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Action speaks louder than words: development of a tangible Persona-Scene as supportive project management tool.

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User-centred design is an essential part in AAL (Active and Assisted Living) research projects. The conduction of end-user studies and the creation of Personas should support the technology's development based on real end-user needs. Experience showed that the defined Personas tend to fade into the background in the course of the technical product development. This paper addresses this issue by suggesting an evolvement of the use of the Personas method, from a two-dimensional user description to a three-dimensional supportive project management tool. In order to support a project's management, the tangible Persona-Scene could act as a facilitator of team discussions to guarantee the focus and permanent engagement of the whole project team with the users they are designing for. Establishing a shared language among team members is also a vital factor for a project's success. Utilizing the Persona-Scene as translation tool for team presentations would enable a quick and easy possibility to visualize and inform team members about the progress each discipline made in their field and support through this an easy understanding of their input. The design of Personas in form of tangible elements should enable a permanent engagement of the whole project team with the targeted end-users.

***Keywords**: user-centred design; Personas; project management; collaborative working; meeting strategies*

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Introduction

A combination of different disciplines, from technical engineering, system architecture, user research and design, contribute to the development and success of a product. Each of these disciplines applies their own project development process methodology in their work and use their own specific terms. This fact bears possible hurdles for a product's development and could lead to misunderstandings in communication. The case on which this paper builds on originates from the work performed by the project Kith&Kin (2018) in the realm of the European Active and Assisted Living (AAL) Joint Programme. The project Kith&Kin aims to offer a solution for computer illiterate older adults to foster the communication and interaction with their family and friends by designing a new product, which is based on well-known communication and interaction patterns. The AAL Joint Programme funds research projects to foster 'the emergence of innovative ICT-based products, services and systems for ageing well at home, in the community, and at work' (AAL Europe, 2018) with the goal to increase the quality of life of older adults. Projects in this realm are committed to a user-centred design process to guarantee a high level of user involvement during the technology development process. Partners from industry, research and user organisations collaborate in the realisation of these funded projects. When people of different fields of expertise work together on a research project like this, the selection and definition of an overall process methodology is essential to reach the defined project goals. The user-centred design's ISO 9241-210:2010 standard (International Organization for Standardization, 2018) is used most often in AAL projects as a process management and requirements engineering tool for the creation of computer-based interactive products and systems to guarantee a high level of user involvement during the technology development.

User-centred design with the focus on the wishes and skills of the actual end-user and target groups is an essential part in AAL research projects. Although the use and the effectiveness of conducting an end-user study in a product development process seems no longer to be in question, the crossover of implementing these findings as a basis for subsequent development phases still is. In order to create a lasting impact of research findings on following technology development and design phases, the Personas method is a viable possibility to address this need. However, experiences from former AAL projects revealed that the defined Personas tend to fade into the background during the technical product development process. So far, Personas are predominantly used for descriptions of the

target group of the product and the envisaged product interactions. The identified limitations of the appliance and feasibility of the Personas method inspired the authors to the development of a new approach for its implementation within the product development process of the Kith&Kin project.

This paper suggests an evolvement of the Personas method, from the two-dimensional user description to a three-dimensional supportive project management tool. Three-dimensionality is understood in this approach by means of the creation of tangible Persona-Scene elements. The Persona-Scene is designed as a set of pictures of the project's Personas, pictures of indoor and outdoor furniture elements, pictures of different indoor and outdoor scene settings, and pictures of other reference products. The user data for this set of pictures derives from previous qualitative user requirement studies within the ongoing Kith&Kin project.

The proposed tangible Persona-Scene as supportive project management tool could be used as:

- facilitator of team discussions and a quick possibility for concept prototyping sessions to guarantee the focus and permanent engagement of the whole project team with the users they are designing for throughout the entire product development process.
- translation tool for team presentations to visualize and inform about the progress each discipline made in their field and support through this an easy understanding of their input. Since a combination of different disciplines, from technical engineering, design, and management, contributes to the development and success of a product, it is essential to establish a common and shared language among all team members right from the beginning of a project.
- empathy-creating tool for the relatedness and familiarity with the target group.
- enabler for a permanent engagement of the whole project team with the user they are designing for.

