Homes For Life: A Design Fiction Probe

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ABSTRACT
This paper introduces the concept of 'design fiction probes', critical narratives to elicit open-ended responses from potential future users of proposed technologies. Inspired and guided by academic literature, such a fictional narrative allows the reader to explore potential consequences of the use of technologies before they actually exist. The method is illustrated by a design fiction on the topic of smart houses and their potential applications for chronic conditions, such as dementia. Based on constant monitoring and automated responses, these technologies have been criticized on ethical grounds. As these devices are not yet widely commercially available, little is known about their real-world impact. By bringing together what is known to write a fictional account from acquisition to end of use, the design fiction can be used both for research or the design process. Potential uses are presented within this paper.

Author Keywords
Dementia, Smart Home technology; HCI; Design Fiction; Design Probes

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

When new technologies emerge, their ethical and social implications are unknown and can often only be observed when the technology is physically available. Before the introduction of the technology to the market, possible outcomes are mainly debated in the abstract, which may not be easily relatable. Design fictions, fictional and critical narratives, have been suggested to counter this problem, engaging not only designers and developers, but also the wider public in a debate about the implication of future technologies [26]. Design fiction probes are based on the idea of future scenarios [25], but differ from these in the question which issues are explored.

The design fiction presented in this paper aims to open up the debate about the use of emergent 'smart home' technology, giving a fictional example of a potential use case of the technology supporting dementia care. Smart technologies are developed in this context to support caregivers and enhance independent living for people diagnosed with dementia [9]. While potentially useful, ethical concerns about the technologies have been debated because they rely on constant monitoring [1]. The discourse around these technologies is predominately framed around autonomy and privacy [33]. Little research goes beyond these two frames to better understand reasons behind non-use and how the technologies could match user values and requirements. In the cases where non-use is researched, a more differentiated and complex picture emerges (e.g. [17]). The design fiction addresses tensions between stakeholders and their complex decisions by presenting one possible account of how the technology may be acquired and appropriated, how these changes may affect the people using the technology and how they are justified. It is thereby used differently to future scenarios which focus on potential outcomes, either positively or negatively.

In this paper we review related work that discusses how design fiction has been used, particularly in HCI. We then describe how our fiction was developed and include the design fiction as an example. In the discussion we propose two use cases. Firstly how the design fiction can be used as a research tool, to support the understanding of how potential future users frame smart home technology, what functionalities and use cases they find acceptable and how they would prefer this technology to be used. Secondly the paper outlines how a design fiction of this kind could inform the design process by revealing potential hindrances to the use of the technology or generate a more empathic relationship with the potential user group. We conclude with a discussion of the strengths and weaknesses of the approach.

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RELATED WORK

Design fiction probes follow an approach based on the reasoning of Dunne [13] who argues in favour of "developing forms of engagement that avoid being didactic or utopian". The story presented in this paper only hints at future events and focusses on the decisions and considerations that led to the use of a smart home and influence the appropriation. It has been written to "investigat[e] matters of concern", rather than "conveying matters of fact" [10]. Instead of showing outcomes of technology use, questions of appropriation are addressed in the design fiction probe.

Critical design is particular useful in eliciting readers responses by providing accessible methods of communication and presenting complex relationships [15, 12]. Domestic technologies are used within the privacy of the own home, where they may be used in "blurry and unforeseen" ways [40]. Little is known about how the relationships and strategies employed in the context of dementia influence the appropriation of technologies. In the particular example presented in this paper, one set of consequences that can arise within the socio-technical system of people living with technology is shown by presenting the different tensions, responsibilities and benefits that arise within one family.

In addition to involving a wider audience, design fiction has also been placed within the realm of research for example by Grand and Wiedmer [19] who argue that design fiction is a creative way of generating knowledge that has its place in research. The method is related to 'cultural probes' [16] which also sit on the borderline between design and research and have been used in both instances. The development of a probe has been likened to product design rather than study design [29], emphasising the creative nature of the method. Technology probes (see for example [38]) are simple prototypes which are given to users to gain a deeper understanding about the circumstances and issues surrounding their use. Both cultural probes and technology probes share that they are open-ended, exploratory tools, which enable participants to choose topics and issues that are relevant to them. Design fiction used as a probe shares this aim and invites readers to raise any issues they choose from the story and expand why it is important to them. It is expected that these will differ between participants and, possibly even more importantly, that they will differ from the range of issues that researchers and designers bring into the design process. In contrast to scenarios that aim to "reframe or refocus" [37] a debate, this paper proposes to use scenarios as a way to understand how potential users of a technology understand and frame it.

