

Integration of elderly users into product
development processes –
senior research groups as organisational and
methodical approach

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Abstract

Ageing of society is considered as one of the big social and economic challenges of industrial nations in Europe, North America, Australia and parts of Asia. Less workforce and more recipients of transfer payments are straining national budgets and innovation potential.

The disparity between capabilities of elderly persons on the one hand and their integration and participation in economic and social processes on the other hand reveals barriers, which impede a sustainable solution of age-related problems. Regarding employment, lots of active and healthy seniors are interested in fulfilling productive tasks like teaching, caring for disabled persons or supporting younger people with their experiences. Sales potential of the senior market is enormous due to the increasing number of elderly people and its financial strength – but it is not used today. Various methods of resolution of this challenge are discussed by politicians and other decision makers of economic systems. Unfortunately these efforts do not aim to solve one of the main reasons of the described problem: Rapid technological development without consideration of characteristics, requirements and behaviour of senior citizens. For this reason, seniors are often not able to utilize new technologies, which ultimately leads to a decreasing competitiveness compared with younger persons. Moreover, a lack of self-descriptiveness frustrates users when using high-tech products. In Germany, e. g., needs of about 25 million people today and estimated 40 million in 2050 are unconsidered by industry.

To face this challenge, interdisciplinary user groups of seniors have to be involved in the development of new products and work together with product designers and engineers throughout the innovation process. Thereby products can be designed ergonomically and accessible to people of all ages. To ensure feasibility of this concept, a sound organisation as well as conformity with today's industrial product development processes are essential.

This article presents a new process and first experiences for user integration of senior citizens in the design process. The realisation of senior research groups can create wide and positive consequences for economic and social development in industrial and developing nations.

1 Introduction

Ageing of societies is happening in a multiplicity of industrial nations and is often seen as challenge, if not problem. Negative effects arise particularly from social distance and neglecting the potentials of consume and productivity. Social contacts, the impartment of knowledge or self-realisation are crucial factors for a fortunate ageing.¹

The combination of reasonable engagements and liberties of a senior's life can add a high value and fulfil human needs.² But there seem to exist constraints which foreclose this to a large part of elderly people.³

Initially it is important to have a look on the basic conditions which lead to the described phenomenon. As a result of demographic changes and medical-technical progress the percentage of elderly people is growing strongly in Germany and other industrial nations. German prognoses are predicting an increase of life expectancy until 2050 of about six years to an average of 84 years. More than one third of the population will be 60 years and above. Besides that, the old-age dependency ratio – the number of persons above 65 years of age per one hundred persons of working age (15-64) – will rise from 0,44 today to 0,71 in 2050, even when underlying favourable assumptions.⁴ This implies that a decreasing percentage of population has to finance the social security system for a growing number of retired people.

As a result ageing is perceived as a financial burden in public discussion. Public expenses for annuities, care and health systems are boosted, leading to a strained relationship between the

¹ cp. Zimbardo, P. G. [1995], p. 415; Maslow, A. H. [1970]

² cp. Luczak, Ha. [2005], p. 143

³ cp. chapter 2.3, p. 7

⁴ cp. Pöttsch, O., Sommer, B. [2003], p. 7

generations.¹ The economic potential, that arises from the demographic change, is hardly taken into account. On the one hand “seniors” are shaping an enormous sales market. Some examples: People older than 50 years have more than a half of Germany’s spending power and assets, they buy more than 45 % of all new cars, 50 % of skin care products and they book about 35 % of package holidays.² On the other hand elderly people have a rich know-how based on experience. They are willing to use and share it in social, cultural and technical areas. Unfortunately the access to new media technologies – which is fundamental for many activities – remains limited for elderly due to usability issues (**Figure 1**).

This leads to the main question considered here: Which drawbacks exist in human machine interaction for the elderly and how can senior people take active part in the elimination of these?

This analysis obviously leads to many more questions – for example how social and economical barriers in employment and sales market can be overcome.