Being aware that the Personas method is applied in diverse human-centred design approaches, including the areas of design thinking, co-design and product design, this paper is not targeted at comparing its use within these approaches or contributing to an evolvement of the method itself, but

explores its implementation on collaborative working processes among interdisciplinary teams in AAL projects. The three-dimensional Persona-Scene is designed as a new approach to cope with this challenge.

User-centred design process

In the realm of AAL projects, the user-centred design's ISO 9241-210:2010 process (Figure 1) is widely accepted and applied. Starting after the identification of the need for the application of a human-centred design process for the development of a product, the iterative process is characterised by four phases. Phase 1 is intended to understand and specify the context of use of the project. Technical as well as user requirements are collected in this phase. In phase 2, the collected technical and user requirements get listed and Personas, uses-cases as well as scenarios are developed. During phase 3, design concepts and prototypes are created in order to evaluate them in phase 4 against the collected requirements of phase 2. In an iterative manner, the phases get repeated till the evaluation results show the desired overall outcome of the project.

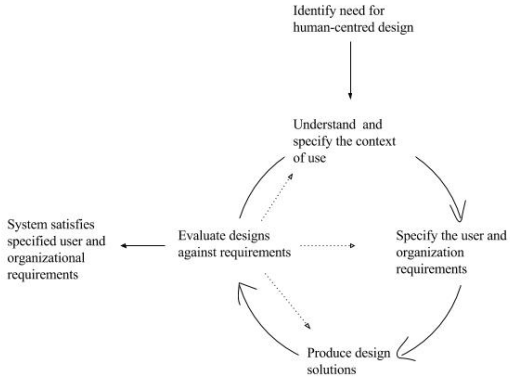


Figure 1 User-centred design process model – ISO 9241-210:2010. Source: own representation based on International Organization for Standardization (2018).

Personas

As described before, in AAL projects Personas are created in phase 2 of the user-centred design's ISO process. Personas are life-like characters representing user behaviour patterns, goals and personal attitudes and motivations, which are applied for supporting the project team members' understanding of the target user. Applying Personas in a development process facilitates effective communication about users and reduces necessary changes at the end of the process.

Cooper (1999) was the first who came up with the fictitious construct of users in the context of user-centred design, fostering Personas as a tool for communication and design within the group of designers, software developers, managers, customers and other stakeholders. '[t]he more specific the persona is, the more effective they are as design tools. With more specific, idiosyncratic details, the persona becomes a »real« person in the minds of the developers.'

The benefits of the Personas' construct were broadened over time (e.g. Grudin & Pruitt, 2002; Pruitt & Grudin,2003; Pruitt & Adlin, 2006), mentioning the possibility for extrapolation from partial knowledge of users to diverse contexts and stressing the Personas' potential to increase the engagement of team members which consequently leads to better design solutions. Without Personas, development teams routinely make decisions about features and implementation without recognizing or communicating their underlying assumptions about who will use the product and how. As Personas explicitly do not cover every conceivable user, the method indicates the target group a project is designed for.

To date the benefits are well reported, for an overview see Table 1, based on Miaskiewicz and Kozar (2011). This table describes Persona characteristics defined by selected Personas authors.

Table 1 Overview selected Persona authors and their correspondent defined Persona characteristics.

Source	Specified characteristics
Cooper (1999)	- Increase focus on the users and their goals - Facilitate effective communication about users - Reduce changes at the end of the development process
Cooper & Reimann (2002)	- Build consensus and commitment to design - Help to measure a design's effectiveness

