

User Involvement in Future Internet Projects

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Abstract. To determine actual attitudes and practices of those in the Future Internet industry towards user involvement, delegates at the 2012 FIA participated in a focus group and a survey. Continuous user involvement is highly valued and expected to maximise the societal benefits of FI applications. However, just over half of the FI projects apply a user-centred approach, and a large number of survey respondents admitted to being not very knowledgeable about standard user-centred design tools or techniques.

Keywords: Future Internet, user involvement, user-centred design tools, SESERV.

1 Introduction

The design of socio-technical environments, such as the evolving Internet, cannot solely be based on technical considerations or they risk experiencing a cascade of unintended consequences as the technical systems enter use in-the-wild. Social Informatics researchers have identified the exclusion of people who will be using a system from the design process as one major cause of system failures. Many designers develop tacit scenarios of the ways they imagine that people will use systems that often differ significantly from actual conditions and uses [1]. Unless there is integration of the requirements of users and technology “there is the risk that researchers and designers invent something that only a few people need, want to use, or are able to use” [2]. Extrapolating from current trends, the Future Internet (FI) will almost certainly have more users, a greater diversity of users and support a greater diversity of Internet applications. End-users are increasingly active participants, not just passive recipients in the online value chain. Only through identification of user requirements will it be possible to achieve the customer satisfaction that leads to the success of any commercial system.

In this chapter we address user involvement in the Future Internet community. We were interested to find out whether current FI projects support user-led innovation and in this way empower ordinary people, citizens and non-commercial entities. To determine actual attitudes and practices of those working in the Future Internet industry towards user-centricity, the authors, as part of the SESERV FI support action (www.seserv.org) involved participants at the 2012 Future Internet Assembly

(FIA) in Aalborg, Denmark by organising a focus group and by distributing a survey on user-centricity.

2 Methodology

During the first year of the SESERV project, eight major societal topics of interest to FI projects were identified, mainly as a result of a survey and a workshop held at the University of Oxford in 2011 [3]. The workshop brought together technologists, policy makers and experts across various Challenge 1 ICT and socio-economic projects. In SESERV's second year another survey asked respondents to rank these eight topics along with seven network-economic issues in order of relevance and interest to identify appropriate topics for focus groups. The highest ranking topic showed that the most significant societal issue according to the respondents is the need for more user-centricity and control in the design and use of online services.

Furthermore, one of the major themes that emerged from discussion between those building and those studying the Future Internet was the fact that users are now more than just consumers of services and content: they have become participants in the Internet and in consequence there is a real need for user-centricity in design and discussion. At a SESERV workshop in Athens, it was acknowledged that user behaviour presents challenges for operators [4]. Even more than that, users are now savvy technology adopters whose opinions are ignored at the operator's peril. Furthermore, at a SESERV workshop in Brussels it was very clear that technology is now everywhere and regarded as a commodity, not so much a "must-have" but a "so-what's-next" where innovation is driven by the users. The transition is very clear and not unknown in the business innovation literature: what starts as a technology push ends up being market demand, if not user drive [5].

In order to investigate users' motivations and to understand their needs, desires, and fears it is recommended that designers and engineers involve users continuously throughout the development process. We organised a focus group and distributed a survey at the 2012 Future Internet Assembly to investigate the *actual* attitudes and practices of those working in the Future Internet industry towards user involvement. Both the focus group participants and the survey respondents were recruited from the 500 registered delegates during the two-day FIA meeting.

Using a small number of participants, the *focus group* discussed in what way end-users could or should shape the Future Internet. It investigated whether current Future Internet projects are user-centric and what kinds of methods are used to give users an active role – a voice – not just as commentators on new developments, but as innovators and shapers of technology. The focus group discussed whether FI projects need to assign as much importance to the needs of ordinary users as to the requirements of industrial players. We asked what is more important: user needs or technical possibilities. We also examined whether involving users stifles creativity and innovation. Throughout the chapter, verbatim quotes from participants will appear in *italics*.

The *survey*, which was distributed among the delegates at the Aalborg FIA, asked similar questions as the focus group. The survey consisted of three parts. In the first

part the respondents were asked some background questions (gender, age, area of work, FI project involved in, etc.). The second part asked about respondents' opinions about user involvement in general, while the third part of the survey asked about user involvement in the respondents' own FI project.