Scenarios have been traditionally divided into those "normative or exploratory" [39]. A range of normative scenario methods have been developed that argue in favour or against a certain technology using narrative to create persuasive arguments [36]. 'ContraVision', a framework developed by Mancini et al. [28] is based on developing both a positive and negative scenario in regards to the same technology. Wright et al. [39] describe a method of developing three scenarios comparing outcomes: "(1) surprisefree or business-as-usual that simply extrapolates current trends with interplay of the trends; (2) worst case scenario based on mismanagement and bad luck; and (3) best case scenario based on good management and good luck." In this use case scenarios are either utopian or dystopian, projecting specific aspects of the technology to predict future consequences or elicit people's expectations about future developments.

To summarize, a design fiction probe is a narrative scenario used to elicit open-ended responses from viewers about the values, possibilities and limitations of future technology developments. It can be written or be presented as a video or performance. It is proposed to evaluate the use of a design probe, by its ability to elicit issues and emotional responses formerly unknown to the designer or researcher.

METHOD

Problem Space

Before describing the methods used to generate the story, this section provides a brief overview of the context that inspired the content of the story. Dementia is an umbrella term for a range of progressive illnesses that affect memory, behaviour, mood and communication. With the number of dementia diagnoses and pressures on the health care systems rinsing in the Western world, technology is considered a means to augment dementia care (see for example [6,17]). A main aim of technology developers is to support people with dementia living in their home for longer, which is not only a declared goal of people living with dementia but might additionally reduce the financial pressure on the health care system [9, 11]. A strong area of interest is the move towards context aware and connected technologies, so called smart [6] or intelligent [4,5] systems. Even though a distinction can be made in regards to the level of automation between these two terms, they will be used interchangeably throughout this paper. While not yet commercially available, it is expected that intelligent technologies will be on the market within the next decade [5].

Intelligent technology is expected to overcome the problem of introducing new technologies to people with dementia who might be anxious or unable to interact with it [31]. Nonetheless, while potentially useful, critical voices warn that people living with dementia might be disempowered through the use of this technology [6], as it may take away control [2] or be used without their knowledge [8].

As caregivers are engaged in constant monitoring to avoid harm to the person with dementia [30], technology has been welcomed as a means to reduce caregiver burden. So called 'monitoring technologies' monitor behaviour, environmental or physiological signals to alert caregivers to

potentially dangerous situations [1]. Additional expected effects are reduced harm to people with dementia and a delay in institutionalisation [ibid].

Nonetheless these technologies can also be framed as surveillance technologies, which poses questions about individual rights, such as privacy and autonomy, and the quality of care [21, 1]. Further questions are raised about the acceptability of these technologies for the intended user group. In a focus group Dewsbury [9] found that elderly people showed little interest in those kind of technologies, but that their concerns were "more mundane". Fleming and Sum [14] reviewed the effectiveness of assistive technologies for people living with dementia and found that their acceptance is currently limited, but argue that future developments will improve and become more useful to the target group. These solutions need to be further integrated into the care system as observed for example by Bossen et al. [6]. Issues beyond practicality and usability can influence the acceptance of the devices.

Formal and informal caregivers often influence the use of technologies [34]. Even though the importance of both privacy and autonomy of people living with dementia has been recognized, concerns about their safety may lead to a decision to use monitoring technologies disregarding those issues [23, 33]. The debate about monitoring technologies is ongoing. Stakeholders' views and wishes within this regard vary and influence whether the technologies will be used by this user group. Understanding the impact these technologies have in everyday use is complicated due to the nature of the illness and reservations hold against them. The rise of ubiquitous computing solutions stresses the problem and new ways of furthering the debate and insights into these technologies are needed to enhance the technologies used in this area.

