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Towards Innovation Foresight: Two empirical case studies on future TV experiences for/by users

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ABSTRACT

This paper discusses the need for a shift towards more Foresight-based inclusive innovation processes and introduces the concept of "Innovation Foresight" (IF) in this respect. IF represents an approach for bringing the future into holistic innovation processes, in which users and other stakeholders are systematically involved to detect future opportunities and risks. This could allow for a better integration of inclusive, long-term visions in decision-making and strategic thinking in the context of innovation. To be effective and enable mutual learning, the IF process calls for future-oriented, continuous interaction with current/anticipated users and a better integration of methods and approaches from different fields, including Foresight, user/market research and human-centred product design. This paper discusses two empirical studies that closely involved users in the exploration, imagination and creation of future TV experiences. Study 1 aimed to identify users' specific (future) needs and possible Lead User ideas concerning digital TV (DTV) in Flanders through an online survey ($N = 11.802$ digital TV users). 13 unique ideas representing important unfulfilled needs were identified and evaluated. Study 2, which focused on 'Future TV experiences', consisted of a multi-method research approach in three phases, resulting in six persona profiles, that help to provide an understanding of users' daily practices and futures aspirations. It is argued that a better introduction of future anticipation in inclusive innovation processes could enhance the input of users in innovation and contribute to the detection of potential user/societal needs and possible unexpected forms of use.

1. Introduction

Over the last decade, scholars, policy makers and practitioners from various fields have witnessed and influenced the increased emphasis on principles such as connectedness, interaction and knowledge sharing in R&D and innovation management. The 'open innovation paradigm' [1], which has been widely covered (and even hyped) in the literature is a

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good example in this respect. Although the principles underlying the open innovation concept have been subjected to critical analyses, which designated it as '*old wine in new bottles*' [2], it has undoubtedly (re-)propagated the belief that successful innovation requires openness, interaction and knowledge sharing. The nature of innovation in this new era is fundamentally different from the earlier technology push and market pull approaches due to increasing complexity and uncertainty of systems, more distributed nature of knowledge creation and innovation, and finally the recognition of the close relationship between Science, Technology and Society due to the limits to the 'plasticity' of the society, which have become clearer more recently [3].

In the literature, the relevance of inclusive approaches and interaction between various stakeholders is strongly emphasised. It is argued that participatory methods are effective at stimulating the transfer of knowledge, mutual learning and collective visioning [4]. New (systemic) policy instruments have been/are being developed to facilitate such interaction between relevant stakeholders [5] and their importance is ever increasing in the more general context of what Cagnin et al. [6] refer to as 'Grand Societal Challenges'. In particular, there is a growing recognition of the user as 'innovator' and key stakeholder, especially in the early phases of scientific and technological research, development and innovation [7]. Users are seen as important sources of knowledge and co-shapers of the innovation trajectory (cf. Social Shaping of Technology perspective), whose needs, values and expectations should be 'tapped' systematically [8,9]. In so-called 'user-driven innovation', users are involved in a more systematic and continuous way, from the early, anticipatory and generative stages on. In practice, however, involving users for discovering more tacit needs and for identifying future innovation opportunities often remains problematic due to several constraints and limitations, which are briefly discussed in the next section. One approach that may be effective at enabling the desired inclusive knowledge creation is to use the future as a catalyst for precipitating the collective intelligence of users and stakeholders [10]. However, in inclusive processes aimed at enhancing users' input into innovation, notions of the future and anticipation often tend to be poorly introduced or lacking completely.

This paper proposes a shift towards more Foresight-based inclusive innovation processes and discusses the concept of "Innovation Foresight" (IF) [11] in this respect. It is argued that IF could serve as an interactive, participatory and forward-looking process towards the 'social shaping of technology'. IF is a basis for stimulating a future-oriented innovation dialogue that enables different types of users and stakeholders to voice and further develop their ideas, expectations, concerns. Through a better introduction of the future based on Foresight theory and practice and through an integration of methods and approaches from other fields, including user/market research and human-centred product design [12], IF could help to overcome some of the limitations and constraints of traditional market innovation research and enhance users' input into innovation.

The remainder of the paper is organised as follows: in the next section, the Innovation Foresight concept is introduced and contextualised. Thereupon, the methodological set-up and results from two empirical studies in which current and future users were closely involved in the exploration, imagination and creation of (future) TV experiences are presented in Section 3. *Study 1* focused on the identification of unfulfilled needs and possible Lead User ideas related to interactive digital TV; *Study 2* investigated 'Future TV experiences'. A multi-method approach was used to stimulate users' imaginative potential. Finally, Section 4 discusses a number of experiences and conclusions from the empirical studies in the light of the proposed shift towards more Innovation Foresight-based inclusive innovation processes.