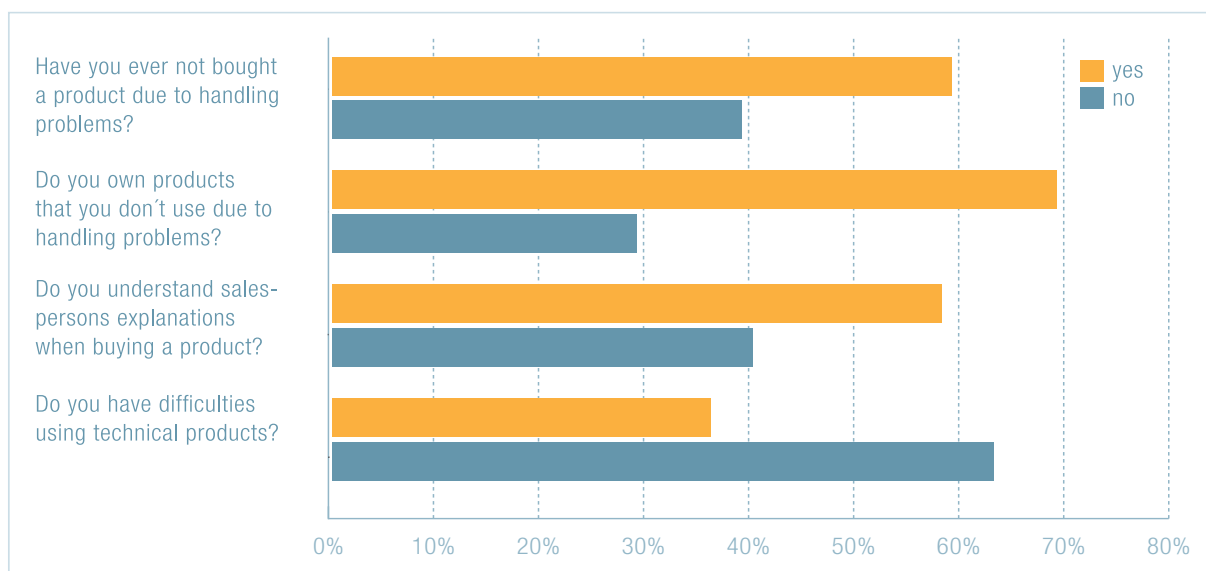


Figure 1: Results of the survey „Use of technical devices“ with 130 participating seniors³

¹ cp. Kruse, A. [2005], p. 452

² cp. Klesse, H. J. [2006], pp. 44

³ Source: Own research; this survey has been conducted in the context of the DFG-funded research project SENTHA

2 Basic characteristics of the market segment 55+

In this chapter barriers are identified, which are responsible for the poor use of seniors potential, based on actual employment statistics and typical characteristics of elderly people. Besides that, the inappropriate market segmenting on the basis of rigid age limits as well as the product development only from a technical point of view and its effects have to be considered.

2.1 Employment of the market segment 55+

Today, the border between working and not working population is determined by age, not by criteria such as qualification, motivation or vocational success. Each discussion about raising the retirement age from 65 years to 67 or above creates vehement protest. Due to the perception of work as a burden a discussion about voluntary work after retirement hardly exists. Nonetheless a decision about employments for seniors based on performance and motivation is missing in Germany and other industrial nations.¹ Compared to international average, the unemployment rate of people aged 50 and above is considerably high (>30%) in Germany. A distinctive willingness to retire early, little investments in qualification and a serious age discrimination are primary reasons for this situation.²

Due to the profound technological changes it becomes more and more difficult for elderly persons to adapt their qualifications to the requirements of work. A relatively large portion of people 50 years and above abandons work before reaching the defined retirement age of 65. Changing the occupation is uncommon among elderly employees due to economic reasons, as qualification programs may not amortise before retirement.

¹ cp. Kruse, A. [2005], p. 453

² cp. Kruse, A. [2005], p. 458

From underfunding qualification measures for elderly combined with the demographic change arises a high risk of losing international competitiveness. Aging of employees leads to an aging of the knowledge of the society – which impairs the growth determinant “technological progress”.¹

But so far, attempts to reduce this risk are insufficient. At least the goal of increasing employment of the elderly has reached the top level of macroeconomic policy. Furthermore the increasing demand of unsolicited qualification shows – against operational experiences – the motivation and interest of the considered target group.

2.2 Sales potential of the market segment 55+

The market segment 55+ offers a huge turnover potential, which is not utilized today. In Germany, people older than 50 years dispose of 48 % of all incomes, even though this segment only represents 35,5 % of the German population.² Furthermore seniors have the time for leisure activities and shopping – more than during working life. This creates good opportunities for successful marketing. The generally high propensity to consume does not apply to electronic devices and computer equipment due to a lack of knowledge about the requirements of elderly user groups. As a result of the strong market growth in the area of mobile phones and computers for the last years, interest in user-oriented development of high-tech products has been on a low level. Still today the large part of products, services and advertising campaigns developed for the considered market segment is based on stereotypes of physically disabled and thrifty pensioners. This sets a difficult environment for product innovations.

