communication That Is Simply Successful. Marketing Management Spring: 38–43.

Kohlbacher, F., and Herstatt, C. 2009. "Silver product" development: The reality of R&D firms in Japan. Paper presented in R&D Management Conference June 2009, Vienna.

Laukkanen, T., Sinkkonen, S., Kivijarvi, M., and Laukkanen, P. 2007. Innovation resistance among mature consumers. Journal of Consumer Marketing 24(7):419–27.

Lunsford, D. A., and Burnett, M. S. 1992. Marketing product innovations to the elderly: Understanding the Barriers to Adoption. Journal of Consumer Marketing 9(4):53.

Lynch, S. M. 2000. Measurement and prediction of aging anxiety. Research on aging 22(5):533–58.

McDonagh, D. 2008. Do it until it hurts! Empathic design research. Des. Principles Pract. 2(3):103–10.

Moschis, G. P. 1994. Marketing strategies for the mature market. Westport Conn: Quorum Books.

Moschis, G. P. 1996. Gerontographics: Life-stage segmentation for marketing strategy development. Westport, Conn: Quorum Books.

Niemela-Nyrhinen, J. 2007. Baby boom consumers and technology: Shooting down stereotypes. Journal of Consumer Marketing 24(5):305–12.

Orlov, L. M. 2011. Technology for Aging in Place: Market Overview 2011. http://www.ageinplacetech.com/2009TechMktOverview (accessed August 31, 2011).

Pirkl, J. J. 2011. Transgenerational design: A heart transplant for housing. In The Silver Market Phenomenon, ed. Florian Kohlbacher and Cornelius Herstatt, 117–31. 2nd. Berlin: Springer.

Raina, P., Massfeller, H., and Wong, M. 2004. The relationship between sensory impairment and functional independence among elderly. BMC Geriatrics 4(3).

Randers, I., and Mattiasson, A. C. 2003. Autonomy and integrity: Upholding older adult patients' dignity. J. Adv. Nurs 45:63–71.

Wang, A., Redington, L., Steinmetz, V., and Lindeman, D. 2011. The ADOPT Model: Accelerating diffusion of proven technologies for older adults. Ageing International 36(1):29–45.