Digital innovations with inherent uncertainties:

From the justification of value to the articulation of a value proposition

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Dedication

To my beloved parents, Antonis and Maria,

and to my partner in life, Christos

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Declaration

This thesis is submitted to the University of Warwick in support of my application for the degree of Doctor of Philosophy. I certify that the thesis is solely my own work other than where I have clearly indicated that it is the work of others (in which case the extent of any work carried out jointly by me and any other person is clearly identified in it). It has been composed by myself and has not been submitted in any previous application for any degree. However, some of the material in sections 1,2,3,4,5, 6 and 7 has been previously submitted for high quality journals and conferences.

List of peer-reviewed publications

Parts of this thesis have been peer-reviewed and presented at high quality conferences, however, they do not form in itself the material to be examined for the degree.

- Antonopoulou, K., Nandhakumar, J., and Panourgias, N. 2015. "Reconsidering conceptualizations of value in digital innovation: insights into the performativity of a business model", *in* ***Proceedings of the 31st Colloquium of European Group of Organization Studies*** (EGOS - Athens)
- Antonopoulou, K., Nandhakumar, J., and Panourgias, N. 2014. "Value Proposition for digital technology innovations of uncertain market potential", In the ***Proceedings of the 22nd European Conference on Information Systems***, AIS Electronic Library, June 2014, Tel Aviv, Israel
- Antonopoulou, K., Panourgias, N., and Nandhakumar, J. 2013. "Rethinking the value proposition: justifications of value in digital games innovation", *IFIP 8.2 OASIS Workshop, International Conference of Information Systems* (ICIS - Milan)

Abstract

The establishment of business models for digital technology innovations of uncertain market potential is often seen as challenging because of the difficulties in conceptualizing the value of such ventures. There is, however, limited empirical material on how digital entrepreneurs and innovators assess the emerging value of a novel digital technology in practice in the early stages of its development. This thesis, therefore, seeks to investigate how the value of digital innovations with inherent uncertainties about the lack of clearly determined use and addressable markets is justified and how a value proposition is articulated in an emergent way during the design and development process of such innovations, and the implications this has for dealing with the challenges of establishing a business model in such a setting. In particular, I aim to answer: (a) how do the actors involved in the development of digital innovations justify the value of their innovation, (b) how is the value proposition of digital technology innovation with indeterminate use and addressable market arrived at in the development of such innovations, and (c) how does an emergent value proposition contribute to more generally on the theorization and development of business models when there is lack of clear idea of the use and an addressable market. This doctoral research explores these issues through an in-depth study of two 'serious games' development companies that seek to develop digital games for businesses. I argue that through mutual adjustment and reconciliation of different value elements, clarity and stability is brought to the articulation of value proposition, which is crucial to the eventual development and drawing-up of a formal business model. The contributions I make namely are: (a) providing insights into a socioeconomic justification of value for digital innovations (b) conceptualizing how a value proposition is articulated, (c) providing new insights into the relationship between value proposition and business model, and (d) introducing a new theoretical approach to the study of value proposition and business model development drawing from the pragmatics of justification.

Chapter 1: Introduction

1.1 The motivations for the study

1.1.1 The importance of digital innovation

The rapid development and adoption of digital technologies, seen as the combination of "information, computing, communication and connectivity technologies" (Bharadwaj et al. 2013), and their ever increasing incorporation into a growing number of products and services is reshaping organizations, markets, and industries (Yoo et al. 2010, Bharadwaj et al. 2013). Central to this transformation is "digitisation", defined by Yoo et al (2010, p.6) as "the transformation of socio-technical structures that are mediated by digitalized artefacts and relationships". Digital innovation is a distinct form of innovation that results in digital objects that provide often radical new uses for goods, services or procedures. Digital technology products have been associated by Yoo et al (2010) with the particular architecture that imparts to them context-transforming characteristics and which differentiate them from technological innovation. Viewed in this way, digital innovations differ from technological artefacts due to their specific attributes namely; "re-programmability, homogenisation of data and self-referential nature" (Yoo et al. 2010, p.726).

Digital innovations have attracted the attention of several scholars in Information Systems and according to Svahn et al (2009) they bring together insights from technology management literature and IT innovation literature. Over the last decade digital innovations have brought challenges for both the academic community and those participating in innovation processes involving digital technologies. On the one hand, digital innovations are not only technical artefacts and they open up opportunities that "reshape the underlying value propositions" (Yoo et al. 2010, p.6). While on the other hand, it is not anymore clear or predetermined who the users might be and what they might do (Chesbrough & Rosenbloom 2002, Eaton et al 2015) with such digital technologies. As a result, new and often unpredictable

markets are created and existing markets and sectors have been undermined, or their boundaries have become blurred and shifting. Hence, there is an emergent call for interdisciplinary research to address the challenges these novel digital artefacts pose. Some of the topics that confirm the necessity for further research in this direction explore the value of digital innovations and the usefulness for customers (Yoo et al. 2009), the ways in which digital innovations cut across different industries and sectors (Yoo et al. 2012) and the justification of investment in innovation when usage and market cannot be fully known up-front (Chesbrough 2002).