2. Towards Innovation Foresight (IF)?

From the seventies and eighties onwards, several proactive and more bottom-up technology assessment approaches emerged in different countries, including Denmark, The Netherlands, Norway, etc. A number of concepts and approaches were proposed, such as Constructive Technology Assessment (CTA), Participatory Design and Participatory Innovation [13,14]. CTA, for example, with its aim of broadening design and development processes and early interaction between the relevant technology and societal actors, can be considered an initial attempt at Innovation Foresight. CTA drew strongly on the inclusivity of broader social constituencies and interaction with current and anticipated future users in Research, Development and Innovation (RDI) activities. Similarly, Participatory Innovation sought to empower people and to create an environment for user innovation in a broad sense [13].

In spite of the terminological differences, a common, explicit focus is put on dialogue, co-production, societal learning, joint agenda-building, etc. The benefits of such user involvement and interaction are widely discussed in the literature. For instance, active and continuous user involvement have been said to lead to '*unique and valuable ideas for future development*' [15], to more '*socially and environmentally friendly technologies*', to an increased '*quality of innovations*' [16], and even to societal democratisation [8,16]. The term 'hybrid fora' has also been coined in this respect. Such fora facilitate interaction between stakeholders that usually do not interact [6] and enable them not only to make their expectations more explicit but also to share them with each other. The latter is of key importance, not only for mutual learning or joint agenda setting, but also for legitimation purposes and for increasing the possibilities of success, especially within the early stages [17]. Similarly, den Hertog and Smits [18] emphasised the positive effects of user involvement, such as '*more effective articulation of social needs, improved acceptance and social embedding of technology, broadly supported decision-making on innovation*'. At a more tangible level, it has been argued that active involvement of users helps to create a good fit between the needs, expectations, aspirations of users and the actual product or technology that is envisaged or might be developed.

Although in theory, such inclusive processes aim to strengthen the role and input of users into innovation, the actual contribution of users often remains limited. In this paper we argue that this limitation is to an important extent due to the insufficient or even lacking introduction of the future and future anticipation as components into the user-driven knowledge creation process. From the users' perspective, several limitations and constraints have been discussed in this respect. In the opportunity identification and idea generation phases, issues such as the '*functional fixation*' of users to their current reality and the difficulty for users to break loose from their own use context are mentioned [19,20]. Similarly, aspects such as the technological complexity and lack of references to existing products seem to constrain users to think about possible future products. This relates to another constraint that is often mentioned in literature, i.e., that users are not aware of the features and possibilities that future technologies might offer [13]. Another barrier discussed by Lettl [20] is that of 'not wanting' and of a lacking motivation to contribute (e.g., due to the anticipated changes).

However, as is argued in this paper, this does not imply that users simply lack the capacity, skills and motivation to reflect about possible, preferable, probable futures and to make a relevant and meaningful contribution. The point that we want to raise in this paper, is that they are in many cases not empowered and encouraged to do so. By means of 'scripts' and 'intended uses' – which are built in by firms and developers in advance – the possible representations of users, their mind-sets and roles as e.g., co-creators are already predetermined and limited accordingly [16]. As a result, little attention is given to unexpected or unanticipated forms of use of a (future) product/technology, despite the potential impact of unanticipated use on future success or failure (e.g., in terms of user adoption). Moreover, traditional user research methods tend to be focused on the 'here and now' and in most cases, they fail to address or surpass the abovementioned limitations and constraints [21]. Additionally, users are often perceived and addressed as a homogenous group, while it should be taken into account that there are different types of users with distinct characteristics, expectations and needs [22].

On the other hand, it can also be the case that only a very narrow spectrum of users is involved. Lead User methods for example, represent a specific category of methods that do include the future as a component and that have been successfully applied in innovation research. However, they cannot be considered as inclusive in the sense that they only rely on a small niche group of expert users [23]. Lead Users have distinct needs and a strong expected profitability related to the fulfilment of those needs. Although it is argued that they are merely ahead of the rest of the market [23], Lead Users cannot simply be considered as representative for the wider population and other market segments. Yet, Lead User input can to some extent help to lower uncertainty regarding possible future needs and markets.

Although it is unknown in the present who the future users of a technology or product will be, what their characteristics and expectations will be, what their usage behaviour will look like, this knowledge is crucial in view of strategic planning and decision making within innovation research. Therefore, lowering this uncertainty is an important challenge, which firms try to tackle by means of e.g., forecast studies allowing to develop anticipatory assumptions with regard to future user behaviour, future needs, expected profiles of adopters, etc. Moreover, other Foresight methods such as horizon scanning, scenarios, customer and technology trend analysis, and roadmapping are commonly used for the identification of technological opportunities and exploration of possible future markets in this respect. Nevertheless, the introduction of the future in inclusive processes aimed at enhancing users' input into the innovation process remains problematic. Although firms and development teams usually have certain assumptions and develop visions of the future, current or expected future users are rarely actively involved in this anticipatory process. An integrated approach towards Innovation Foresight is thus called for.

The notion of Innovation Foresight is based on the consideration of different dynamics. These include the recognition of challenges facing innovation including the increasing complexity and uncertainty which result in failing innovations; over- and under-estimations of technological and social developments, and unanticipated use; the need for accurate insight into and anticipation of user's needs and expectations; and the emerging necessity of diagnosing the changing innovation landscape to address these issues for 'Foresightful Innovation.'