The survey was completed by 55 respondents (four female) working on 35 different FI projects. The age distribution is shown in Figure 1. Half of the respondents worked in academia, mostly in the fields of computer science or engineering. A quarter of the respondents worked in the technology industry, while the remaining respondents worked in government and policy units, as IT and data service providers, or as project managers in telecommunications. On average the respondents have worked in their current field for about 11 years (ranging from 1 to 40 years).

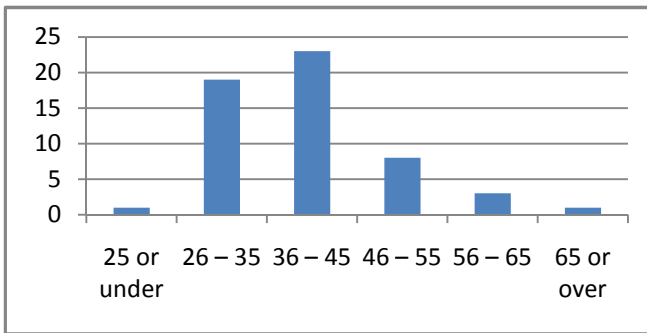


Fig. 1. Age distribution of the survey respondents

3 User Involvement in General

Overall, the survey respondents have a positive attitude towards user involvement. About 93% agree or agree strongly with the statement that continuous user involvement throughout the development process will result in higher adoption rates of new Future Internet technologies. Users should be seen as active research partners according to 82%. Almost all respondents (95%) agree that involving end-users will maximise the societal benefits of Future Internet infrastructures and applications. The majority (69%) feels that the quality of information obtained through user involvement is high and they would recommend (80%) that other development teams spend effort on user-centred design activities. Three quarters of the respondents feel that the expenses incurred by such activities are offset by savings elsewhere in the development process or life-cycle of the product.

The 2010 'Towards a Future Internet' (TAFI) report [6] explains that in the early days, a specialized technical community oversaw the internet's development, while today major commercial internet players have a stronger influence, especially within the context of the committees that agree open standards. The report argues that the future should see a strengthened role for the end-user and user-led design. We asked the FI community who they think is currently driving the development of internet technology. Their opinion supports the TAFI report findings with 56% stating that

commercial players dominate, 25% claiming that technical developments drive the technology and 9% saying that end-user innovation is the main driving force. When asked what *should* be driving the development of internet technology in the future 35% say end-user innovation, 29% say technical developments, 14% say large commercial players, while 22% indicate that there should be a balance between the three players.

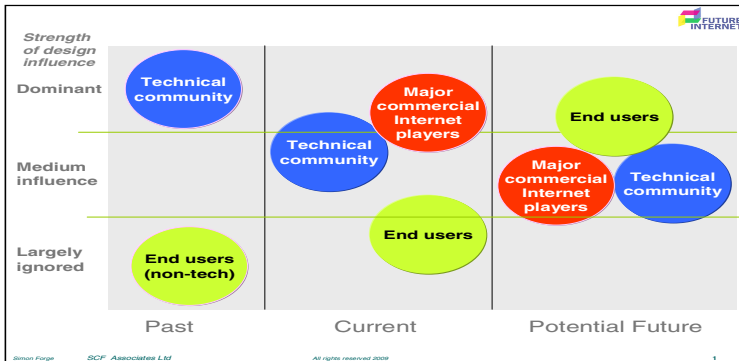


Fig. 2. Who influences the evolution of the internet? (Source: [6])

The focus group participants pointed out that what guides or controls technology development is often a political issue, and may be becoming one of the most important political issues. There is considerable debate about privacy, surveillance and similar issues, which is really about where the technology will go. The political frameworks, such as whether technology is developed in a setting with high or low government regulation, the global distributional production, and so on, set a role for what kind of technology can be developed. Funding models are also seen to have an impact on who sets the agenda. One participant did not agree with the 'current' situation depicted in Figure 2:

I would say that the major commercial players are not so dominant in coming up with new ideas. Rather, to some extent end-users and primarily lead user types, so different types of technically fluent end-users and to some extent new start-ups. It could be commercially driven but it's not the major players who come up with the new ideas. I mean, it is the start-ups that then get bought by some of the major players after a year or two. But the major innovation is not within the big players.