¹ cp. Keil, T. [2005], p. 11

² cp. Klesse, H. J. [2006], p. 50

Despite this, one indicator points out the existing interest in new media and technology: The degree of web-utilisation is growing strongly within the market segment 55+. But this arises mainly from better training than from product adaptation.¹

During the last year, utilisation of the world wide web has increased by 3 % to 34 % within the so called “Best Ager” (people 55 years and above). On closer examination strong distinctions between segments of the target group “seniors” become apparent: The younger the segment, the higher the utilisation of the web. Despite the low market saturation of 12,2 % within the group 70 years and above, an increase of only 2,4 % occurred.²

Analogical to the demographic segmentation at the employment market, the sales market 55+ is structured only by age. This is insufficient, since even younger target groups are segmented by manifold criteria, although interpersonal differences can be more explicit within the elderly due to experience of life. Differences related to economic status, social class and education intensify with higher age. Combined with the diversity in physical and mental capabilities, the inhomogeneity is incomparable to younger target groups. In order to use the sales market potential, the conjunction between personal circumstances as well as behaviour (e.g. family ties, intergenerational contacts, education, use of media, etc.) and buying behaviour in various fields of products and services has to be researched.

Amongst others, decreased average size of households (from 5,5 to 2,2 persons within the last century) leads to more mobility, flexibility and to a higher importance of leisure and consumption. Due to the changing attitudes a new demand for consumer and technological products emerges, which has not been satisfied so far.

¹ e.g. the project „Web competences for the generation 50 plus“ by the Federal Ministry of Family, Elderly, Women and Youth

² Möller, E. [2006], p. 12

In terms of marketing and communication with elderly people serious weaknesses appear: In a survey by the German Institute for Consume Research (GfK) more than 50 % of people of 50 years and above state that it is noticeable that advertising campaigns are created by younger persons. User integration is implemented in the conceptual design of advertising just as little as in product development. Companies still assume a high brand loyalty for seniors, even though this only applies for the segment above 75 years, which is a small part of the senior market. Everybody wants to get old but nobody wants to be – this assumption has been validated in several surveys and seems to be essential for successful campaigns.¹

Besides marketing, an adequate conceptual design of products is most important to tap the full market potential. Today, less than one third of all enterprises thinks about cultivating the senior market. Estimates of GfK claim that the “Generation 50+” in Germany has an idle spending power of more than 100 billion Euro annually. For lack of appropriate products this amount remains unspent, which causes considerable damage to the German economy.

If senior’s needs are considered in product design today, most of the developed products claim to be “barrier-free”.² This type of design is oriented to deficits of the elderly, not to resources and potentials. For this reason it contributes to stigmatisation and equalisation with disabled people. But with this image healthy and active seniors can not be addressed effectively.

To benefit from the described market potential and to attain economic revival, user integration with elderly people has to be supported and promoted by industry, media and public organisations.³

¹ cp. Gaspar, C. [2000], pp. 162

² cp. Pichert, H. [1999], pp. 35

³ cp. Kruse, A., Altenberichtskommission [2005], p. 458

2.3 Barriers to employment and sales

Commonly the ability to work is composed of the factors person (health and competence), working process (content of work, stress) and culture (moral concept, social conditions, management, team).¹

The basic work interest is particularly influenced by culture and can represent a serious barrier. As example, ageism, early retirement, a lack of qualification measures and little confidence in utilising technical products are most obvious problems.

Moreover, ability and interest to work are affected by a factor, which is not part of the described theoretical framework – the working appliance or implement. HETZE suggests the importance of this factor: “The percentage of low qualified elderly unemployed persons is particularly high in nations with an above-average growth of productivity and technical progress.”² Due to the gap between job requirements, e. g. for the utilisation of information technology, and competences of seniors, access to the job market is restricted. Two strategies are appropriate to solve this: On the one hand use training, which can also be regarded as adaptation of human to machine and indirect solving strategy, could be promoted. On the other hand, the user-friendly design of products could be implemented in product development by user integration (**Figure 2**).³