Such Foresightful innovation requires investigations into systems through (i) anticipation of the drivers and weak signals of change with the intention of being prepared for whatever might follow from the ongoing and future social, economic and political mayhem with a rich understanding of systems, their history and possible futures, (ii) analysis of different stakeholder perspectives and their social relationships, which can affect and be affected by the Foresight process, and (iii) investigation into the formal and informal networks and procedures, which may be in harmony or in conflict with other systems.

Zooming in on the interaction with current and anticipated users as a crucial yet very specific group of stakeholders, the concept of Innovation Foresight (IF) [11] has been introduced as an interactive, participatory and forward-looking way to engage in the 'social shaping of technology'. IF is defined as "*the systematic involvement of users and other relevant stakeholders from the early stages of a holistic innovation process in view of discovering future opportunities (and risks), and informing decision-making, strategic thinking with a long-term vision in the innovation development trajectory*" [11]. Different from more policy oriented institutional Foresight exercises, IF is more focused on New Product Development processes, where stakeholders, and more specifically current and anticipated future users are not only consulted, but are engaged actively in the process and share their 'future' experiences and aspirations in an interactive and iterative way.

IF introduces an inclusive vision development process with longer-term perspective and a strong future component. Such an inclusive approach requires participation and involvement of different stakeholders on equal terms, hereby empowering users as key stakeholders and involving them continuously, beginning from the earliest phases and throughout the whole process. Contrary to traditional user research, which is still predominantly technology-driven and de-contextualised [21],

IF aims to go beyond the 'here' and 'now' and is situated at the intersection of Foresight, user/market research and human-centred product design. It seeks to understand the complex interactions between products, services, users and other stakeholders in multiple, realistic contexts, building on Foresight theory and practice, traditional user research, and creative, generative methods.

We now zoom in on two empirical studies in which current users have been closely involved in the exploration, imagination and creation of (future) TV experiences. Both studies have sought to engage current users at an early stage in the exploration and identification of possible future development ideas, embedded in a continuous interaction cycle. They represent two different approaches for going beyond the 'here' and 'now' in the context of innovation research.

3. Illustrations from two empirical case-studies

3.1. Study 1: a 'Lead User' approach for digital TV

Study 1 aims to identify users' specific (future) needs concerning interactive digital TV in Flanders. Previous research on this topic has shown that there is a large gap between the adoption of digital TV and the actual use of its interactive features and applications, i.e., the 'use diffusion' [24]. As a result, in collaboration with an operator, a large study on current user behaviour and practices concerning DTV in Flanders was set up in order to investigate the observed adoption – use diffusion gap. Here we focus on one facet of the study, namely the identification of unfulfilled needs and possible Lead User ideas related to the (future) use of DTV.

3.1.1. Methodological approach

An online survey was set up in order to explore current DTV-uses and behaviour and to identify users' specific (future) needs concerning digital TV. A large group of 46.000 Flemish DTV-users – as key stakeholders – were invited to fill in the survey by email. In total, 11.802 DTV-users participated, resulting in a response rate of 29%. For the identification of these future user needs, we adopted an approach based on the first steps of Lead User-market research [23,25] and inspired by the idea of 'crowdsourcing' [26]. Lead User identification is a method for finding unfulfilled needs (the first Lead User characteristic) with high expected benefits (the second Lead User characteristic). In crowdsourcing on the other hand, an unsolved problem or question – in this case what are (future) needs concerning digital TV – is submitted to a large 'crowd' of users, drawing on knowledge that is available in the crowd. In the strict sense, crowdsourcing implies an open call for ideas and contributions. In this study however, a large crowd of users within a delineated subpopulation of Flemish DTV-users was addressed.

We surveyed whether the respondents wanted to use certain features or do things with digital TV which were not possible at the time of the study (the questions can be found in the appendix). When the answer was affirmative, they were asked to elaborate on these needs in an open text box. We also asked (on a five-point scale) how important they considered the fulfilment of their reported need to be.

The ideas and needs that came out of the open questions were coded into different categories. The main category grouped rather common needs/complaints (i.e., recording two programmes at the same time, connecting the set-top box to multiple TV-sets, having more channels, ...). Answers that looked promising and differed from these more general needs were coded in a separate category as possible Lead User-ideas. In a next research phase, these potential Lead User-ideas were evaluated by a group of 15 Flemish experts in the field of digital TV (consisting of content managers and innovation managers from Flemish broadcasters and digital TV providers, representatives from digital TV hardware companies and independent digital TV consultants). Their role was to evaluate the ideas in terms of market potential ('now' and 'in five years'), degree of newness/innovativeness and degree to which some players in the digital TV business were already working on the idea at hand. The ideas were then ranked on the basis of these evaluations and estimations.