Although it is acknowledged in both the focus group and the survey that end-users need to be involved in the development of the Future Internet, two-thirds of the respondents agree that users do not always know what they want and that they frequently make bad choices. So, does it follow from this that end-users are seen to be hindering innovation? We asked the survey respondents to indicate how much they agreed or disagreed with three statements about this. First we asked whether end-user involvement hinders innovation because end-users have too limited skills to understand the

technical possibilities and constraints of Future Internet applications. Only 10% agreed with this statement. We then wanted to know whether end-user involvement hinders innovation because a ‘user-centric design focus’ creates sameness and therefore stifles creativity. Again only 15% agreed with this statement. Finally, we wanted to know whether end-user involvement hinders innovation because end-users tend to be conservative in their tastes, preferring the familiar over the innovative. This statement found more resonance among the respondents with 29% agreeing to it. Overall though, in our sample, Future Internet designers and engineers do not feel that user involvement will hinder innovation.

When we addressed this issue in the focus group three reasons were identified why end-users tend to be reluctant in the adoption of new technology, especially in the workplace. Firstly, people often do not understand the benefits of new innovations. One participant explained that users involved in an ICT project in the health sector were not open to technical solutions, indeed preferring the familiar over the innovative (as posed in our third statement): *‘They are used to have their methods, their... “ICT, no, we don’t like it, please give us our notebook”... And it took some time but we said, look, okay, there are advantages if you can improve the efficiency, you can do this, this, and this. In our first project I think it took one year before we understood each other’*. From this remark the question arose whether technologists are actually listening to what users want and are taking their needs serious, or whether it becomes a case of technology push where the believe in the own product or system is so high that the end-users need to be convinced at all costs. An interesting discussion ensued in which it was argued by the participants that end-users often need to be informed about new technologies as they don’t understand what they are or what they can do for them:

But then, if you try to explain it to them and if you develop an application so that it is tailored to their activities, after some time they see “yes, we can have advantages, yes, it’s not that bad”.

Secondly, people seem to be reluctant to accept new technologies when they feel they are imposed upon them against their will. It was argued that when innovations are imposed top-down there can be issues which are not optimal, making users feel that they end up having to work harder because the technology has not been well thought out. One participant argued that developers often take the following position:

“Hey, it can be so much smarter, it’s just a matter of explaining and convincing them, they’re so stupid they won’t understand.” That means they[the developers] are not interested in their [the end-users’] world. “Oh, we have this new system for you, it will make life easier”. “Yeah... Right”.

A third reason why end-user may be reluctant or even resistant to adopt new technologies has been noted before by many researchers and relates to the power balances within organisations. New innovations can upset traditional power balances. When a system is introduced, people will make projections about the consequences of its use.

I actually don’t think that it has so much to do with fear of technology or technical things. I think it often has a lot to do with organisational things. That if

people, for example in a health organisation, feel that the change comes from above, this is the bosses who have decided it should be this way, and if you are a nurse or something and have a paper notebook you can use it in informal ways. You can write things in the margin or something that is not really sanctioned from above. If you have a computer programme, maybe the fear is that this will be precisely controlled by the way the administration think the work is done, while in their perspective they always have to find ways to work around it to actually make it work. We must acknowledge that if you introduce new technology in organisations, say healthcare or something like that, then it's not only the technology change. I mean it always comes with organisational change and power balances, and all these other things that you must acknowledge and recognise, which perhaps are not made explicit.

This last comment reflects a situation where participatory design could be applied as a successful user-centred method. After all, participatory design is one of the efforts to democratize technical change, where people who will be using a system or application are providing a voice in the process of design, evaluation and implementation [7]. As Ehn [8] points out: “Participatory design raises questions of democracy, power, and control in the workplace”.

When asked about their knowledge of user-centred design tools, 44% of the respondents admit to having little awareness of standard tools. 45% indicate that they have never attended a user test session, and 56% have never helped to conduct a user test session. The following section gives more detail about user involvement respondents' projects.

4 User Involvement in Future Internet Projects

Of the 55 respondents, 32 indicated that their Future Internet project applied a user-centred approach. Of these 32 respondents, 17 (53%) said that it had been easy to identify the end-users in their project, while 12 (38%) disagreed with that. In the focus group one participant argued that the term ‘user’ is becoming less clearly defined:

The term ‘user’ already presupposes a certain technical configuration, where you have on the one hand someone who develops the technology, manages it, owns it, controls it, and then you have the end-user who then maybe can feed back into this but is not really in control. If you compare it to free software, then the distinction between who is the developer and who is a user is kind of arbitrary. There was a project out there about community owned internet infrastructure, where you also have no distinction really between the managers and the users. I think it's important to be a bit careful with this term, and maybe you can involve users so much that they cease being users and become something else.

