Using scenarios to explore the social aspects of design led innovations

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Abstract

Emerging technologies have redefined the way people go about everyday life. An increasing array of online and on-the-go solutions supporting remote work, entertainment on demand, information sharing, social communication, telehealth and beyond, are now available at the touch of a screen. This paper discusses concept of scenarios as a design tool that can be successfully employed by organisations as an innovative design led approach to: (i) understand people's everyday practices in current social contexts in order to identify opportunities and emerging markets, and (ii) reveal stakeholder relationships existing in the provision of services within current everyday practices. To illustrate this approach, two case studies will be presented: the first focusing on a real industry project exploring opportunities for the development of future health care services, the second focusing on people's access to services as part of a transport journey experience. This paper aims to demonstrate the use of scenarios as part of a design led innovation approach to understand the social aspects and their complexities of new designs in an increasing everyday technological driven context.

KEYWORDS: Scenarios, design led innovation, experiential journeys

Introduction

Widespread advancements in technology have altered the social environment that we operate in and transformed the way in which people work, interact and maintain relationships (Australian Bureau of Statistics, 2010; Isen & Stevenson, 2010). In this busy interconnected world, technology 'on-the-go' enables, and indeed some may argue, requires that we are always 'on-line'. As consumers are drawn to new features and extensive applications in what have rapidly become the "ultimate portable converged device", in 2010 Australian sales of internet enabled Smartphones grew by 29% (Euromonitor International, 2012). A 2012 study by Google about the use of mobile technology in 26 countries highlighted that people use smartphones to access the web (as much as through their desktop computers) for everyday type of activities, this includes: at home, work, on the go, public transport, while

waiting, at social gatherings, etc. Such use 'have transformed consumer behaviour' in various facets of everyday type of decisions. How does this affect society and individuals' everyday life?

The invention and diffusion of information and communication technologies are said to be revolutionising work and family life. Wireless mobile devices increase the scope for work and family flexibility by enabling the micro-coordination of time, tasks, and schedules. This is particularly significant as people are now working at times and places outside of the traditional workday and place. It is widely believed that technologies like the mobile phone and e-mail are blurring boundaries between personal life and the workplace. While for some commentators these developments represent a threat to the quality of modern life, for others they represent new opportunities for integrating the spheres of work and family (Anu and Amta, 2007).

As emerging technologies surrounding us mediate most of the human world influencing our everyday life, design plays an ever important role in the evolution of the environment with greater effect and wider scope of how design shapes our everyday interactions (Friedman, 2003). Design is an interdisciplinary and integrative discipline; it has been defined by Simon (1998) as the 'process by which we devise courses of action aimed at changing existing situations into preferred ones'. The process of design thinking has the ability to capture both new knowledge and in the application of this knowledge to the creation of possible futures and scenarios with a broad research team, stakeholders and with future potential customers (Bucolo and Mathews, 2010).

Over the last forty years, design researchers have extensively employed empirical studies to explore a variety of everyday life practises (Cross, 2007), to capture new knowledge and discover opportunities to identify latent needs and potential markets. In capturing knowledge and translating it into future practices, design thinking can be assisted through the use of scenarios, which describe possible, preferable or avoidable futures (Jonas, 2001).

This paper reports the use of scenarios to explore social aspects of design led innovations that affect people in everyday life activities. Two case studies are introduced; the first around the design of a design led innovation in the medical field; the second focusing on the use of mobile technologies during public transport. The following sections discuss the concept of scenarios and design led innovation, and two design case studies describing their methodological approach including the use of design scenarios. The conclusion section presents a comparison of approaches and limitations in each case study. Finally, the discussion section addresses the complexities, challenges and opportunities of the use of scenarios in design practice and research.

Scenarios as conceptual framework for design

Jonas (2001) defines that 'scenario is a design itself'; it is a conceptual framework for disciplinary design development. It is informed by a cyclical reflective process between theory and practice leading towards a 'prospective' design solution. The construction of such conceptual framework (scenario) requires a methodology where the individual is the centre of the design production. In order to produce scenarios that describe 'possible, preferable or avoidable futures', such methodology embeds three phases that go from 'problem modelling' (analysis), to 'future concepts' (projection), to the identification of a 'solution' (synthesis).