3.1.2. Results

In total, 3563 respondents (30.2%) from the whole sample reported and elaborated on an unfulfilled need. However, in the analysis it became clear that the vast majority concerned very common features and possibilities. Most of these 'needs' were already possible with other digital TV-providers or contained straightforward suggestions. Eventually, 34 respondents (0.3%) were identified as providing an entry with possibly promising DTV-applications or services. After clustering, this resulted in 13 unique ideas: (1) 3D images, (2) community-functions through DTV, (3) DTV as an embedded open source platform where everyone can develop applications, (4) the set-top box replaces all gaming consoles, (5) automatic subtitling of all channels and content, (6) 'mailing' of recorded programmes or content to other users, (7) ratings and recommendations through DTV, (8) 'smart home' applications through DTV, (9) syncing functionality with PC, laptop and/or mobile, (10) the exchange of user generated content through DTV, (11) video surveillance integrated in DTV, (12) virtual digicorder, i.e., the possibility to access the set-top box from elsewhere (e.g., via SMS, ...) to record programmes, and (13) a visual, image-based Electronic Program Guide (EPG). 12 out of the 13 Lead User-ideas came from users that showed both Lead User-characteristics: an unfulfilled need and high importance attached to the solving of this need (as their score on the importance attached to the fulfilment was 4 or 5 on a five-point scale, indicating they considered it 'important' or 'very important').

As already mentioned, the 'Lead Userness' of the identified ideas was validated by an expert panel. The results are given in Table 1. The column 'market potential now' shows the mean estimated potential for the Lead User-idea at the moment the

Table 1
Results from expert survey ($N = 15$).

Idea	Market potential now (%)	Market potential +5y (%)	In development	Implemented 5y
Virtual digicorder	23.7	48.2	13	13
Visual EPG	13.1	37.7	10	11
Exchange	18.0	37.0	6	8
Sync	14.9	35.5	11	13
Rating	15.1	33.7	14	14
Subtitle	21.4	33.3	4	6
Community	11.1	33.0	13	14
UGC	11.4	28.5	11	12
3D	3.8	22.2	7	12
Open source	9.7	19.9	5	11
Gaming	10.7	19.4	7	10
Smart home	8.9	17.9	2	11
Surveillance	5.0	15.1	3	11

survey was taken (end 2009) in percentage of Flemish digital TV-viewers. The second column 'market potential +5y' indicates the experts' mean estimated potential five years from the moment of surveying (end 2014).

The ideas are ranked based on the percentages from this question. 'In development' shows the number of experts ($N = 15$) that believe this idea is already in development somewhere, and the last column 'implemented 5y' indicates the number of respondents that thinks this idea will be effectively implemented in five years' time.

The 'virtual digicorder'-idea is clearly regarded as the idea with the most potential, but also considered as being in an already advanced stage of development. This idea was also mentioned by the largest number of respondents. A visual EPG that synchronises with other devices, ratings and recommendations of content and community-features is also considered a Lead User-idea with an estimated future potential of 1/3 or more of the digital TV-viewers and is also at a more advanced stage of development. Automated subtitling and the exchange of (recorded) content amongst users is also considered as having large potential, but is considered to be in a more immature development stage. The current hype surrounding 3D-applications is clearly not shared amongst the experts. They even consider it to have the lowest actual market potential for digital TV-users. The open source, gaming, video surveillance and smart home-ideas are also considered as having less market potential, but the majority of the experts see them implemented within five years' time anyway. The open source, surveillance and smart home ideas can be considered as the most innovative ideas, as for these ideas only a few experts believe that they are currently being developed.

Although the presented combination of a large-scale survey with an expert evaluation as such is not new, we argue that it differs from traditional approaches in market innovation research. First of all, user surveys are traditionally rarely used at the early, exploratory stages of the development process and with the purpose of detecting future needs or opportunities. Rather, they are commonly used at later stages, e.g., for concept testing, preparing for market introduction, assessment of adoption potential. Secondly, this study was part of a larger research project, based on continuous interaction with different types of users (i.e., not only Lead Users), whereas In traditional market research, the involvement of current or future users is often still cross-sectional and not based on a continuous interaction [7]. In this respect, the gathered ideas serve as bottom-up input for further exploration of future innovation opportunities for DTV in a natural research setting (through the Living Lab approach).

3.2. Study 2: future TV experiences

Study 2 was set up in collaboration with a 'Philips Consumer Lifestyle' group[2] and explicitly focused on 'Future connected TV experiences'. Current and prospective users (i.e., TV viewers) were actively involved. Television is one of the most widely adopted and domesticated media, which occupies an important place in people's media use and leisure activities. The starting point for this study was the observation that this very popular medium has been the subject of rapid technological evolution over the last few years. Technology-driven impulses and developments have resulted in continuously improving sound and image qualities (e.g., immersive 3D TV experiences), ubiquitous TV experiences via mobile devices, advanced possibilities for on demand viewing, etc. Another crucial evolution concerns the growing convergence of TV and the Internet and the introduction of new hardware systems and services. Philips has a strong interest in this area which tries to combine the best of TV with the best of the internet (such as e.g., GoogleTV).