Deciding how many users to involve in a project is another issue developers have to deal with, varying from a handful to well over a hundred. Usually it boils down to a pragmatic issue; projects only have a limited amount of time and money. Then again

it is also related to the kind of research questions being asked, as pointed out in the focus group:

I mean is it something where you want statistical relevance, where you are really comparing one system to another to show that this is so much better with some significant thing for instance? Or is it a more general enquiry into understanding what are the possibilities, because then it is a more qualitative investigation, and then you apply different types of methods. So you need to understand what you are looking into, what kinds of approaches are relevant. What are the research questions that you are investigating? And then apply appropriate methodology.

Overall, the survey respondents that had experience with user involvement in their project were positive about the impact. In the relevant projects, 84% had made user involvement a priority. It was felt by most of the respondents to have been effective (84%), to have made the project more innovative (78%), leading to major new insights (69%). User involvement seems to have had a real practical impact, with 59% of the respondents who had experience of it claiming it had changed the developed technology.

We have applied observations and interviews in the real home environment or the real context where people actually are, and found that quite useful, and then also different levels of co-creation or participatory design to some extent, where we actually make sure the people who we were working with understand the general issue of what we are trying to do. Once they are used to that to some extent then we can introduce ideas, and based on the feedback we can suggest technical ideas that address the needs that they express, and then have an ongoing discussion in a quite agile or iterative way, and develop new technical ideas and try them out and have this kind of process.

Only 15% of the respondents were of the opinion that user involvement had been a hindrance, and that it just created more work and was too expensive.

Between technologists and users, often sits an additional layer: the user researcher and UX (user experience) designer. Depending on the skills of this team – whether they pick up the important aspects that users express and how they communicate what they discover to the technologists – designers and engineers will have different experiences with user involvement. We asked the survey respondents whether the user researchers/UX designers in their projects were able to clearly communicate the user needs to the people developing the technology. Only one person felt that they were not able to communicate their findings clearly due to ‘speaking a different language’. About 66% felt that there are some difficulties translating the user requirements into technological terms. A quarter of the respondents thought that the user researchers were able to pick up on the important user aspects and explained them well to the technologists. In the focus group we saw a similar result:

In many cases we do interviews. Well not me, but the people from the social sciences. They have their methods. So we are not bothering with them. We are

together in a project and at the beginning of a project they will organise with different types of users, they do many interviews, and this is the approach they follow. They try to create persona, and then they make a kind of summary page for each persona, to understand how their life is organised and what they expect, so we understand those people. We don't have to participate in this interview but at the end of these interviews, we - the technical persons - understand what they are expecting and we take that into account. Then we come to more technical requirements, so what is expected from the system. And then the technical people get involved and create the architectures and concepts and things like that. Then the user, at least not in healthcare, you cannot involve Alzheimer's patients, but nurses stay involved in the project and follow up what is happening, are also involved in these technical proof of concepts, but there sometimes you see that it's a bit too technical for them. There is sometimes a mismatch.

From the survey we learn that the projects that apply a user-centric approach have many different methods to give end-users an active role. Figure 3 gives an overview of all the methods used by the Future Internet projects represented in the survey.