The use of scenarios is not new. In a review of the use of the use of scenario as a tool, Hertzum describes that it emerged as a methodology in the late 1940s spreading to other areas since then (2003:216). Most commonly applied in: strategic management, human computer interaction (HCI) and software engineering fields, scenarios are commonly employed to ground decisions around the 'use situation'. From this point of view, Carroll defined the concept of scenario as 'a projection of a concrete narrative description of activity that the user engages in when performing a specific task, a description sufficiently detailed so that design implications can be inferred and reasoned about' (1997:385). Under this concept, scenarios are widely used in (HCI) and information technology (IT) to understand human activity interacting with computer systems. Within those fields it has been acknowledged that the use of scenarios in design process facilitate: (i) evoking reflection in the design process, (ii) managing the fluidity of a design situation, (iii) affording multiple views of an interaction, (iv) helping to generalise, and (v) promoting communication among stakeholders (Caroll, 2002).

To produce realistic scenarios depicting work practices and providing an information tool for the design process, data employed for the design of scenarios is based on contextual enquiry and analysis, demographic or market research, and observations (Grudin and Pruitt, 2002). In the evolution of scenario related methods, Persona Design emerged as an infrastructure for engagement to facilitate communication of data and to provide possibility to illustrate different scenarios of use.

From the interaction design field, Cooper (1999:23) defines personas as 'a precise description of our user and what he wishes to accomplish'. A more detailed definition is provided by Calde, Goodwin & Reimann (2002): 'fictional, detailed archetypical characters that represent distinct groupings of behaviours, goals and motivations observed and identified during the research phase'. Cooper's definition focuses on the motives behind the user's actions and argues that good interaction design has a meaning only in the context of a person actually using it for some purpose (1999:149).

In the broader sense, scenarios facilitates the creation of design representations that are focused on 'use situations'; they can be employed for different purposes: the construction of mock-ups and user interface metaphors, revision of design rationales, usability specifications, evaluation of use cases, etc. However, the widespread HCI's approach on scenario focusing on 'use' aspects does not provide further insights beyond the specific human interaction with computer system activity that it represents. Persona Design provides a design tool that complements HCI's focus on use and activity by addressing 'motives and purpose' in the scenario design process, and thus, provides a platform for discussion of future-use situations of technologies in the context of everyday practices.

Scenarios and design led innovation

As noted by Kyffin and Gardien (2009) innovation no longer relies on technological breakthroughs or incremental product development. In their view, innovation ranks high on management agendas with an increased scope in complexity as it needs to integrate product, services, and users' needs while bringing different stakeholders in the process. The importance of design to a firms' innovation and in particular for the development of new products has been addressed in various studies (Bruce & Bessan, 2002), with an increasingly interest in the use of design thinking for the creation of innovative services. Along these lines Brown (2008) states: thinking like a designer can transform the way you can develop product, services process – and even strategy'. This trend, stimulated by design firms such as

IDEO (Hargadon & Sutton, 1997, Nussbaum, 2004), has repositioned 'design' from downstream manufacturing related activity to one that adds strategic value to business. In understanding such strategic value, various authors have looked at the design practice as a 'construction of alternative futures' (Ehn, 1988). This trend leads to a view of design that is concerned with the social and creative activity that considers multiple futures of unknown complexity (Bucolo and Mathews, 2010).

From this perspective, the use of scenarios in design led innovation processes provides a methodological framework to outline current and future everyday practices, and to deal with the 'construction of alternative futures'. As a design tool, scenarios allow devising alternative futures and thus, overcome the flaws of traditional innovation process which is often seen as being very linear. Traditionally new ideas are prematurely channelled into products and processes that do not necessarily turn the ideas into market successes (Kyffin and Gardien, 2009).

These approaches have been widely document in the literature; however, little is known about the use of scenarios as: (i) a socio-design approach to understand people's everyday practices within social contexts, or (ii) as a method to identify innovative design opportunities and emerging markets. To explore the use of scenarios in design led innovation, two case studies are described: one from a commercial perspective, the second from a design research perspective. The following sections introduce each case and describe the methodological approach employed.