	- Define the product's feature set - Facilitate effective communication within the project team - Help other related efforts such as marketing plans
Grudin & Pruitt (2002)	- Facilitate a focus on users and work contexts - Make assumptions about users explicit - Facilitate effective communication about the users - Increase focus on a specific audience
Nielsen (2004)	- 'Engaging Persona' as user in one or more scenarios - Facilitate the exploration of design solutions - Memory aid for developers
Pruitt & Adlin (2006)	- Narrow the users being designed for - Lead to better design decisions - Increase engagement among the design team - Build empathy for the users
Long (2009)	- Strengthen focus on the users during development process - Lead to more user-friendly designs - Make the user needs more explicit - Guide decision making
Matthews et al. (2012)	- Tool for communication to others - Support building for a chosen design - Advocate user needs
Schneidewind et al. (2012)	- Support concept description to team members - Support description of a new product in use

In general, the data for the building of Personas can derive from ethnographies, market research, requirements and usability studies, interviews, observations, and other research methods from social sciences or design research. Nielsen (2004) for example situates her approach at the beginning of the design process after having conducted ethnographic studies or user inquiries, just before system development begins. Nielsen introduces the term 'engaging persona' which she understands as a description of a user in a scenario, based on field studies. Depending on goals and the situation of use, the engaging persona can be the user in one or more scenarios. The scenario focuses on a user using the system with the objective to explore design solutions.

Pruitt and Grudin (2003) outline the psychological theory why Personas are more engaging than scenarios and why it is better to develop Personas before scenarios. They argue that based on the *Theory of Mind* deriving from psychology, which describes the ability to predict or assume other's

behaviours, needs, expectations and intentions, humans constantly use partial knowledge to draw inferences, make predictions and form expectations about the people around us. This human capability is brought to the design process by Personas. If Personas are well-crafted, they are generative and if team members are familiar with these Personas they can extrapolate from a situation to its affection on behaviour of this Persona and the Persona can easily be projected into new situations.

Scenarios make discussions possible and make it possible for the decision makers to take strategic decisions and to work with and discuss risks (Heijden, 1996; In: Nielsen, 2004). Clausen (2000; In: Nielsen, 2004) makes a distinction between stories and scenarios where the scenario implicates a context and its role is to influence the context. The story supports the system designer's dialogue with other design groups about the design. However, in most perceptions the scenario has the ability to function as a support for communication too (Nielsen, 2004). An important aspect when creating Personas and developing them further is to keep in mind their life context which we understand in this paper according to Roto, Väätäjä, Jumisko-Pyykkö and Väänänen-Vainio-Mattila (2011) as environment wherein the user experience (UX) emerges. In the context of UX, which studies the relation between the user and the system, researchers take the user and the system into focus and consider the surrounding circumstances as context (e.g. Hassenzahl & Tractinsky, 2006; In: Roto et al., 2011). Context in this regard is always seen from the user's perspective, whereas e.g. context-aware systems approach context from the system's perspective. Roto et al. also underline that visiting the study contexts in advance is a crucial step of field studies. The researchers should at least have some idea of the variety of potential contexts of use and get familiar with those contexts.

To inform the design and development process, it is important to capture user information and feedback ideally at every stage, with input from everyone involved: users, designers and stakeholders. It's the attempt to better understand and involve real users, and is as imperative and important in creating more appropriate and user friendly products or services (Lindgaard, Dillon, Trbovich, White, Fernandes and Lundah, 2006); Muller, 2002). Marshall, Cook, Mitchell, Summerskill, Haines, Maguire, Sims, Gyi, and Case (2015) refer to a study by Goodman-Dean et al. in 2010 who confirm that designers value design information that is quick and easy to use, visually stimulating, flexible, open ended and clearly and concretely

related to design issues. Thus Personas suit informal and flexible working and when visually compelling they are ideally suited to engaging designers and fostering empathy with user needs.

In literature there is no doubt that Personas are a medium for communication within a project team (e.g. Cooper, 1999; Pruitt & Grudin, 2003), but a recent study by Matthews, Judge and Whittaker (2012) revealed that most designers do not use Personas significantly in their own design work. Schneidewind, Hörold, Mayas, Krömker, Falke and Pucklitsch (2012) express the hypothesis, that Personas are mainly used on the one hand to describe the whole way of interacting with the new product from the viewpoint of the Persona, as it is crucial to communicate the conceptual model to all involved project members. And second, Personas are used by illustrators enabling them to create pictures or stories consisting of the Persona interacting with the new product.