Development

This section will give an overview over the methods used to write the fiction presented above. It presents literature that influenced the writing process, before summarizing each step into a short guideline.

The discrepancy on the expectations and promises of smart technologies between the different stakeholders has been the starting point for the 'Home for Life' design fiction. This gap has been established via an extensive literature review which has been part of a PhD project on the technologies that are currently developed and proposed for dementia care, their aims as well as issues surrounding their use that have been debated in the literature. It brings together literature about technology development, care practice and ethical debates.

Step 1: Gather literature on what it known about potential issues that may arise from the use of a new technology. Identify ethical implications that are debated.

Design fiction has been suggested as a tool to analyse emerging technologies [40]. While some critical design methods address present states of technology, others turn towards near or "longer-term, speculative futures" [35] Scenarios are one specific way to enable stakeholders to consider possible future developments of a technology. Malpass [27] distinguishes two ways of design methods, depending on their relationship with time:

> "If speculative design focuses on science and the potential future applications of applied technology, then critical design focuses on present social, cultural, and ethical implications of design objects and practice. It is grounded in critical social theory."

Following his argumentation, the design fiction presented in this paper is critical because it presents a very near future, if not current practices. Nonetheless it invites a more speculative discourse in addressing future developments unknown to the reader. By placing the current account within a future time frame and hinting at events, without clarifying whether they are positive or negative, the reader is invited to draw own conclusions and share them with the researcher. Grounding the story within a contemporary account has been a deliberate move to address criticism of design fiction. Gonzatto et al. [18] observe that future speculations are always grounded in current "desires, that bear no accountability in the present." It has therefore been decided against an account in a far future, rendering the technology unrecognizable or too far advanced to relate to. The technology presented in the design fiction is very relatable, with little, though imaginable technical progress. This also encounters a criticism of Walsh [37] that a scenario can hinder a debate when the content is too far removed from the experience of the reader. The setting and scenario of the 'Homes for Life' scenario has been carefully chosen to enable readers to relate to it. It is set within a family, though little context information is given about their background. Places and times have been carefully avoided, even though names have been added to enable a more personal connection.

Step 2: Define a time frame and setting that the readers can relate to and identify with.

Domestic environments, and thereby smart homes, also pose particular challenges to designers as their use is complex to observe. The private nature of decisions around buying and living in a smart house was maintained by choosing a family to represent the issues. By developing a 'lived account' consequences are played out not in the abstract, but in one –fictional, yet concrete – case study. In developing this personalized narrative, issues came to the foreground that have not yet been addressed in the literature to the author's knowledge, such as the question of a resident dying. Dunne and Raby [12] observe that

> "Dark, complex emotions are usually ignored in design; nearly every other area of culture accepts that people are complicated, contradictory, and even neurotic, but not

> design. We view people as obedient and predictable users and consumers."

Fictional approaches are one way of building up personas that give a more detailed and complex image, taking personal relationships and circumstances into account. Additionally, as issues have emerged during the writing process that did not yet stand out in the literature, such as financial matters or end-of-life decisions, it is proposed that writing a fiction like this could support the design process by enabling designers to think through potential use cases and potential hindrances to the uses of their technology.

Enhancing the discourse about the many factors that can influence the use of these technologies, it has been decided not to use a person with dementia who discusses their own experiences with the house, but rather a family member as the persona for this story. While this approach could be criticised for marginalizing the person with dementia even further, as she never appears personally within the story, it has been decided to bring in this more provocative position. The impact caregivers have on the use of technology is a current theme within the literature and it has been decided to highlight how this might influence the person with dementia.

Step 3: Define a group of actors of the story between which potential conflicts play out.

Another main inspiration for the story has been the insight by DeLaat [24] that many future visions focus on the promise of new technologies, but that "they hardly tell us anything about what the world should look like in which these technologies are expected to live". Building on the existing academic literature on smart technologies in health care as well as the use of technologies in dementia care, the story outlines the considerations that led to and influences the use of smart home technology in one particular case. Financial matters and family relations interact with the promises of technology, sometimes enhancing them, sometimes standing in their way. By presenting one, easily relatable example of the use of the proposed smart technologies, the design fiction disrupts technology determinism, in which the promise of a technology can become a "necessity" to develop and support [25]. The story presented in this paper shows one potential of a "plurality of possible futures" [19], thereby countering this determinism and critiquing the process [7]. While many of the reports in the literature focus on specific use cases, it has been attempted in the design fiction to consider the whole life cycle of a potential smart home: acquisition, appropriation, everyday use and end of use.