Case study 1: exploring design solutions for new medical services

Bucolo and Mathews (2010) reported a study conducted to explore alternative approaches to the design of health services. MedCo is leading medical device manufacturer and is the current market leader within its sector interested in exploring design services to compliment their product offering, specifically in China and India. The company has a small specialised product offering; however it has significant opportunities to grow within their current and emerging markets. Given MedCo's dominance of the market due to their scientific and technical superiority, the company could be described as a technology led company, with a significant science and engineering development team, and they have also undertaken market research to help guide the development process. MedCo is aware that the likely barriers to growth are similar to the challenges facing many other medical devices manufacturers and that they need to ensure that their product remains accessible and affordable to all.

Stages	Description	Methodologies and Technologies	Outputs
Stage 1	Understanding the social and cultural context	Semi-structured interviews, Persona Design	Multiple Personas with insights from diverse contexts and needs
Stage 2	Moving from Product interactions to temporal experimental journeys	Experiential journey map	Multiple experiences of Personas over life journey Value propositions for new services
Stage 3	Identifying latent user needs for new services	Role paying	Graphical representations Digital service opportunities
Stage 4	Transforming latent user needs into scenarios	Fragmented connections Future scenarios	Narratives for each sub scenario
Stage 5	Communication of results Development of strategy	Video vignette for final deliverable	Video vignettes of new service possibilities

Table 1: summary of case 1 methodology (Bucolo and Mathews, 2010:184)

Table 1 summarises the design exploration approach. Data collection was undertaken over five stages and each stage involved the construction of new materials, and new insights through active engagement with the research team, stakeholders and MedCo.

Stage 1 focused on capturing market intelligence of the proposed market and achieving an increased understanding of the stakeholders and of the contextual information required to inform the creation of future scenarios. Results from stage 1 were conveyed into Persona designs. Stage 2 focused on understanding MedCo product beyond the singular instance of user-product interaction but within a temporal experiential context. These insights were translated into actual stories that convey key specific activities linking potential market end users to MedCo.

Stage 3 focused on identifying latent user needs for new services. Role-playing was employed by the research team as a rapid ideation workshop that led to the identification of latent needs represented in the form of storyboards. Selected latent needs were then transformed into scenarios in Stage 4. This stage focused in identifying 'fragmented connections' in the Personas journeys with MedCo devices/services. The use of scenarios and narratives, not only assisted in communicating ideas to a broader group of MedCo stakeholders, but also generated discussions about the ideas proposed as 'future scenarios'. It did not focus in producing product development type of solutions, but in describing opportunities for potential future MedCo services. Finally, Stage 5 focused on transforming scenarios into media appropriate to deliver concepts emerging from the project and gain acceptance from stakeholders. In this process, the use of scenarios not only was instrumental to communicate final results, but also to develop the design strategy of new service possibilities

This project employed Personas, experiential journey maps, narrative, scenarios and video vignettes to translate customer experiences into ideas and conceptualisations for discussion within the company regarding potential future service development. This process led to more detailed understanding of the context for the service, the end user, and provided a new strategically approach in a company with strong technological knowledge.

Case Study 2: the study of mobile technologies in the context of personal transport journeys

Research is never ending into how these devices can integrate into our daily lives; what the technology is capable of and what it can now do for us. But is the technology advancing faster than our understanding and acceptance of it? Developers have certainly been able to identify and exploit the potential of these devices, but have we given enough consideration to the contexts in which they are used? We now have the power of a PC available in the palm of our hands. So does each different and dynamic context that we use these advanced devices in, have an influence on our use of them? Are we changing our behaviour to integrate this technology into our daily lives? And does design recognise our needs or simply facilitate technology?

In seeking to address these questions a research project was conducted to explore people-technology interactions with fixed and mobile technologies in a public domain. To this end, this study focuses on exploring this topic within the context of public transport (PT). A city's PT network is intended for use by the population at large, for thousands of people this service is essential to their daily activity. Technology implemented in this context is both aimed at making the process more efficient and enhancing the overall experience of the service. However new designs can be perceived as complex and difficult to use. Although the study of public transport is widely reported in the literature, a topic not addressed is about the impact of context on people's use of these technologies. The research question

guiding this study was refined to: What is the experiential context of fixed and mobile technologies in transport journey experiences?