¹ cp. Karazman, R., Kloimüller, I., Arato, P. [2003], p. 96

² Hetze, P. [2005], p. 8

³ cp. Lohse, H., Grunau, H., Salomon, J. [2000], pp. 107

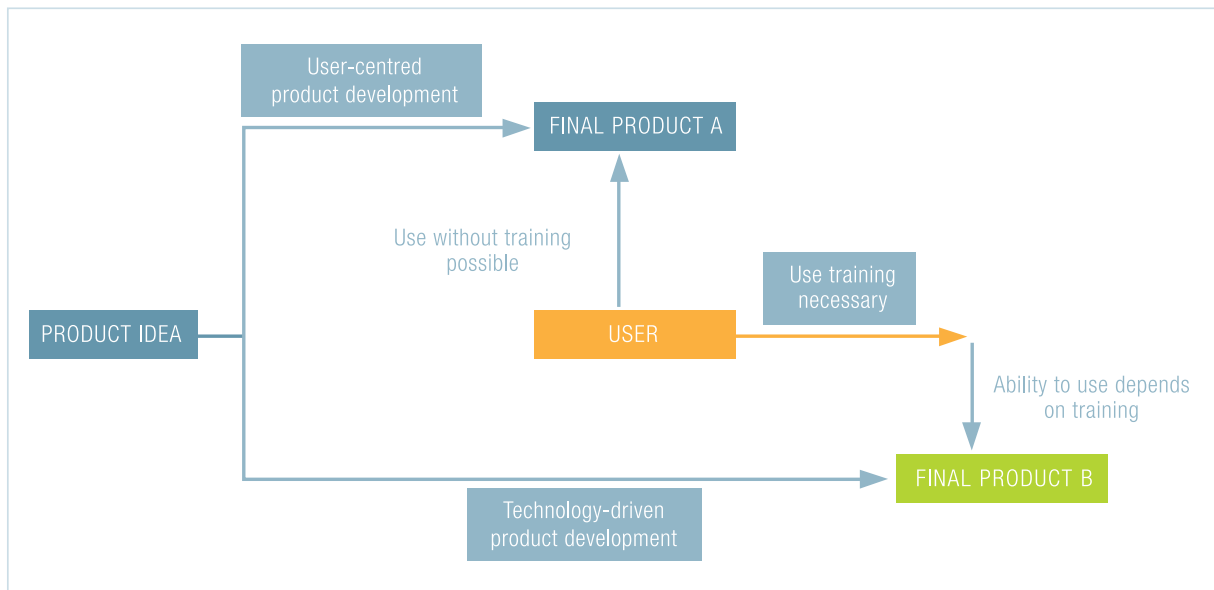


Figure 2: User-centred vs. technology-driven product development¹

Some commonly accepted causalities concerning the skills of elderly persons have to be ascribed to the missing user integration. Absence of mental flexibility, a lack of innovative ability and learning aptitude do not have to be considered as results of ageing, but as long-term effects of product development only from a technological point of view.²

One reason for too little regard to user needs is the complexity of today's product development processes and thereby small capacities for integration of additional information and sub-processes. Methods for analysing user behaviour and requirements are often inapplicable due to costs, time constraints and extensive interference with other sub-processes of the design process.³

An assumption, often expressed by technically affected product developers, is that this problem will be solved over time, because future generations of senior citizens will be more familiar with computers and other technical device due to a longer period of experience. But the rapid

¹ Source: own research

² cp. Pack, J. [2000], pp. 414; Friesdorf, W. [2004], pp. 9

³ cp. Blessing, L. [2007], pp. 18

evolution of technologies without adaptation to user capabilities may lead to more complex products, than people can manage with their experiences.

Particularly with regard to motivation to voluntary social or cultural activities after reaching retirement age, user friendly design and fun of use are essential. In this context another barrier can be identified – the focussing on physical human-machine-interaction without consideration of mental and psychological aspects (**Figure 3**). Mental interaction, which is based on understanding the use-logic, is essential to prevent frustration of users and non-acceptance of new technologies. To focus on elderly user needs, their know-how and opinion have to be used during product development. A complete empathic approach by younger engineers is unrealistic, since personal experiences with technical products as well as mental attitudes are too different. The biggest problems occur in psychological areas of interaction. Products well adapted to seniors physical needs are often characterised by unattractive design. Mobile phones in size of pocket books and ergonomic clothes contribute to stigmatising elderly people.