Thus, there seems to be a gap between the use of Personas in theory and practice or in other words there is a missing link between the creation and communication of Personas – designed in a two- or three-dimensional form - and their applied use as a supportive method in each step of the product development process. Possible reasons for the non-use of Personas during the development process are according to Matthews et al. (2012) the abstraction and impersonality of Personas as well as the danger of selecting and presenting misleading and distracting details when creating Personas.

Therefore the challenge does not to lie in the assembling of user characteristics and defining those as Personas, but in the selection of the appropriate user data and the kind of presentation of Personas for applying them most effectively as design and communication tools. In other words, the power of Personas is limited unless they can be situated within rich contexts and are brought to life so that developers can explore how situations appear and feel from different perspectives. (Lewis & Cole-Kemp, 2014)

‘Vision trumps all senses’ states Susan Weinschenk (2011), meaning that visuals are easier to remember as words or sounds. Indeed, the illustration and presentation of Personas, such as text documents, posters, foldable persona cards, paper cut-outs or movies (Dittenberger & Koscher, 2017; Saez & Garreta-Domingo, 2011) generally are supposed to be beneficial for the development team, irrespective of direct contact with users or not. Obviously the task of a researcher includes the clear and vivid visualisation of information to not only make the findings visible in general but furthermore to memorize them for a longer period of time, e.g. for the

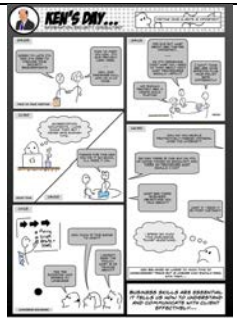
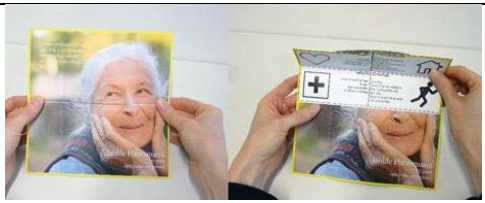
whole process of a product's development. As we know from neuroscience, data gets an easier access to long term memory if its perception is connected to emotional as well as tangible aspects. Moreover, data is better perceived and memorized if there is the possibility to experience it with more than one sense, e.g. if visual, haptic and acoustic stimuli are offered. There is research in how to visualise data in general in two-dimensional ways (Pruitt & Grudin, 2003; Nieters, Ivatury & Ahmed, 2007; Hunter, 2012; Lewis & Coles-Kemp, 2014) and in three-dimensional ways (Saez & Garreta-Domingo, 2011; Dittenberger & Koscher, 2017), always addressing the question how to get product teams connected to specific characteristics of users. For example, Nieters et al. (2007) describe the production of physical Personas in form of cards in order to stimulate interest, create fun, stickiness and confidence in persona content for product teams. Personas were presented in form of action figures, which were displayed on posters and pop-ups. This solution turned out to be memorable for the developers and it instilled confidence in the Persona content.

The visualisation of three-dimensional Personas instead is less disseminated, yet there exist examples of attempts to create more tangible and interactive Personas presentations. Saez and Garreta-Domingo (2011) combined the concept of Personas and scenarios and created a playful and more permanent artefact to hold the information, which should foster the understanding of users by showing their main contexts, as contexts are becoming more important with the use of mobile devices. Contrary to Weinschenk (2011) who underlines the importance of faces concerning memory, Saez and Garreta-Domingo (2011) chose to reduce the bias that a face can generate, using silhouettes instead. The foldable Personas card presents a new way of a visualization technique for Personas with the goal not only to display information but to translate this information into a tangible, fun creating and curiosity awakened experience (Dittenberger & Koscher, 2017). Table 2 shows an overview of exemplary two- and three-dimensional Persona visualisation.

Table 2 Overview of two- and three-dimensional Personas visualisation.

Source	Description	Visualisation
Two-dimensional visualisation		
Ditten-berger & Koscher, 2017	Two-dimensional Persona poster	
Pruitt & Grudin, 2003	Left poster: presents real quotes from users that fit the profile of one Persona; Right Poster: compares characteristics across Personas.	 