Step 4: Building on the established conflicts and the chosen setting, guide the writing process by constantly asking: 'What if …?' and 'What next?' to describe the life time of a product.

Due to the requirements of the call this work is presented as a written account. Even though critical design methods draw on material culture and often consist of tangible prototypes which are then placed in a narrative, the focus on the story is relevant to the problem at hand, as the technology discussed is proposed to be invisible. The interaction between the stakeholders on which the design fiction presented here focusses makes the technology visible. In addition to written accounts, the role of other media, particularly film is often discussed in regards to critical design (see for example [27], [18]) Keeping the narrative aspect of the design fiction, video could be considered as a means to emphasise the story and make it more realistic, possibly creating a deeper, more empathic connection with the audience.

Step 5: Consider the medium of the story.

Taking discrepancies between users' wishes and technological development as a starting point, this story builds on the promise of technology and applies them to a recognizable, domestic background, avoiding highly positive or negative consequences. Framing the story as a look back from the future and indicating that non-specified events have taken place by then, the story invites the reader to consider possible future consequences of the developments.

EXAMPLE FICTION: HOMES FOR LIFE

Having described how we developed the fiction, we include it here as an example of the rich story that can be developed from this approach.

A TV studio, announcer sits in front of a deep blue background, introducing the show:

"When we put together this last episode of our series, we did not know yet how timely it would be. We will start by giving you an overview about the beginnings of the technology, when in the early 2000 ubiquitous computing took over and large companies invested in what was then called "Smart Homes". This kind of building had a wide variety of in-build sensors, often hidden from view which would measure the movements and physiological data of the residents. Networked, the data drew a very conclusive picture of the residents that connected people and services, businesses and governments for a highly convenient, supportive and safe life. We will start this broadcast by presenting you with an account from an early user of these services, who spoke to our studio shortly after the legislation on smart technology had been passed."

Cut to a different TV studio, an interviewee sits at a small table, only a glass of water next to her, in front of a darkened studio. She starts to speak:

“Is this on? Would you like me to start now? That camera? Ok. Sorry, I am a bit nervous, I have never spoken on television before.

I was very keen for my mother to get into one of those smart houses. ‘Homes for Life’ is what they call them. I mean yes, it meant that she had to leave the house she moved into shortly after her marriage to my father, the house she had been in for so many years, but as I explained to her over and over again: this would be the last time for her to move. Once she settled in there was no reason why she would have to move out ever again. No care home, no hanging out with old people, no bingo. Oh god, she hates bingo. Really, it would have been quite irresponsible to get her into a home that does bingo. What would she have done to any of the nurses that suggested it? Is that what they call the staff in care homes? Or is it something fancier? Well, anyway you know what I mean. I just felt it would not be right for my mum. She always wanted her independence. Wanted to be by herself quite a lot. She did not always get on so well with the neighbours and I thought that would be even worse, you know when she had to share a room with someone or had so many people around all the time. So, a care home just did not feel right.

But, with these houses they say you don’t have to move again because they give you all the support you need. They do everything for you: they arrange for the shopping to be delivered to you, call someone for you when you are not feeling well and even diagnose you. No really, the house diagnosed my mother with dementia, shortly after she moved in. The guy who builds them, calls them a maid, a personal assistant and a doctor in one. Well, they do not really do anything for you. It’s not like a futuristic robot house. You know, like the ones you saw in the early movies, with metal arms everywhere. It’s not like that at all. It looks very normal really. But the houses help the resident to stay independent by giving what the company calls ‘directed support’. There are sensors everywhere in the house and they measure what you do and can help when you get stuck. And as for moving in with us. Oh no, that would not have been good. I mean we both had our jobs and Kevin was on the loose. Kevin is my son. Proper teenager he was then: banging doors, listening to music far too loud and losing his temper for absolutely no reason. So we felt it might be a bit too busy for her here. Also, to be honest, we did not always get on too well. Don’t get me wrong, there was never anything big between us, but sometimes, one wrong word and we could be at each other’s throats. No, no, it would not have been right. Not comfortable for her. Nor for us I think.