Using field observations, the study explored the interaction between people and technology during PT journey experiences and investigated the context of use of both fixed and mobile technologies while undertaking these activities. It considered people interactions with technologies relevant to the transport journey, for example: ticketing machines, timetable displays and self check-in interfaces. It included the use of advanced mobile devices within these environments, such as personal mobile phones and tablets. Employing video recording and talk-aloud verbal protocol, the objective was to examine the affect of social and experiential context on the use of these technologies. The data analysis employed thematic analysis and was supported with ATLAS.ti qualitative analysis software. The coding of field observations identified a number of emerging themes from the collected data. Field observations were conducted at Brisbane Central Station and Brisbane's International Airport. The methodological approach is summarised in Table 2.

Field observation:	Observation of people's use of mobile technologies in public contexts as part of a public transport experience. Aims: • Identify key aspects of participants' PT journey, activities that are part of it, and interactions with technology • Data collection: visuals and verbal protocol
Participants and resources	• Participants must be an infrequent user or unfamiliar with PT • Equipment: Eye-tracker glasses Tobii and a micro HD spy camera. Participant must bring his/her own a smart phone or iPad.
Instruments	• Design narratives or written scenarios to guide participants • Screening questionnaire to determine participants' familiarity with mobile technologies and use of PT
Task 1	Observing people's use of a hand-held device for way finding in Brisbane CBD. Description: 1. Participant to role-play a prescribed scenario in which the goal is to find his/her way to Central Train Station and purchase a ticket for the next available train to a certain station. 2. Using his/her smart device, participant must: find the train time schedule, find directions to Central Station, use ticket vending machine, and identify the platform location.
Task 2:	Observing people's use of a hand-held device to take a train from Brisbane Airport to the CBD. Description: 1. Participant to role-play an out-of-town passenger arriving to Brisbane Airport. 2. Using his/her smart device, participant must: find the train time schedule, find his/her way to the train station, use ticket vending machine, and identify the correct platform.
Outputs:	• Video recording: (a) from researcher's perspective, (b) from participant's perspective • Verbal protocol: talk aloud during self video recordings

Table 2: summary of case 2 methodology

The methodology employed for field observations has been successfully employed in previous studies aiming to explore experiential knowledge taking place in people's interactions with technologies (Chamorro-Koc et al., 2011). Field observation sessions are organised on a one-on-one basis: participant- researcher. This required participants to be followed during a daily life journey activity in a designated public context-of-use. The researcher follows the participant throughout the activity and the participant is asked to talk aloud while interacting with technological devices. The researcher audio records his or her observations as well.

Participants were briefed before each field observations, and were provided with a specific scenario for the task at hand. Field observations consisted on the researcher following the participant and were video recorded from both the participant and the researcher's point of view. To diminish the intrusive nature of this type of participant observation, the researcher worn a micro HD video camera placed on his/her lapel to capture the surrounding context in which the task was taking place. To capture the participant's interactions with the various technologies interfaces from his eye point of view, an eye-tracker glass device was employed. The video recordings captured not only the images but also the participants' comments (talk-aloud protocol).