Pruitt & Grudin, 2003	Left poster: aspects of security and privacy across all Personas; Right poster: shows how certain types of hackers can target Personas.	
Pruitt & Grudin, 2003	Persona focused style collage.	

Nieters et al., 2007	Poster with action figure Persona including day-in-the-life photo shoots.	 
Lewis & Coles-Kemp, 2014	Persona Card and corresponden t experience comic strip.	 
Three-dimensional visualisation		
Ditten-berger & Koscher, 2017	Three-dimensional foldable Persona card of a primary Persona and her relation to a	

	secondary Persona.	
Saez & Garreta-Domingo, 2011	Personas Cube based on main life contexts.	

The question how to establish a permanent communication process with well-visualized Personas is broached by Nielsen (2004) who suggests a structured process starting with discussions among the team members about whom to target and create written Personas. Thus, the creation of a shared understanding of the core user is supported by creating opportunities to constantly refine and broaden the understanding of the user in relation to context in terms of surroundings, situations, and needs. Nielsen's proposed model is a tool for communication and it shifts the focus to the process of understanding the user and exploring the design area (Figure 2).

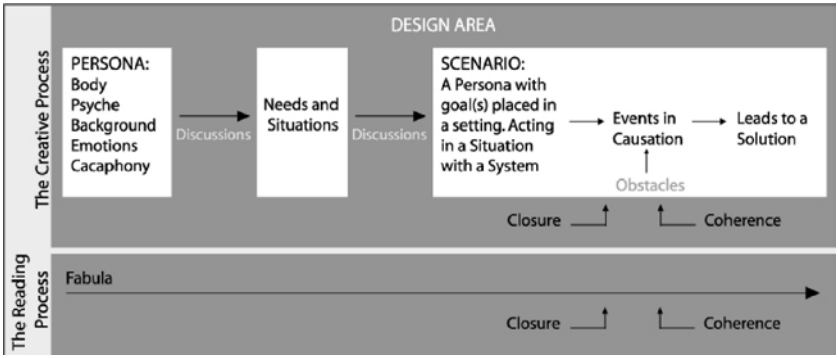


Figure 2 Process of perceiving Personas and Scenarios. Source: Nielsen (2004, p. 254).

The model with the three steps engaging Persona, needs and situation, and narrative scenarios offers room for specific discussions that are focused on the user. Those discussions widen the knowledge about the user, reveal stereotypes and inferences and offer opportunities for adjustment. It therefore meets the need of a user-centred permanent communication among the project team members. Yet there is still the open question how to establish well-crafted visualised Personas to a permanent communication culture, as also Schneidewind et al. (2012) hypothesize the use of Personas at the end of the development process as a means to describe or illustrate the new product. This 'fading-out' phenomenon of Personas during the project development process corresponds with our experience in AAL projects, where Personas played their role strongly in the beginning of the project, and then again in the end when it came to explaining and communicating a product, but they got neglected during the designing phase. Although we uncovered relevant factors for assessing user characteristics at an early stage of the project to ensure a profound output as a basis for the subsequent project development process, the Personas have not been internalized as they should have been.

Consequently, our aim is to establish a permanent user-centred communication with the visual appliance and support of Personas, where not only information about the Persona characters is presented to the team, but where the team constantly has to actively work with and develop the Personas as well as their surroundings further.

Three-dimensional Persona-Scene: case study

As mentioned before, this paper discusses the observation that the created Personas had faded into the background during the technical development process of the project. The creation of a three-dimensional Persona-Scene resulted from the detected need for offering the project team members tangible Personas elements as a supportive tool to work with during the project. Until then, the team members used two-dimensional posters of the Personas, which were developed in the course of the project based on the results of the end-user study conducted in phase 1 of the user-centred design's ISO process, for team discussions (Figure 3).

Figure 3 Persona Anna. Source: Kith&Kin (2018).