So when I heard about ‘Homes for Life’, I jumped at it. They said the house could do everything. Really fancy. You could talk to it and it understands you and all sorts. There was so much it could do! Helping you during the day, you know, with the stuff you always do - that came in really handy I can tell you. It even had alarms when things go wrong and all this, so we knew that she was all right in there as long as we did not hear from the house.

You could set the alarms as you see fit, you see. So, we made sure that we would know when someone was in the house, in case of burglars, or swindlers and that sort. You hear so much about how they swindle pensioners with tricks, so we wanted to make sure that the house could get in touch when there was someone in the house who should not be there. We also set an alarm to get a message when she would fall. I saw a thing on the telly, the television I mean, when someone would fall and just lay there on their own for days, unable to reach for help. I was really scared of that happening to my mum. But I could not stop by at all times, could I? There are these alarm things that you can wear, round your neck or like a watch and they have alarm buttons and all but mum was really stubborn about that. Said she did not need it and left it on a hanger in the bathroom. Always. I tried to convince her a couple of times to put it on, but no way. That was one of those things we fought about. When I just mentioned the alarm in the end, she went from 0 to 100 in a second, I can tell you. There were a couple of other alarms that just came with the house. When she went out for example. It was a great relief for us to know when she was out and if she came back all right, because she never took her phone with her. Could not get used to the idea that it would work without a cord, and therefore she was convinced it would be of no use outside. I am not sure how often we told her it would work, but it would just not go into her head. Hard to imagine really. I would just take my phone … I mean I do take my phone everywhere. But she did not have one, or rather did not use it, although we gave her one for Christmas. Luckily the house sent notifications for her. There was nothing she had to do really. Made it very easy for us. For her as well of course.

Yes, I had doubts at the beginning. It was all so new, you see. My mum would be one of the first to live in such a house. All this technology! It was a bit over my head really. Smart algorithms and all that. What if something breaks, I thought. Who would fix it? I could not do it. Peter, that is my husband, I don’t think he could have done it. I mean he is quite good with computers and all this stuff, but I think all the technology in the house went a bit over his head as well. We looked at the description and I swear to you, with some of the sensors I don’t even know what they did. I am sure Peter did not know either.

So I went to one of those information events they did. It was about an hour’s car ride away, but it was still well worth it. The guy who invented the houses was there. Really nice man. Told us about his PhD from some university, where was it again? Well, that skipped my mind at the moment, but you know he studied at a department where they focused on old people. Geronto-engineering it is called. He told us how he was really interested in sensors and connections and all this stuff when he started, but then

he learned about all these problems just waiting to be solved. Real-life problems he called it. So like my mum. What happens to people who are still quite all right but need a helping hand? Who do not really have a place to go to? And his answer was: They go home. That's what he said. They go into a place they can call home, and have exactly the support they need. Sounds great, right? And he told us how he was quite overwhelmed at the beginning as well. He had never built a house, right? He told us that he planned everything from the bedroom of his shared flat to save money and put everything in this dream of his. But he said, he found the right people to build houses for him so that he could concentrate on getting the technology right. I mean that was what he was good at, right? And it was good to see that he knew what he was doing and how good he felt about it himself. He really wanted to help. I think that clinched it for me.

He explained that there was a support package, someone just round the corner who would pop in; just in case the technology did go faulty and they would fix it really quickly. He said there were plans to put power generators in place to have a backup when the power goes off. It had not happened yet, then. I think it is in place now, but I really do not know. Luckily we never had a power cut. I am not really sure what would happen then with the notifications and all that. Think I had gone up there to see if she was all right, you know, just because I would not know that she was.