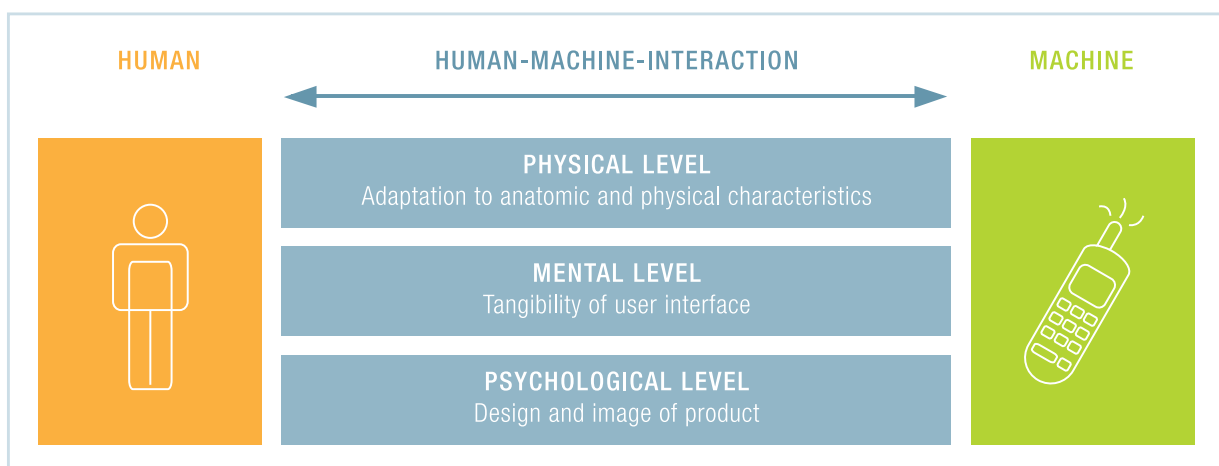


Figure 3: Levels of human-machine-interaction¹

¹ Source: own research

3 Senior research group as approach to solution

Described problems can be solved by involving target groups, especially seniors, in product development processes. To ensure success, orientation on existing industrial development processes is necessary. These are mostly standardised and subdivided into various phases from generation of ideas to conception of marketing strategies. Phases are often finished by quality-gates, which are milestones where compliance to requirements is audited.¹ To set the preconditions for more user-influence during product design, organisation of user know-how and user integration methods are fundamental. A theoretical model of senior research groups is illustrated in the following chapter. Aims, organisational structure and methods as well as exemplary results of user integration are described according to industrial product development processes. Additionally first practical experiences with the implementation of this concept are portrayed.

3.1 Aims and benefits of senior research groups

The superior aim of senior research groups is influencing and advancing the design of technical products and services to enhance quality of life and enable the utilisation of elderly people employment potential. User integration can improve the competitiveness of seniors by facilitating the use of technical work equipment and therefore increasing efficiency of work. Various sub-goals - known as dialogue principles and standardised with ISO 9241 “Ergonomics on Human System Interaction” Part 110 – are part of this idea.^{2,3} Especially self-descriptiveness

¹ Various product development standards are described in literature; further information can be found in:

Pahl, G., Beitz, W. [1993], pp. 80

² The seven principles are: suitability for the task, self-descriptiveness, controllability, conformity with user expectations, error tolerance, suitability for individualisation and suitability for learning.

³ Further information in: Luczak, H. [1993], pp. 486

and error tolerance depend on user experience and behaviour and require user integration during design.

Senior research groups should create and use a pool of knowledge, methods and testbeds and support industrial product developers as consultants and test persons. They strive for emancipation of the elderly generation by revealing customer needs and requirements and avoiding solely adaptation to existing user interfaces.¹ Not least, senior research groups can underline special capabilities of the elderly, like quality awareness, loyalty and working morale as well as counteract the image of decreasing innovative ability and creativity.

3.2 Organisational structure of senior research groups

A senior research group has to be able to represent the needs of as many as possible seniors. For this reason a heterogeneous team, concerning age structure, education, work interest and social background has to be organised. The combination of technical experienced and inexperienced users can be recommended.

To facilitate the validation of research and test results, two user groups have to exist in parallel: On the one hand a core group to attend to product development tasks. An adequate size, which allows efficient workings as well as enough different points of view is between 15 and 25 members. On the other hand an alternative structure for surveys to get information about needs, interests and acceptance of products and functions has to be provided. For that purpose about 100 seniors should be selected as a senior-pool, representing people aged 55 years and above. This structure can be used to validate work results of the core group and field tests. For both core group and senior-pool a continuous recruitment of young seniors is essential. Within a senior research group various sub-groups can be established to assume organisational and

representative tasks like project management, documentation and finances (**Figure 4**).

The group has to be managed by scientists that are skilled in product development as well as user integration and test methods, which make users' creativity and experience accessible.