This technical perspective however does not take the evolution of TV as a medium *from the user's perspective* into account and does not necessarily represent the possible, probable and desired evolution from a user point of view. From previous research we know that TV is still seen as an accessible and relatively simple to use medium. Moreover, this simplicity is seen as a key asset by users. In the light of new internet-based contents and services which offer new possibilities and features to

[2] Located in Bruges, Belgium, at the time of the research.

the TV audience, this simplicity is however under pressure. As a result, it is crucial to reflect on current and future viewing practices and on how the TV of the future should address these evolving practices in order to stay close to the users. In this study, we therefore involved different types of users in an inclusive process to reflect on possible, probable and/or preferable 'TV experiences of the future (initial time horizon: 2030).

3.2.1. Methodological approach

A multi-method approach was used to stimulate users' creative and imaginative potential in the IF process. This study consisted of three consecutive phases in which users and other key stakeholders were involved:

3.2.1.1. Phase 1. In the first phase, literature and trend reports concerning current TV watching patterns, user profiles and trends were explored in order to collect information and intelligence. This desk research was combined with an expert consultation round ($N = 10$) and a limited number of user interviews. In the first, exploratory phase, both primary and secondary data sources were used to scan the TV industry and to identify the main competitors of Philips' Net TV platform. In this respect, platforms such as Hulu, Netflix, internet TV Samsung, GoogleTV and AppleTV were evaluated in terms of collaboration with other players (e.g., content providers), hardware development, distinguishing characteristics, business models, etc. Additionally, different experts were consulted and asked for their expectations concerning the future of TV and their vision on the future TV user and TV set of the future. Among the experts were people representing stakeholders from different perspectives (from a commercial broadcaster, regulatory institute, large multi-media retailing company, online social platform, university and big telecommunication player in Flanders).

3.2.1.2. Phase 2. The aim of this phase was to identify personas based on the gathered information on current usage patterns and viewer profiles. Drawing on insights yielded through the scanning exercise in Phase 1, six current user profiles were identified. In this respect, a distinction between three different profiles was made: analogue cable TV viewers (S1 in Fig. 2), digital cable TV viewers (S2 in Fig. 2) and internet and connected TV viewers (S3 in Fig. 2). Each of these types was further divided into a positive and negative profile, based on current viewing practices, positive or negative attitudes and behavioural intentions towards current/future viewing possibilities. Based on these three positive and three negative profiles, six so-called 'assumption personas' were developed and 'fleshed' based on the secondary data that were gathered. Personas are '*fictitious, specific, concrete representations of target users*' that are used for conveying information about a (future) user population in product design and innovation processes [27]. Personas are usually based on empirical data and real-world observations. In most cases however, researchers need to fall back on secondary sources [28] which makes it more difficult to distinguish empirical observations from assumptions. So-called 'assumption personas' can therefore serve as a starting point for empirically grounded personas [27].

3.2.1.3. Phase 3. In the *third* and last *research phase*, the aim was to explore possible future viewing behaviour and viewer profiles through the involvement of real users in a cultural probing exercise. The cultural probing method allows researchers to gather subjective information from the users in an everyday context. Probes are '*collections of evocative tasks meant to elicit inspirational responses from people*' [29]. More concretely, a probing 'package' is put together and filled in by the users. Afterwards, the probes are collected and discussed. According to Sleeswijk Visser [30], the process of creating the probe material and of interacting with the users is maybe even more crucial than the completed probe itself: this process helps to take the real user's life, thoughts and experiences into account, and may help developers and innovators to not be technologically biased.

In total, 11 (Lead) users matching the six distinct persona profiles were recruited for further qualitative exploration.[3] These 11 users participated in creative and imaginative home sessions in which different tools were used for collecting information and for projecting the personas in the future as a way to explore, imagine and create 'future TV experience'-scenarios.

The probe consisted of seven small assignments/questions, one for each day in a week. On day 1, the i-Magine concept was explored. A short video and storyboard with text and pictures visualised a specific multitasking problem and the participants were asked to reflect on this from their own perspective. Day 2 of the probe focused on scent-TV and included a DVD with video sequences and scents matching those sequences. Day 3 focused on holographic TV. Participants were asked to select adjectives from a list and to match them with pictures of different locations in which they think that holograms would fit. On day 4, the focus was explicitly on the combination TV – Internet: participants were asked to indicate where they would want to watch TV and have internet access in the future by pasting green and red stickers on pictures of different contexts-of-use (see Fig. 1 on the left). They were also asked to motivate their preferences. Day 5 addressed the sharing of content: participants were asked to cut out programmes from a TV programme guide and to paste them on paper planes and to include a short message for the receivers. On day 6, a row of drawings on TV control by gestures was used to elicit

[3] For the analogue viewers, there were two participants, one matching the positive and one the negative analogue viewer profile; for the digital viewers, there were 3 participants: 2 matching the positive and 1 the negative digital viewer profile. With respect to the digital – Internet TV viewers finally, 4 positive and 2 negative users were involved in the cultural probing.