I still had a couple of fights with mom, but I think in the end she understood. We visited the place and saw that most of her stuff would fit in and that was better than a small room in a nursing home, right? It is not as big as her old house, but with father gone she did not need that much space anyway. Also, the house was all new, not like the old one that needed a couple of repairs. She could not really deal with that anymore. Having someone her age climb under the sink to drain the pipes? Could not be done. Peter could not go out every time something happened. I mean, he was busy with the job and all. He had to go to the new house a couple of times, but really rarely. The house could do nearly everything, but it could not repair itself. People can go to the moon, but fuses still go… Well, the maintenance packet was really expensive and we figured that the house was all new, so why throw all that money out. The old house was in a much worse state. We still got a good price for it though, so when we sold it, it paid for the new one and everything.

When we went to visit one of their test houses on an open day, mum was quite impressed with how clean and nice everything was. You really could not see any of the sensors and stuff, they were all hidden behind the walls and in the cabinets and all. Even the cameras and microphones are hidden away. I think I know by now where some of them are, but I am not sure really. Well, luckily I do not need to know. Service came and fixed a couple of things sometimes, but I had nothing to with that. Mum even less.

She was quite scared of the voice at the beginning though. This is how the house communicates, you see? It spoke to her to remind her of stuff she had to do and gave her advice on the status of her health and the house itself and stuff. But mum said it felt creepy and she did not know where it came from and why it bothered her? So we changed it to an actor she really liked from her younger years and she loved that. It's like, what's his name, is in the room she would say. Imagine this, me talking to… oh, I could never remember his name. He was an actor before my time you know. Anyway, mum loved it. She would have proper conversations with it. I am not sure if she thought it was a real person or if she just did not bother. Well, she sometimes forgot how it all worked especially in the end and called me and asked where all the switches are. I told here again and again that there are no switches and everything works by saying what she wants. In the end we put up some stickers reminding her.

She never asked how it worked in detail and we never told her. I don't think she would have liked the idea that someone was watching her. I mean it wasn't really someone, was it? Just sensors and wires and cables. I got some notifications about her health but that was about it. No one else could see anything. Well, I think so. With all this hacking going on, you never know. But who would have liked to watch my mum going about her day? Not like she had anything to hide really.

At the beginning it was a bit stressful for all of us. There had been a couple of false alarms and I would drive over, but all was all right. It always confused her why I just stood on her doorstep in a panic. I had to make up a reason then why I suddenly wanted to see her. Once I got the notification that there was a man in her bedroom. With her. Immediately called the police and they drove down and found the two of them … well, snuggling. If you know what I mean. I have no idea how she met this man, but apparently they knew each other quite well. I had no idea. It was really very awkward and I don't think we have spoken about it since. What must the police men have thought about us? Not knowing this about my own mother. Well, glad nothing happened. Gave us quite a fright though.

Around that time she started arguing with the house. Told him, well, it I mean, that she did not want to tidy stuff up even though it was a fall hazard. She was annoyed that it would switch on the light when she got up at night. Said it gave her a fright. Anyway, the house learned a bit about her and I think my mum adapted as well. The wrong calls just drained out and I think she got calmer about the house and the voice and everything. We started to go less and less, with Kevin in university and not able to join us and both of us working. It was good to know that she was all right and got on with her life through the notifications we got.

I think in the end nobody knew as much about my mum as the house did. It had to. With the medical package and all that. The sensors measure your blood pressure and urine and all that, but they also measure things like how you walk and whether your behaviour changes. I mean we knew about her wonky heart even before she moved in, but the dementia diagnosis threw us quite a bit. She was always so bright! At the beginning you could not really tell, but the house said so. We did not take her to a doctor though. What good would it have done? You cannot really do anything about dementia I have read, and it would have only upset her. She didn't like to go to the doctor anyway. So we just changed the package, so that the house would do more for her. You know, give her more reminders and tips on what do next and not to leave the stove on and that sort of things. I think she noticed that the house was different and was a bit suspicious at first, but then she got used to it I think.

They also offer that the house can give you medication. It goes directly in the water. Someone from the pharmacy comes around and renews the powder or whatever form it takes and then the house calculates how much to put in the water. We decided against that. I mean what would happen if the house got it wrong? Or if she would just not drink water that day? No, no she was used to the pills and that was ok for us. That is a bit creepy. We thought, you really do not know what could go wrong. Messing around with medication did not seem right. With the dementia it became more urgent though. But the house could set reminders. That seemed to work and we left it at that. Sometimes I got a notification that she had not taken her pill and had to drop everything and call her and remind her. She always wondered why I called her out of the blue, but I think she was glad to hear from me anyway.