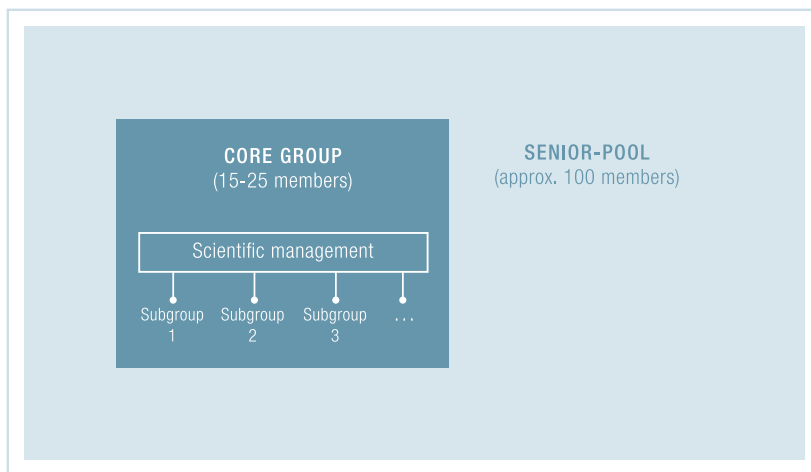


Figure 4: Organisational structure of senior research groups²

3.3 Recommended process for user integration during product development

The aim of user integration during product development is the detection and elimination of ergonomic weaknesses. With an iterative procedure and a continuous involvement of senior research groups as potential users a systematic improvement of products is approached. Furthermore, typical user requirements and design mistakes should be identified and included in checklists. Thus, a standardisation of ergonomic product development can be supported. This standardisation is a key factor for dissemination of ergonomic knowledge – only easy to understand, transparent, feasible and cost-effective user integration processes will be considered for integration in existing complex product development structures.

¹ cp. Keck, B. [2000], pp. 152

² Source: own research

The ergonomic optimisation is processed synchronously to typical phases of product development. It is structured in six steps with different methods for analysing and evaluation (Figure 5):

Phase 1: Definition of general conditions and objectives

- State-of-the-art description regarding technological and scientific results and developments related to the considered product, its possible applications, assets and drawbacks
- Demarcation of target groups concerning age, health, education, social background etc.
- Demarcation of scope of application with a temporal, spatial and task-related focus
- Basic design of testbeds

Phase 2: Process analysis and requirement definition

- Analysis and visualisation of possible use processes
- Identification of user group and characteristics, use-tasks and use-environment requirements based on analysed use processes, afterwards compilation of requirement list
- Identification of usability-relevant tasks with a high interaction-rate between human and machine

Phase 3: Evaluation of tentative drafts

- Development and discussion of various tentative drafts by means of drawings or mockups with seniors
- Evaluation of feasibility and pre-selection of design elements with a high impact on usability
- Inquiry within the senior-pool, aiming on validation of pre-selected tentative drafts
- Further development of requirement list

Phase 4: Evaluation of second draft

- Evaluation of second draft (prototype or software simulation), focused on user interface, with a Cognitive Walkthrough¹, conducted by the core-group
- Weighting of identified usability weaknesses in reference to its relevance
- Revision of requirement list

Phase 5: Evaluation of close-to-the-market prototype

- Usability-Test on the basis of selected application scenarios with six or more members of the senior-pool who have not been involved in the development process before
- Survey on product acceptance within the senior-pool²
- Interviews aiming on identification of usability strengths and weaknesses

Phase 6: Field test

- Product use by members of the senior-pool in real use environments with a duration of one to four weeks, depending on use frequency and product complexity
- Documentation and iterative optimisation of usability weaknesses until product launch

¹ Usability inspection methods on the basis of various scenarios; further information in: Nielsen, J. [1993], pp. 155

² e. g. evaluated with the Systems Usability Scale, cp.: Brooke, J. [1996], pp. 189