Fig. 1. Examples the cultural probe tools (Day 4 and Day 6).

thoughts, comments and ideas (see Fig. 1 on the right). On the 7th and last day, the participants sent a postcard to the future describing their ideal future TV experience and context.

3.2.2. Results

3.2.2.1. Phase 1. The main aspects and trends mentioned by the experts in *phase 1* in their vision on future TV experiences and TV set of the future viewer, included the increasing convergence between TV, PC and the internet, the shift from 3-dimensional television (3D TV) to holographic TV and 4-dimensional television (4D TV), in which even more immersive TV experiences will be created by adding additional sensory effects to television viewing and the TV set of the future. Also stressed was the importance of the (ongoing) evolution towards multi-screen content consumption, meaning that the same content will be accessed from different screens including TV, PC, smartphone, tablet, thus enabling increasingly mobile and ubiquitous TV experiences. Portable devices such as smartphones and tablets are seen as 'companions' for the user representing not only an additional screen, but also a remote control and programme guide. Additionally, the experts pointed to the importance of possibilities for social viewing and video-chat during watching (co-experience tools), for sharing and exchanging media content through connected TV platforms, for convergence with social platforms and gaming. Finally, also mentioned was the need for innovative user interfaces and more on demand/personalised content.

From a user perspective, a review of the literature on current television viewing practices and time spending patterns confirmed the observation that TV is still predominantly a lean-back medium. Although different viewer profiles can be distinguished and although viewers have the opportunity to watch content 'à la carte', anywhere, any time and anyhow, the current viewing practices have not evolved at the same pace as the technological possibilities [31]. Drawbacks and thresholds related to the convergence of TV and the web mentioned by users and in the literature in this respect relate to e.g., the problems with traditional remote controls, which are not adapted to new forms of use; the shared screen that is still predominantly used (and indivisible); the dependence on time and space, etc. These aspects were translated in concepts, which were further explored in the cultural probing.

3.2.2.2. Phase 2. Fig. 2 provides a schematic overview of the different personas that were developed in *phase 2*, based on the gathered data on current user profiles. For each of them, a profile card was developed. Fig. 3 gives the example of Aline, a positive persona who still watches analogue cable TV. The positive analogue persona (PP1) represents a heavy TV viewer who follows the linear broadcast scheme and watches her favourite shows on a daily basis. PP1 is familiar with and has domesticated the features and affordances of traditional analogue TV (e.g., Teletext, subtitling, ...). For this persona, TV is a social companion and part of everyday life. This persona does not feel threatened by new technology at all, and is interested

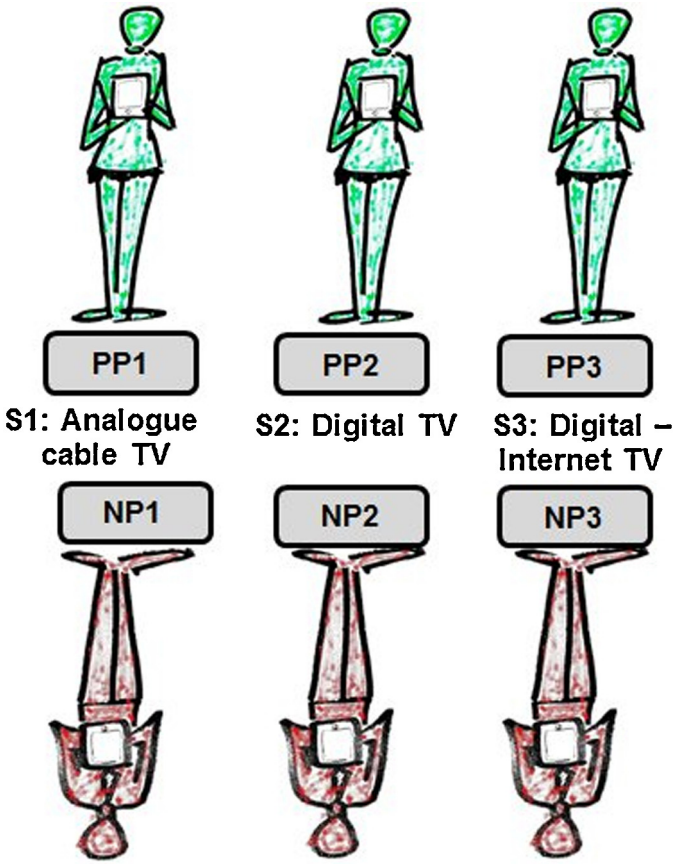

Fig. 2. Schematic overview of the developed positive and negative personas.