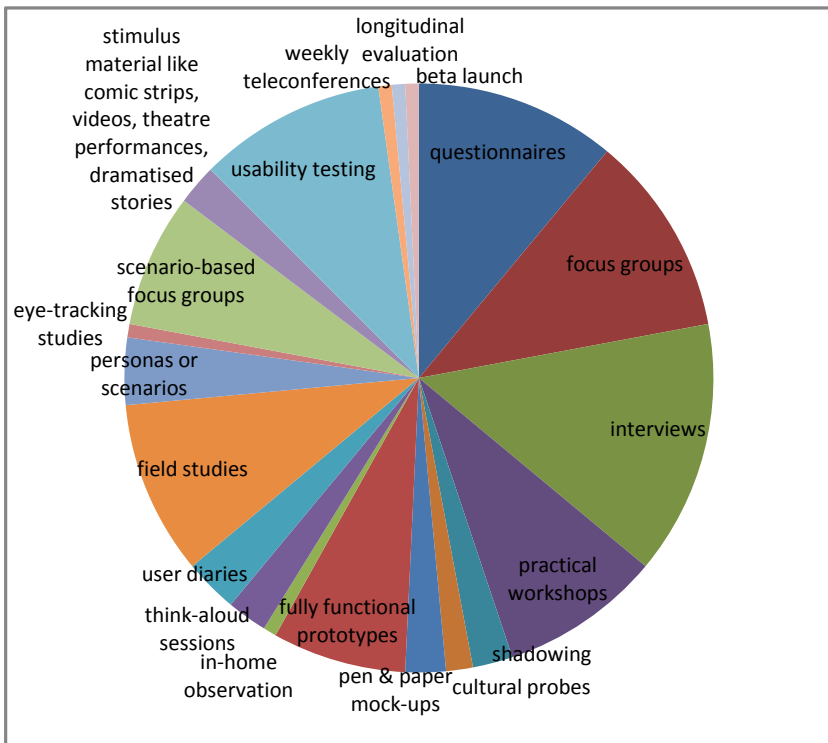


Fig. 3. User-centred design tools used in Future Internet projects

The most popular user-centred design tools are interviews, questionnaires, focus groups, usability testing and field studies. But fully functional prototypes, practical workshops, and scenario-based focus groups are also used frequently. Less common are methods such as shadowing, in-home observation, and user diaries. This might be because these methods are very labour-intensive and time-consuming (either on the part of the researchers or on the part of the end-users). Relatively novel methods based on stimulus materials such as comic strips, theatre performances or dramatised stories are not very common but might increase in popularity over time, however, in comparison to the more popular methods they are in general very expensive.

The participants in the focus group also applied a rich set of methods in their projects. They were of the opinion that if you use the classical waterfall design (business requirements, functional requirements, and functional design) it separates the developers from the outside world so they don't need to understand why a function is needed. In the more agile types of development, however, it is much more common for developers to talk directly with users (themselves or through an intermediary), and that way they really hear what the users are saying. One participant illustrated the user involvement in her project as follows:

In earlier projects the focus was still more on the technical, and also the industry expected a purely technical project. But now this is evolving. We once had a project where we had several use cases in healthcare, things like that, where we really had very nice and interesting user studies, creating a kind of personas to understand what the users expected from our solution. So where there was peer feedback from these requirements to the technical solutions it was greatly appreciated, also by technical industrial partners, and we see now in more recent projects that even industrial partners like to follow this approach, and take more into account the needs from the user and also applying internally these kind of techniques to match their products more to what the user needs. This is interesting.

Again, interviews, field studies, and fully functional prototypes are popular methods, but the participants also used in-home observation and personas. Involving the users can be challenging though:

When testing a fully functional prototype, it can have a very negative impact when the prototype does not immediately function as it should. I have a very nice example. We had a system which worked by speech recognition and it was used by the people who check the tickets in public transport. We had some speech interface so that you could look up information from a database. There is for example somebody without a valid ticket, and then they could speak the name and have information on this person. They didn't want to use it. Why? Because if you spoke a name... 'Hans Andersen'. "I did not understand correctly. Please restate the name." 'Hans Andersen'. You can imagine yourself standing there with this guy, with his friends, and you are speaking to a device which doesn't react, which doesn't work. You are a complete loser. They didn't want to use it, because the image that they created by using this was so negative.

Another participant had the same experience with failing tests:

We also try to go to a kind of field test. But this is not always the case, and again I said earlier, you have to be careful, in the beginning we did more field tests. But then if a field test fails, if it is not working for the first time, if you have to come for example at home several times to fix it they really don't like that. If it goes wrong when you test it for the first time with real users that is really a bad thing, while we as technical people say, "Look, yes, it can happen. We do it again and then it's okay". But you can't do this with users because they expect it to work from the beginning. If you go to the field, you should be shown that it is working from the first time, otherwise you will, even if it is a good solution, people, they don't trust it anymore and they are sceptical.

The duration of a project has an impact on both the success of user involvement and a successful outcome. Typical two-year projects are seen as too short to accomplish anything beyond a mere technical proof of concept, possibly leading to a mismatch in expectations of the involved end-users. They should be followed-up by product development projects.