In the later years of her living in the house, contact dribbled out a bit. Well, she had gone so quiet and did not really seem to want to talk, so it became a bit awkward. Kevin came to visit a couple of times with his new fiancée. I think they got on really well together. Wondered sometimes if her …friend had been around more often or if other people stopped by, but I mean she liked to keep herself to herself before. Anyway, she had gone so quiet. But the house was clean and she was always neatly dressed, sitting in her favourite chair, fridge was full, so we assumed she was all right. I think the house helped her a lot in the end. It got so connected.

We had to make some alterations. We did take out all the social media functions. Hard to imagine nowadays, but my mum was really old school and did not use any of the networks out there. I wanted her to get onto one of those you know, so that she could see our family pictures but she always said, no, that's not for her. She really was old-fashioned like that. I remember that there was a big warning that disabling all this would limit the functionality, you know because there was no access to contacts and so on, but in that regard my mum had not contacts. I mean she knew people, but she did not even have email. We set one up for the house, one of the free ones, because a lot of important things would not work any other way. For example contact with the doctor and the emergency services and all that.

Oh yes, and the payment was something we set up. She had a credit card, but she always kept it in her bed side drawer, I don't think it ever left the house. But so much could be ordered over the internet, groceries and stuff, and paying the bills and all that, it would have been so confusing for her. So we let the house do it and Peter had an eye on the account so that we knew when stuff would go wrong but as far I know it all went well. Really useful. Kind of a godsend really.

I will say this though, when the news came, it could have been done differently. I mean just sending a text like that. 'We are sorry to inform you, …' That is polite enough, but I could have been at work, or shopping or doing all sorts of things. I was at home luckily, having a day off. I just wanted to go out and buy a birthday present for Peter, he had had such a tough time then that I wanted to get him something really nice. Imagine if it had come half an hour later. I would have been in the car, driving into town. Anything could have happened.

I mean it wasn't always so nice to get the texts before. Along the lines of 'Your mum has fallen and you need to get her to hospital'. But it was good to know. To be able to help so soon. Knowing that she would not have any problems she had to cope with on her own. But this, no, that could have been better. This is not the way you want to hear about your mother's passing. That should come from a person. But I bet they would just charge for that and I am not sure if we would have taken that package anyway. Would you want to think about this in advance?

Would we be moving in? Ha ha, Kev, I mean my son, Kevin, he keeps on asking the same question. Over and over again actually. He says that the house is there all empty. We do not get any younger. Well, he is right about that of course. But I bet I still have some time before I need that level of assistance. He keeps on asking what I think about care homes and I tell him that would not be for me. Maybe he is scared that I want to move in with him? Well, I think that would be a bit much, wouldn't it? It is called a 'Home for Life', but I already have a home. I asked Kev if he wants to use it, with house prices what they are and his young family and all that but he says it's too small. With the one kid it is okay, but they are already planning for more, so they say and then there really is not much space. Shame really, I mean for Liam, that's his son you see, for him it could really become a 'Home for Life'."

Interviewee fades out, studio goes dark, cut back to the announcer:

"Before we speak to our expert about the most recent developments, we would like to hand the discussion over

to you. Did any of the issues addressed in this clip touch you? Any points you would like to raise, any items you would like to discuss? Now is the time for you to call and get in touch. Ah, here we already have the first contribution. …"

DISCUSSION

As ubiquitous technologies enter into complex spaces such as care settings which include a range of stakeholders with contrasting goals, new methods of evaluation are needed in the field of HCI. This has been observed for example by Heidt, Bischof and Rosenthal [20] who argue that: "Interactive artifacts continue to permeate social reality. Consequently the field of HCI has to produce new conceptualizations and theories trying to account for its new responsibilities." Some of these methods borrow from other areas, such as arts and design to encounter the new tensions. Design fictions are one promising method to support this process.

Lessons learnt with regard to writing fiction.