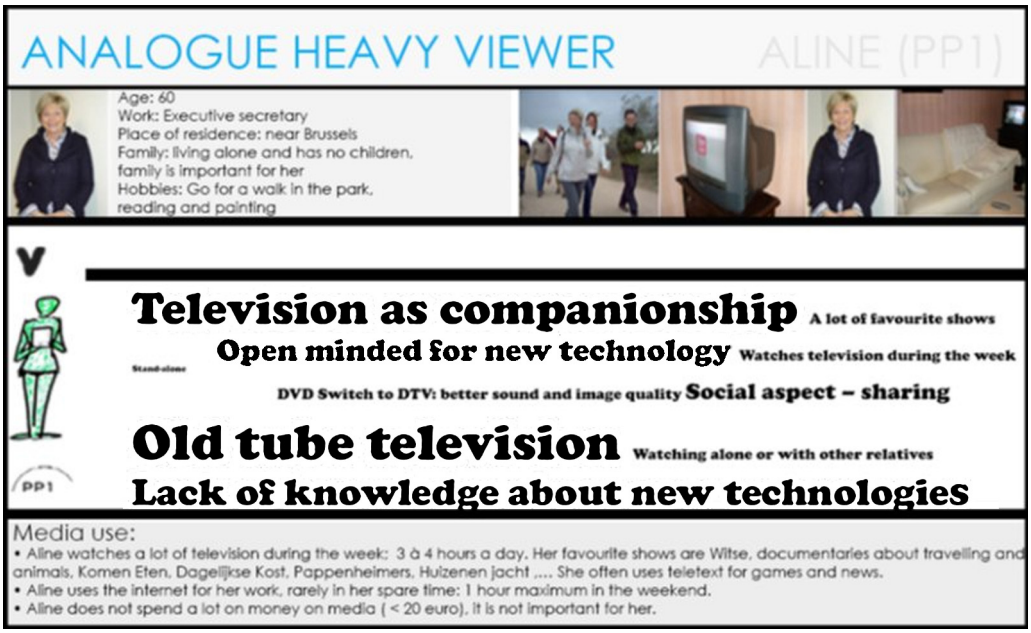

Fig. 3. Example of positive persona Aline (PP1) who watches analogue cable TV.

in it, but considers herself as a non-expert. This persona is aware of most of the affordances and functionalities of iDTV and is considering to adopt digital TV. However, the adoption decision is being postponed because of the associated costs and because of the assumed lack of skills to use the technology.

The negative analogue persona (NP1) on the other hand is a light TV viewer, who does not make intensive use of the specific functionalities offered by analogue TV and sees no added value at all in switching to digital TV. TV does not hold a central place in the life of this persona and the daily activities of this persona are not structured by what is shown on TV. TV is merely a means to get informed and to relax from time to time, especially with other family members. As a result, upgrading to digital TV is not something that NP1 is willing to spend (additional) money on.

The positive digital viewer (PP2) has domesticated iDTV and is a heavy digital TV viewer who is perfectly aware of its affordances. This persona makes full use of the EPG and the possibility to watch TV 'à la carte'. The PP2 records a lot of content matching personal interests on the digital recorder and watches it at a convenient time. This persona is very familiar with the set-top-box and its possibilities and has a subscription to specific channels and/or Video on Demand services.

The negative digital viewer (NP2) has adopted digital TV but keeps watching TV in a traditional, linear way. This persona is aware of the possibilities with regard to time shifting and on-demand viewing, but does not use them. Instead, the NP2 follows the traditional broadcast schemes. Moreover, the NP2 is not willing to spend additional money, for example, to get access to additional thematic channels, to order on demand content, etc. Moreover, this viewer is not interested in TV connected through the Internet.

The positive digital – Internet TV viewer (PP3) is very much into new technologies and has a real innovator profile. New gadgets and ICT products are immediately adopted, price is not an issue. The PP3 uses streaming services such as Netflix or Hulu in order to be able to immediately consume very recent content that is of interest (e.g., popular American fiction series are watched on the day that they are broadcasted in the US). The PP3 is also a very intensive internet user who uses multiple devices and screens (e.g., smartphone, tablet) to access the content he is interested in.

The negative digital – Internet TV viewer (NP3) finally, currently has a TV set that is connected over the Internet, but this persona needs time to gradually get used to the new functionalities. The purchase was largely influenced by others in the immediate environment of the NP3. The NP3 is still watching TV in a more traditional way. This persona has adopted but not yet domesticated the technology. Moreover, the NP3 is characterised by a need of assistance by others to use the technology.

3.2.2.3. Phase 3. The cultural probing exercise which was conducted in *phase 3* helped the respondents to reflect on how they might engage with TV as a medium in the future and on new user practices that might arise from the offered affordances. The probes stimulated them to think beyond their current practices and experiences (but still using them as a reference point). In general, the exercise showed that user-friendliness and simplicity should still be key in the development of future TV experiences. This was the case for all 6 personas, both the positive and the negative personas. Yet, in the future projection of the distinct persona profiles, several differences could also be observed. Whereas the negative analogue cable persona wants TV to be inconspicuous and fears the feeling of being observed, its positive counterpart is eager to learn about and explore possible new affordances. Similar observations could be made for the digital cable TV viewers: the negative digital viewer persona is overwhelmed by the possibilities and perceives them as a possible threat. The positive digital persona on the other hand immediately identifies ways for integrating the extra dimensions into enriched viewing patterns. For the internet and connected TV personas finally, the biggest difference that was found between the positive and negative persona was that the former is ready and eager to experience future TV now and that the latter emphasises the importance of gradual change, familiarity and adaptation.