Storyboards were produced to help explore and communicate the mobile context and activities of the participants' PT journey experiences, for all observations conducted. Figure 1 shows the storyboard from the pilot test conducted for this study. The conduct of the pilot test allowed for confirmation of the effectiveness of the video recording equipment and to determine the extent to which the method would be able to respond to the research question.
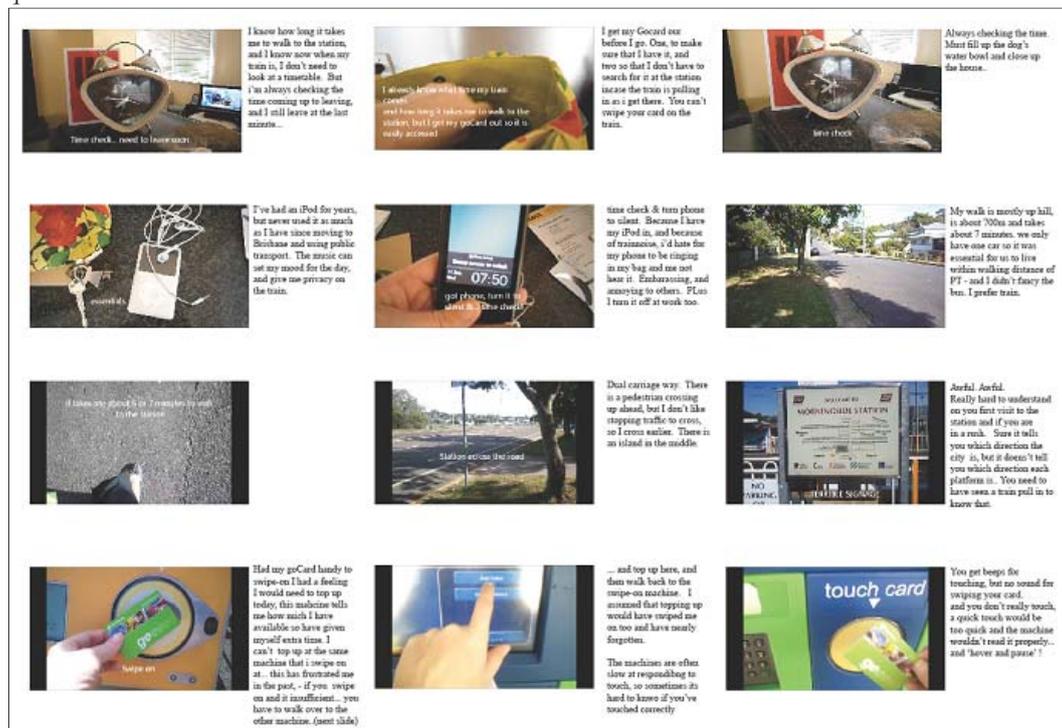

Figure 1: Storyboard for Case 2 (pilot test)

Although participants were not expected to adhere to the scenario exactly, the use of scenarios provided a framework for the observation with relevance to aspects of context of use identified in the existing literature. On average the duration of each scenario was 45 min. An exemplar of the narrative provided in each scenario is provided below.

> *Scenario 1*
> *You are a twenty something year old backpacker. You have just arrived in Australia from the UK. This is your first trip overseas on your own; you are excited but also a bit nervous. Due to trying to save a bit of money you went for the cheaper flight that had a two hour stopover in Brisbane before your final connecting flight to Sydney. You have decided that two hours isn't enough time to leave the airport so you will pass the time here. Your tasks are:*
> * *Confirm your flight departure time, your boarding gate and location.*
> * *When do you need to be there? Where can you find this information? Is the information you need readily available?*
> * *A new mobile app has been launched at the Brisbane Airport. Do you see any information directing you to use the site?*
> * *Try visiting bne.com.au on your mobile device or seek out any available Wi-Fi zone.*

Figure 2 shows images from the researcher's perspective. The images show the instances in which the participant interacted with a technological device while role-playing Scenario 1.

Figure 2: images from the researcher's perspective

From field observations and verbal protocols it was identified an evident connection between context and action issues, where familiarity and prior knowledge are the determinant factors. Familiarity refers to the participant's level of understanding of particular objects and/or interfaces. Prior knowledge refers to the participant's previous experience in similar context situations. The study found that contextual factors are the primary source of reference to inform participants' actions. This is evidenced by the fact that participants' described their interactions with public transport infrastructure and emerging technologies based on context situation or environment. Figure 3 represents the four identified connections: (i) context -> experience, (ii) context -> interface, (iii) context -> knowledge, and (iv) context-> emotional. Such connections explain that people's actions are informed not only by the physical environment or the technology interface, but also by their experience of a 'known' social context and a particular configuration of time and space. This type of experiential knowledge allow people to connect particular contextual information to a decision making process in which they can assess if the situation is 'normal or standard', whether to undertake a passive or active role while waiting or expecting a particular event in the journey experience, or to decide for alternative actions (other routes) for faster or more enjoyable travel experiences.
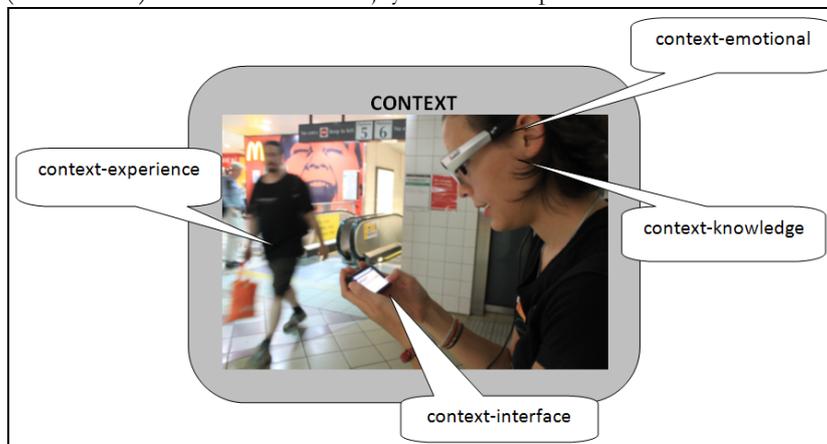