A two-year project is not that long if you have to do the whole cycle of having requirements and development and implementation and proof of concept. And what we see sometimes at the end, that users are a bit disappointed about the technical solutions we offer, which is not really the technical issues that are a problem, but we are making a research proof of concept, and users are expecting a fully integrated project with a nice design and form factor and everything, and then they say "Oh, this is not a nice thing".

From the conversations it appears that particularly in the domain of eHealth, going beyond 'proof of concept' or prototypes is difficult due to the funding models.

In healthcare if the government is not coming into play... The involvement of the government is very low in this kind of project... at least it is in Belgium. But the industry, as long as it is not supported by the government it will say look, it costs too much, we will not have enough customers. So there are several parties and in Belgium what we believe in this area is missing is the involvement of policy makers and government and things like that. They are not involved, we involve the users, we involve the technical people, but we do not involve the policy makers.

In general, the problem is that projects often stop after the first iteration because of a lack of money and time. This is why applications which would be highly appreciated by the end-users do not come to be a final product. There are however alternative ways to go beyond the actual duration of a project, as one participant points out:

Instead of the project coming in with something and then after a project ends, leave, let's say you have to find some caretakers of what the project is about, and you are sort of helping them to grow. You make the project through them, or let's say, I don't know, if you want to improve a neighbourhood in some way you find some organisation that's there and you just improve something there but they

can continue afterwards. It's not always possible to do, but that's just one way that...if you do that then you can make sure there is some kind of continuation.

Another participant shows that this is indeed a viable solution by giving an example of such a project:

Here the community is so strong that you just only have to give them small bits of information, and of course you have to find some funding, etc., but then they take it out of your hands while you're working at it. And I think that is one illustration of, if you have a strong local community and you have to invest a lot of time in it and in discovering what it would really need, and you have to find people who are enthusiastic, the caretakers, then well it just keeps on running, then you just have to feed in the correct technical infrastructure and they will take care of it. You sort of help them create rather than create for them. But well, this project that I was sketching, that's the only project that I know of which works this way, completely bottom-up. And I have invested an awful lot of time in it.

5 Conclusions

In the debates between those who develop and those who study the Future Internet, user-centricity was raised as one of the most significant themes across all the socio-economic workshops organised by SESERV. This chapter has presented the attitudes and experiences of computer scientists, engineers and IT providers working on the Future Internet with regards to user involvement. Overall, the research participants value continuous user involvement, arguing that it will maximise the societal benefits of Future Internet solutions. However, a large number of survey respondents admitted to being not very knowledgeable about standard user-centred design tools and just over half of the FI projects they work on apply a user-centred approach. Those who do employ such an approach consider it to have a positive impact on the project's output, often leading to major new insights which influence the final product. A number of tools and techniques are used to obtain valuable input from end-users, making them active participants in the shaping of an innovation (Figure 3).

Although in our sample only 15% of the developers who were involved in user-centred projects were of the opinion that user involvement is more of a burden than a benefit, this number might not be representative of all FIA delegates, painting a rosier picture than reality. A limitation of our study was the self-selection of both the survey and focus group participants which makes it possible that engineers and designers with either no interest in, or a more negative view of, user involvement did not take part in our research. While it is common knowledge in the HCI field that user involvement correlates both with higher acceptance of new technologies as well as with better designed devices, it is important to recognize that some technologists are of the opinion that user involvement is a hindrance which creates more work, stifles creativity and innovation, or is too expensive [9]. It is therefore essential to first of all *create awareness* of the benefits of user-centred design within the Future Internet community to persuade developers of the advantages of adopting such principles; this paper tries to make that contribution. The positive experiences of those who do engage users

in their research, design and innovation processes provide evidence of the value of conducting extensive user-centred research. User involvement can identify new and significant needs, leading to fundamentally changed concepts of devices and applications and improved end-products. User-driven innovation will help developers to understand the context of use of their applications, and user expectations. To achieve this it is recommended that user-centred design begins early and continues throughout development [10].

Addressing the practicalities of user involvement is the next step in making the Future Internet community more user-centred. There is a need for practical guidance and advice on how developers should conduct user-centred design. Furthermore, there is a need to “create easy and context-specific access to common technical and non-technical resources and capabilities that can be shared for complex experimentation and innovation projects” [11] integrating for instance FI testbeds and Living Lab environments. The challenge remains to move beyond the idea of the ‘user’ as a problem or barrier, and instead to investigate ways to work effectively with technology users and consider them as key stakeholders and co-creators in the design of the Future Internet.

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