Although the two-dimensional poster offered information concerning the family status, living situation, social integration and preferred activities, health condition and technology usage patterns, the Personas itself were interpreted differently by team members from different disciplines. Additionally, regardless the definition of use cases and scenarios, the link to everyday usage practices of the proposed technology were also understood in different ways. In order to address this issue, the idea of the three-dimensional Persona-Scene was born. Referring to the description of the papers' goal, to explore the effects of three-dimensional Persona-Scene concerning their effect on the collaborative working process among an interdisciplinary project team, a team workshop was conducted.

The Persona-Scene workshop was executed in the course of a Kith&Kin project meeting in December 2017 in Vienna, where all eight project partners from the different disciplines, in total twelve team members, took part. The workshop consisted of the following steps:

- Explanation of the workshops' procedure
- Explanation of provided prints
- Explaining the scene structure
- Time specification
- Presentations of each partner's idea of the Persona
- Common creation of an agreed Persona and the corresponding attributes and surrounding

In the first step, the moderators explained the workshops' procedure to the team members. The goal of creating a common basis and involving the Persona actively in the development process was defined. The already gathered user requirements were repeated and the team members were asked to rethink those requirements and to create out of those the Persona they see in this regard. This does not concern only the Persona herself but also scenes in which this Persona interacts and other people with whom this Persona interacts.

Therefore, the design partners offered a composed collection of different personas, friends and relatives, living situations, life contexts, furniture, domestic items, technological items, backgrounds and speech bubbles (Figure 4).

Figure 4 Components of the three-dimensional Persona-Scene. Source: Koscher & Dittenberger (2018).

In a second step, those prints were explained to the team members and distributed amongst them. Additionally, an example of a three-dimensional Persona using the pictures of the set was presented (Figure 5).

Figure 5 Combining Persona, context and surrounding. Source: Koscher & Dittenberger (2018).

After the distribution of prints, the structure of the design of the Personas collage was explained in order to enhance comparable Persona presentations. In the case of our AAL project we chose a structure with reference to the method Empathic Map by Gray, Brown and Macanufo (2010), including realms for background, for the social life context and life context in general, for surroundings and general as well as technological preferences and dislikes or difficulties (Figure 6).

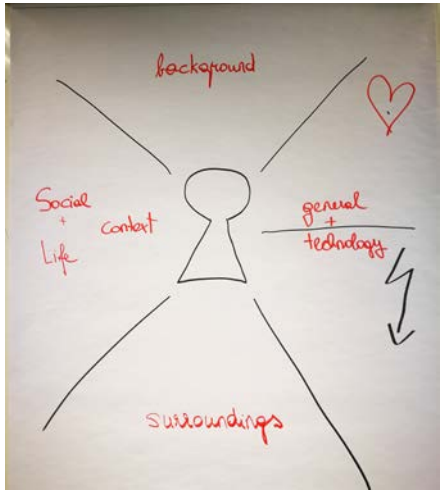


Figure 6 Proposed structure of the Persona Collage.

After having received all prints, flipcharts and working materials, all partners had to design their individual view of the Persona the project is targeting, corresponding to the given structure and taking into account the findings from the requirements studies. The team members were asked to let their Persona speak in first person (Figure 7, Figure 8).

Figure 7 Persona-Scene creation process.

Figure 8 Project team members during the creation of the Persona-Scene.

After a defined working time the partners representing the involved disciplines of the project, presented their individual Persona (Figure 9) and after all presentations the team commonly created a Persona with corresponding attributes and surroundings agreed by all partners (Figure 10). This final step was achieved by a lively discussion and the need to agree on a common understanding.

Figure 9 Examples of the results of the Persona-Scenes.

Figure 10 Commonly created and agreed Persona 'Anna'.

The results of the created Persona-Scenes revealed the fact that there is consensus in many points (e.g. gender, age, living situation) but also strongly divergent point of views regarding aspects like the use of technology (e.g. settings where the product would be used) and the level of computer literacy. The originally defined Persona Anna, presented on the two-dimensional poster, was after the workshop refined concerning a change of age from 74 to 76 years. The Persona-Scenes supported, not only a common understanding of the Persona's key data, but also the everyday life context of the target group we are designing the project for. An agreement was made that from now on Anna would accompany and support the team within the development process. We observed that after the conduction of the workshop the Persona Anna was quickly adopted as the teams´ user representative and in the subsequent team discussions was frequently referred to by quotes such as 'Let Anna speak!' or 'What would Anna do in this situation?'.