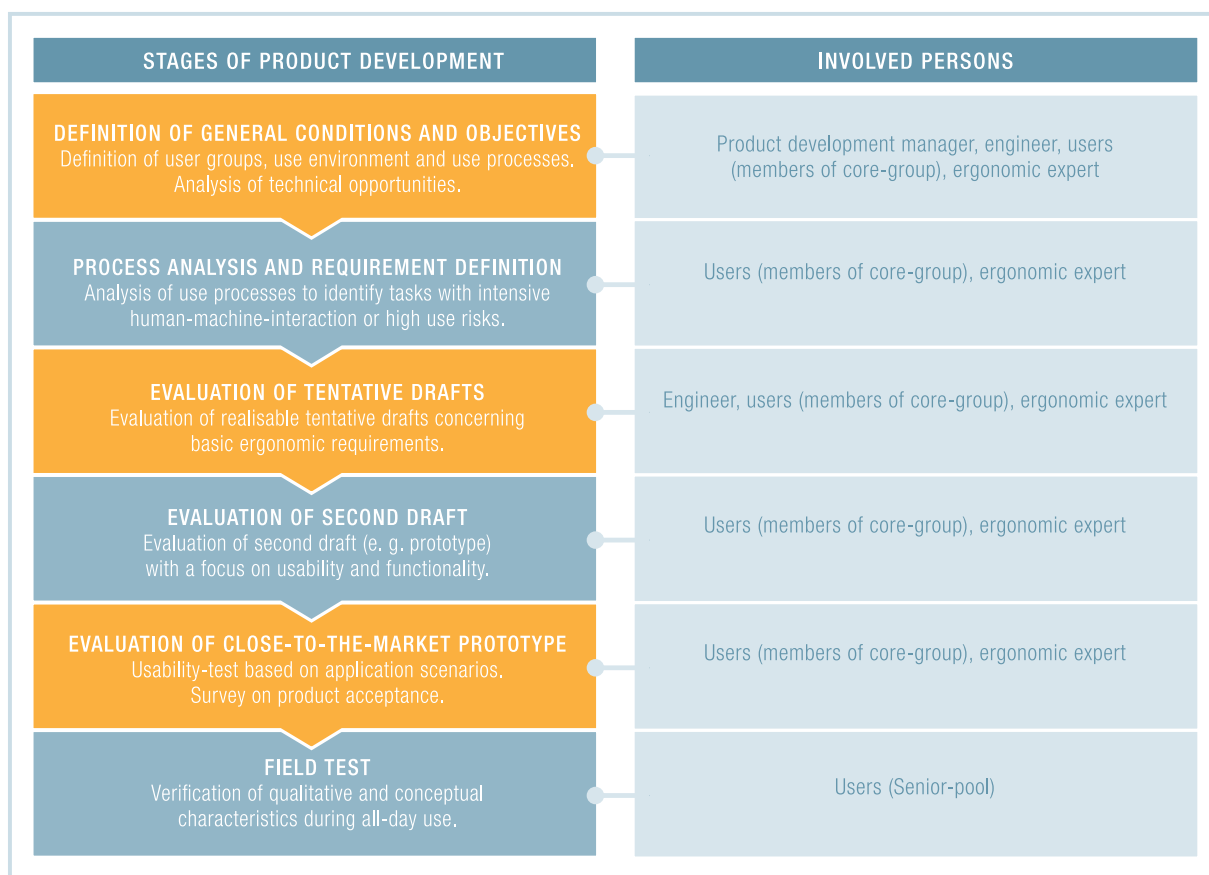


Figure 5: Product development process from user integration point of view¹

3.4 Hands-on experience – The Senior Research Group (SRG)

The Department of Human Factors Engineering and Product Ergonomics at the Berlin Technical University works with about 20 seniors on realising of the described concept. Experiences from the interdisciplinary research project “SENTHA”² led to continuation of the work with elderly persons in product development. The “Senior Research Group” (SRG) was first founded as test-group, expanded their field of activity to consultancy of product developers and is now involved in various stages of the entire product development process (**Figure 6**).

¹ According to: Backhaus, C. [2004], p. 226

² SENTHA is a German acronym for „senior-compatible- technologies in everyday life”. The project has been coordinated by the Department of Human Factors Engineering and Product Ergonomics in Berlin between 1997 and 2003



Figure 6: Senior Research Group members at work¹

Due to the organisational connection between university and SRG, synergies from intergenerational projects with students and seniors have been generated. Besides product development seniors contribute to a better understanding of elderly person requirements and needs. Projects with students aimed e.g. on development of sports equipment for people of 55 years and above, characterised by active interaction between students and the SRG-members.

In addition to concrete results – observable at products of consulted companies – SRG’s work leads to further findings about ergonomic requirements of the elderly as well as processes of user integration.

¹ Source: own photo

Demands concerning senior research groups can be enhanced with hands-on experience. This contributes to the optimisation of the delineated theoretical concept.¹ But working with the SRG shows that the integration of user-centred product development processes by manufacturers is a major problem. The involvement consists mostly of an participation after the completion of the basal design process and therefore limits users influence to a minimum. In this regard, a need for more educational advertising of manufacturers remains.

4 Discussion and future prospects

The presented concept shows, how user integration with seniors can be effective against profound risks and problems in social security systems in the long run. Optimisation of technical products usability is a precondition for fundamental economic and social changes concerning demographic changes (**Figure 7**).

User integration conducted with elderly persons generates new work areas and jobs for the “Generation 55+”. Economic pressure coming from low-wage countries demands a focus on research and development in industrial countries, which implicates a great potential for seniors involvement. For seniors it is more difficult to compensate ergonomic defects of technical devices than for younger people. For this reason, they are more suitable test-persons to identify those defects.¹ A big employment potential arises from the results of user integration: Easy-to-use products, media and communication devices help seniors to realise own ideas and provide know-how, because efficiency-increasing products and tools become better accessible. Allocation of resources can be facilitated with the use of internet technologies, e.g. when elderly people offer their manpower online.