While the role design fictions could play in HCI has been debated [e.g. 36], little is known about the development process. This paper addresses this lack by providing a step-by-step guide on how this story was written, summarizing qualities important in design fictions in the process. While we expect this to be a useful tool for others who wish to develop design fictions, it can only be a guideline, as the process itself is very individual and intuitive.

Building on our own experience of writing a design fiction, an open, exploratory approach has been found useful. Guided by curiosity and creativity, the story has been written without any scaffolding, issues written out as the ideas formed, with little consideration of the language used. An extensive editing process was used to structure the story and find a coherent voice, while keeping the novelty and creativity of the items presented.

Use cases

Here we discuss a range of possible use cases, for both researchers and designers, with the aim of encouraging future research into the value of this method. As our design fiction probe was written with the aim of eliciting open-ended responses from readers of the story, we are considering two methods for dissemination of the probe: sharing the fiction within a focus group and dissemination via the internet.

The first case discussed is the use of a design fiction as a research tool. Here we are considering two methods of sharing the probe with the participants. The first option considered is to set up a focus group and share a design fiction either as a written account or a design fiction, before starting a discussion. Comparable to the end of the story, in which it is indicated that someone has called in to the TV show with an opinion, data collection should be as open as possible and participants should be able to raise any points they particularly remember from the story. In a second step they can be probed whether they remembered because they considered it particularly positive or negative. Additionally participants could be asked about any other issues or possible outcomes they would find relevant, e.g. by asking which aspects they missed in the story.

The second option is to share the story via the internet and to gather responses from participants who are willing to engage with it even further. This second approach not only has the advantage of opening up the number and background of participants, but might also lead to people reading the story less critically, therefore eliciting more spontaneous responses.

Notwithstanding the method of dissemination, it is expected that this tool would enable participants to raise the issues important to them, particularly those not considered by the researchers, thereby reducing bias. Additionally it supports the participant to easily relate to the technology and some problems it might pose, which may enable them to give opinions more easily.

The second use case lies within the design process, not academic research. While it has not been the aim of this story to support the design of an artefact or device directly, it has nonetheless brought insights that could support the development of future smart homes. Based on an extensive literature review of technology development reports, user reports of comparable technology and ethical debates about relevant technologies, it brings together previously disjointed literature and combines them into one account. This could be used to present the issue to a group of designers during the briefing or ideation phase. As the design fiction is written with a relatable protagonist, it could further be used comparable to a design persona to learn about the user group and emphasise with them, thereby supporting the design process. A particular method of design fiction is 'defamiliarization' or 'making strange' [3] which is particular useful in designing domestic technologies [3]. By giving deep descriptions of everyday items, the designers are enabled to question the familiar. The scenario presented in this paper has been guided by this approach and attempts to highlight the many consequences of technology use. The technology itself is 'invisible', built into the structure of the environment and is therefore hidden from view. Instead of describing the technologies and its workings in detail, as it is often done in the academic literature on the topic, the technology only becomes visible through the way it enables or hinders user interactions. This method has the potential to highlight functions of the system that: the user may find problematic; could benefit from re-design; support thinking through the design process; aid in the identification of potential gaps in the design; or identify cases in which the design could be misused.

Strengths & Weaknesses

Two use cases have been suggested that show how a design probe could be used either as a research tool or as a method to support the design process. While the evaluation of the usefulness of design fiction probes is still outstanding, the contribution of this paper lies in the presentation of the method for developing them, which opens the debate about the use of design fictions and can inspire other research projects. While the question on how these tools can be employed most efficiently is still open, the reflective writing process of the design fiction presented here has already led to a step-by-step guide that can be used by others interested in using the design fiction for either case.

CONCLUSION

Within this paper the novel concept of the design fiction probe has been presented which draws on narrative writing to support considering new possibilities and limitations of future technologies. Rather than framing the debate in a specific way, it offers many aspects that could be commented on by readers. It can be used as a way to understand how potential users frame the use of a specific kind of technology, which can then be used to enhance the current technology development. As such it is closer to the original inspirational aspect of cultural probes than other scenario techniques that are more explicit in what is to be understood from the probe. By encouraging open-ended participant comments, this method is expected to bring new impulses that can inspire and further the understanding of the context of ubiquitous, smart technologies.

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