Discussion

As the literature review on Personas showed, the benefits of the method are well-examined and commonly approved. However, there are pitfalls in the kind of presentation of Personas and there is a lack in continuity of their involvement in different development process steps of a project. As

Matthews et al. (2012) point out, it is particularly important to consider the way Personas and their constraints are presented to practitioners. In this context, the choice of data which influences the creation of Personas-Scenes and creates appropriate constraints for solving the product development tasks, which is essential for the outcome of a project has to be considered as well.

The proposal of a tangible Persona-Scene addresses these issues, aiming at improving the pitfalls known from literature concerning the presentation and the continuous engagement of team members with Personas during the entire product development process. The focus however is on the creation of a supportive management tool to support the project team members in their communication and development process. Our exploration on that topic enables the following first conclusions to be drawn.

- Persona-Scene as a facilitator for team discussions:

  The workshop was well received by all participating team members. With reference to the assumption, that the three-dimensional Persona-Scene could be used as a facilitator of team discussions, it is concluded that this tangible and haptic approach of interacting with the project's Personas bears potential for further explorations. By providing the team a set of pictures, everyone was equally and instantly able to visualize his or her ideas in form of a storyboard. This approach of visualizing ideas fosters a common understanding of different discussion points regardless a person's profession or discipline. Different conclusions which might be drawn by different team members, as criticised by Chapman and Milman (2006), can be discussed and brought to a common thread through the active involvement of all team members in this process.

  Additionally, the picture set could easily be enlarged about objects, indoor or outdoor scene sets or other project protagonists according to a project's development. In the case of the project Kith&Kin the three-dimensional Persona-Scene will be employed from now on permanently following the attempt to familiarize all team members with the targeted end-users and to continue on the development of a shared project language.

- Persona-Scene as an input translation tool:

  Since a combination of different disciplines, from technical engineering, design, and management, contributes to the development and success of a product, it is essential to establish a common and shared language among all team members right from the beginning of a project. The attempt to use the Persona-Scene pictures as a translation tool for team presentations produced also interesting findings. In order to build bridges between the contributing disciplines of an AAL project, the continuous information of all team members about the progress each discipline made is essential for the success of the project. The visualization using the pictures of the Persona-Scene supports an easy and instant understanding of the input.

- Persona-Scene as an empathy-creating tool:

  The way in which Personas are visualized plays an important role concerning their perception and their power of creating empathy within a team. The Persona-Scene is a visualisation tool which, applied during the entire project development process, fosters engagement and may create relatedness and familiarity with Personas.

- Persona-Scene as an enabler of permanent engagement with the target group:

  Three-dimensional Personas include tangible and emotional aspects and, if applied constantly, possess the power to be memorized by the project team members during the entire product development. The goal of establishing the usage of the tangible Persona-Scene as a supportive management tool is to foster a permanent user-centred communication with the visual appliance of Personas, where not only information about the Persona characters is presented to the team, but the team constantly has to work on and develop the Personas and their surroundings further.

Figure 11 Three-dimensional Persona-Scene used as facilitator and translation tool for team discussions.

Conclusion

This paper explored the effect of a haptic and tangible Persona-Scene on the collaborative working processes of an interdisciplinary team working on an AAL project. Positive effects of employing Personas-Scenes on a teams' collaboration could be identified as a facilitator for team discussions, as an input translation tool, as an empathy-creating tool and as an enabler of permanent engagement with the target group. Those effects are supposed to contribute to a favourable impact on the product outcome. Yet there is a lack of proof concerning lasting effects and increasing use of the appliance of the Persona-Scenes, but nevertheless the positive feedback of the participants of the case study indicates to a promising potential for further explorations concerning its use as a supportive project management tool.

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