¹ cp. chapter 3.3

In addition, the high senior share of the population constitutes expectations of an increasing sales volume in this market. If – due to user integration – products and services are developed, which fulfil previously unfulfilled needs, absolute revenues of an economy rise. Ergonomically designed products are usable not only for seniors but also for younger people. Consequential competitive advantages will occur in various market segments. Secondary economic results of the improved employment and sales situation are higher public revenues, that may support the orientation to a knowledge-based society.

If senior integration in value creation leads to economic success, the elderly are perceived more active, creative and innovative by society. Intergenerational collaboration is an important factor for social integration and can prevent from losing know-how.² Not least, networking between generations is a way to work against skill shortages. Such knowledge-oriented activities of seniors do not replace jobs of younger people. Intergenerational knowledge transfer, ergonomic optimisation, product testing and social activities are the poorly developed work areas of today and have a high potential for growth.

¹ cp. Pöppel, E.. [2006], p. 56

² cp. Smith, J., Fleeson, W., Geiselmann, B., Settersten, R., Kunzman, U. [1996], pp. 498

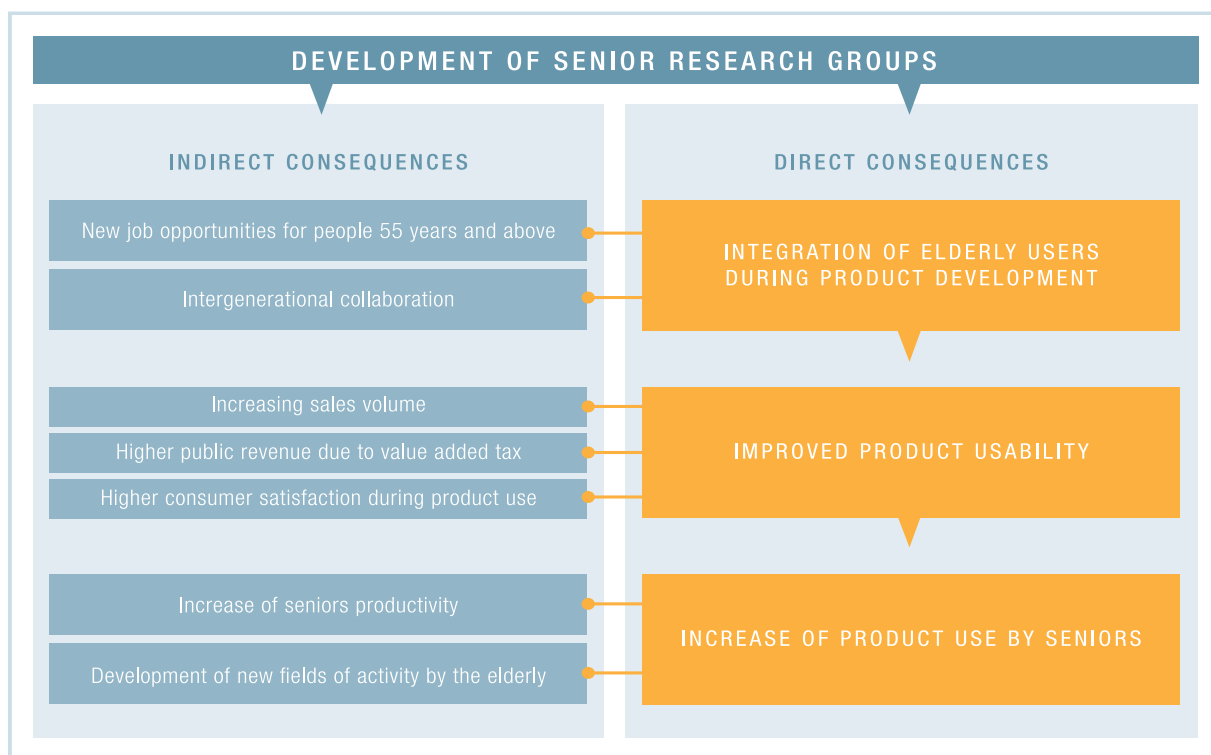


Figure 7: Direct and indirect impacts of senior research groups¹

The activities of the SRG already proved feasibility and potential for success of described concept in parts. To assure success of senior research groups, standards for user integration have to be developed and improved continuously with results from hands-on experience. Best practice examples have to be diffused to encourage an international collaboration in the field of senior involvement. Besides establishing general conditions politically, an early intergenerational contact, e.g. during studies and professional education, is crucial for a better social acceptance of seniors activities.² To promote ergonomics in industrial product development, user integration processes have to be modularised and described transparent and in detail. Only this allows product developing companies to organise and conduct such processes on their own and with small risks.

¹ Source: own research

² cp. Kruse, A. [2005], p. 457

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