In general, 4-dimensional television features that enrich traditional TV watching with additional sensual experiences (e.g., scents) were seen as a way to strengthen the emotional and immersive character of viewing experiences. In line with what was mentioned by the experts, future TV should be multi-screen, flexible and mobile according to the participants. Especially for TV connected to the internet, this multi-screen aspect was found to be of crucial importance. The third key aspect in our personas' expectations and visualisations of future TV experiences referred to the social character of the medium: even in the future, TV should remain a medium that offers and enables shared and co-experiences (as opposed to future TV a personalised and individual). This idea of shared TV was not evaluated as very innovative, yet it was very important for the users. The participants were more sceptical towards motion-controlled TV and holographic TV which were identified as trends in phase 1. Although holograms are fascinating in a sense, several participants perceived them as intrusive and feared the feeling of being observed. It was perceived as a nice feature in a Science Fiction movie, but not for a daily viewing experience.

4. Implications and conclusions

In the two empirical studies presented in this paper, users as well as other relevant stakeholders were involved in an inclusive and future-oriented process, based on a combination of traditional and more creative methods. In both studies, information and intelligence concerning real experiences, practices and visions from a user perspective served as starting points. Two different approaches for tapping the knowledge and imaginative potential of users and for fostering a more anticipatory mind-set were illustrated. In Study 1, a combined approach of Lead Users with the idea of crowdsourcing was used. In Study 2, the design-inspired personas-method was combined with cultural probing, using creativity as a tool to

stimulate users' imagination and to empower them to reflect on possible and preferable future developments in the context of TV experiences.

Such approaches can help to collect anticipatory intelligence, e.g., through the identification of future innovation opportunities or threats and through the detection of explicit as well as more latent future needs. This intelligence can than serve as relevant input for decision making and strategic planning within the innovation trajectory. However, in future anticipation and visioning as part of such trajectories, the actual role and contribution of users is often limited and constrained as the introduction of the future as a component is often insufficient or even completely lacking in traditional user research. Lead User methods form an exception in this respect as they involve users with clear and distinct future needs. These specific needs may arise in other market segments at a later stage. However, it is also possible that other users never experience the same or similar needs: as Lead Users represent a very small niche group of 'expert users', they do not necessarily represent the needs and expectations that other user segments hold.

We have therefore argued that there is a need to also empower and stimulate those users that are traditionally not behind the steering wheel to voice their expectations, needs, visions with regards to possible, preferable and probable futures. In this respect, as was the case in Study 2, both very advanced users as well as non-expert users are capable of reflecting on possible future developments, their possible impact, etc. if they are supported and stimulated to do so through adequate tools and methods. Moreover, the distinct user profiles were found to have different expectations and needs with regard to future TV experiences, implying that it is insufficient to only rely on expert users. Tapping users' imaginative potential may not necessarily lead to breakthrough innovative ideas, yet it offers a way to open up the innovation process, to gain a better and richer insight into their needs, aspirations, visions and to drive the sharing of expectations among the different stakeholders involved.

Acknowledging the constraints and limitations to user involvement in the earliest innovation phases and the poor or even entirely lacking introduction of the future as component in traditional user innovation research, this paper has proposed a shift towards Innovation Foresight. IF aims to go beyond the dominant 'here and now' focus in traditional user research and draws on participation and inclusion of different types of users (not only experts). It represents an approach for bringing the future into inclusive innovation processes in a more systematic and comprehensive way, based on Foresight theory and practice and through integrating methods and tools from Foresight, traditional user/market research and human-centred product design. By stimulating and empowering users to reflect on and anticipate possible future developments, needs, expectations, . . ., IF aims to enhance users' input to and their influence on the inclusive knowledge creation process. As such, IF could facilitate the detection and inclusion of potential user/societal needs, unexpected forms of use, . . . and could allow for a better integration of inclusive, long-term visions in decision-making and strategic thinking in the context of innovation.

Future research should focus on the development of a comprehensive classification and integration of methods that are relevant for IF purposes, taking into account the diversity of user types. Depending on the characteristics of a type of user, it is likely that some methods will be more successful than others in supporting a user to voice his or her future ideas, visions, expectations. Such a classification could be a first step towards an integrated framework comprising different ways to introduce the future, suitable tools and methods, user characteristics and other variables that co-determine the design of a concrete study, such as the objectives of an exercise, time and budget, coverage and time horizon. Secondly, it would be relevant to further investigate the link between Innovation Foresight and the Living Lab concept which was already mentioned in [11]. Living Labs [32] are systemic policy instruments that facilitate user-driven and social innovation in a natural, more ecologically valid research context, reflecting real life situations and conditions. IF studies in Living Lab environments seem promising, especially for the purpose of detecting unexpected uses, latent needs, etc.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at http://dx.doi.org/10.1016/j.futures.2014.01.009.

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