Figure 3: four identified context-action connections

The next step in this ongoing study is to conduct more observations and gather data from different demographics in order to identify different 'patterns' of transport experiences and to reconfirm or expand the context-action connections identified so far. In this study, the use of scenarios as part of the design research process has led to identification of experiential and contextual aspects beyond the 'technical' aspect of people-technologies interactions.

Discussion

From two different perspectives: industry project and design research study, two projects with different aims and similar approaches have been described. In both cases the use of scenarios transcends the 'task-based' approach traditionally employed by Human Computer Interaction and Interaction Design fields. Both case studies describe a methodological approach in which design narratives are employed as an effective tool to explore and identify fine grain detail that is relevant to design projects where technologies affect people's everyday lives.

Scenarios have been instrumental to explore and identify social aspects relevant to design-led innovations. In case 1, scenarios are employed to convey data gathered from the experiential journey of people who are current customers of MedCo services over their lives. This helped reveal 'gaps' in which current services do not meet users' needs. Such gaps were not product related, but related to accessibility aspects of the service due to cultural background and financial issues. In case 2, scenarios are employed as a point of departure for the study participants to frame their actions during field observations. Scenarios in this case, helped participants to guide their decision making process and adopt a state of mind as the activity goals and relevant considerations were clearly stated. In doing so, scenarios were useful to prompt emotional responses from the participants during field observations. Emotions related to boredom or anxiety while waiting, excitement when correctly finding their way around, frustration when unable to find a wireless internet access, emerged naturally during the 'transport journey'. Thus, scenarios have been successfully employed in both projects to understand people's everyday practices in current social contexts.

One evident advantage of this approach is that it does not require a large pool of participants in order to gain a rich level of insights. One of the challenges of this approach is that in order to generalise, an appropriate selection of user representatives must be rigorously identified. Without delving into the specific results of each case study, the main difference that must be highlighted is about the relevance of scenarios to communicate elements of the project or the process itself. As an industry project, case 1 required involving different stakeholders in the communication process, thus scenarios were employed as a strategy to demonstrate and justify results. Differently, as case 2 is located within a Design Research situation, scenarios were employed as an effective communication tool between the design researcher and the participants. The case studies described are compelling in demonstrating the use of scenarios to uncover social practices and identify gaps and opportunities for design innovation.

Conclusion

Personas, experiential journey maps, narrative, scenarios and video vignettes to translate experiences into ideas and conceptualisations for discussion within stakeholders were employed in Case study 1. In its initial stage, Case study 2 has employed scenario narratives and storyboards to formulate scenarios for two purposes: (i) to provide a framework for action to the observation participant, and (ii) to depict current practices.

Case 1 presented the early stages of a research project involving design processes in investigating some potential innovations by a medical device company. There are limits to generalizing from this case but it is argued that the nature of this approach may have application for other medical devices companies who are exploring possibilities in new markets. Case 2 described an ongoing study that focuses on exploring context and

experiential knowledge of people's interactions with technologies in transport journeys. By exploring the social dimension of people interactions with technologies, four context-action connections explaining interconnections between the social context and people decision making have been uncovered.

Through the description and illustration of both case studies, it is hoped that design researchers and industry groups are encouraged to experiment through design tools to help them begin to address the social aspects and challenges of design led innovations. This paper aims to contribute to illustrate how design tools are key players in the process of articulating innovative responses to the needs of the developing world.

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