In addition, digital innovations have profound impact across many industry sectors including healthcare, media, tourism, finance, telecommunications and automotive. However, despite the growth in the development and adoption of such context-reconfiguring innovations, those participating in innovation processes involving digital technologies face challenges due to the socio-economic characteristics of digital innovations (Yoo et al. 2010, Eaton et al. 2011). As a result the actors involved the development of such novel digital technologies are struggling to understand and articulate the value of the innovation during the development process (Lyytinen & Damsgaard 2001, Hanseth & Lyytinen, 2010, Tuomi 2002, Van de Ven 2005) while they are also reconfiguring the social and technical environment around the digital innovation. Hence, they are engaged in a strenuous attempt to identify a clear idea of the usage of that technology (Chesbrough & Rosenbllom 2002) along with ways to assess the emerging value of a novel digital technology in practice.

A good timely example is the case of Twitter. It has been widely discussed the 'fuzz' between the business and product team of Twitter to rationalize their revenue model along with their offering to users, advertisers and data partners. According to Jack Dorsey, twitter's co-founder, "what matters most is the user experience. So if the user's experience fails then we have the wrong model" and although this quote is only a snapshot, it exemplifies the uncertainty that surrounds developers of digital innovations and the challenges they face due to the highly re-combinative configurations of social, technical and economic structures in both the

development and use of such (Chesbrough & Rosenbloom 2002) digital technologies. Because of the existing uncertainty, developers increasingly have to probe and sense possible usages and market opportunities through the launching of an innovation. For instance, in the case of Twitter, it has been often recognized that it grew and developed without an explicit business model. At the early stages, it was not possible for the developers to know the potential uses of its technologies and who its users might be (Niccolai 2010). Therefore, this rationale points to the need of new ways to understand how to articulate the value proposition for such digital ventures and it necessitates the development of new insights related to the value of digital innovations.

1.1.2 The evaluation of digital innovations needs further research

Over the last decades, information systems scholars have seen the importance of examining the value of digital innovations. However, digital innovations offer the opportunity for new ways to conceptualise value and the existing views (Kohli & Grover 2008, Bowman & Ambrosini 2000, Chesbrough & Rosenbloom 2002) cannot accommodate the uncertainty involved in the realization of such innovations. Seen in this way, the development of digital technology projects is often characterized by a limited visibility of the values made manifest through the new technologies. Several scholars have shed light on value creation in IS and areas such as business value (Kohli & Grover 2008), value co-creation, or co-production (Gover & Kohli 2012, Sarker et al. 2012). However it is important, on the one hand, to recognize that several studies have been conducted for either the economic or social evaluation of innovations. On the other, the breadth of perspectives in the relevant literature reveals that the controversies between social and economic views of value are not bridged in an attempt to justify the value of digital innovations. With the vague boundaries between developers and users and while both are struggling to make sense of value and use of the digital innovations (Hanseth & Lyytinen 2010, Chesbrough 2012) it has remained unnoticed how is it possible to justify the value of digital innovations in ways that emphasise in the convergence rather than

the separation between economic/finance and non-monetary views of value (Al-Debei & Avison 2010).

Additionally, digital innovations offer the opportunity for new ways to create and deliver value due to their context-transforming characteristics and it is also widely recognised that the value of digital innovations is obscured until their commercialization (Chesbrough & Rosenbloom 2002). In particular, it is not clear how - or what – a novel digital artefact is valuable and this perspective is interrelated with the technical uncertainty and the ways to increase the sources of value (Davamanirajan et al. 2006). Hence, these viewpoints motivate questions of 'how -or what- values emerge from the digital artefacts', 'how is it possible the enrolment of key partners' or 'how the perceptions of value of the actors involved in evaluation processes for digital innovations can be reconciled'.

It is therefore important to mention that the notion of value is itself contested because it is not static but dynamic, it is conceptualized in different ways among the actors involved in evaluation processes and as I mentioned earlier it is not only economic but also non-monetary. Thus far, there is notable lack of discussion on a uniquely socioeconomic justification of value of digital innovations. This is important challenge since a socioeconomic but also dynamic justification of value can have important implications to those who aim to explain the reasons why some digital innovations are thought to be more successful than others. For example, this can provide useful understandings why Facebook is more successful than Twitter and why Twitter has not yet exceeded to expected profitability.

This, in turn, points also to a further challenge for researchers regarding the value creation and capture. Digital innovations literature lacks discussion in the area of value creation and capture and this is a key motivation for this study because the notion of value is central in this context and needs particular attention in cases where there is lack of a clearly defined idea of the usage of that technology and uncertainty regarding the addressable market for a digital innovation.

1.1.3 The importance of value creation and capture

Digital technologies are embedded in products and services (Bharadwaj et al. 2013, Eaton et al. 2015, Orlikowski 2009) and the firms aim to update their logic or practices "for designing and evolving specific organizational arrangements in response to an enterprise's environmental and strategic imperatives" (Sambamurthy & Zmud 2000, p.107). In addition, due to this rapid, on-going, and reflexive transformation of production and use contexts along with the blurred boundaries between the developers and users it is not clear anymore how is it possible to create and capture value. This points to the need for further research to push forward new ways to create and deliver value and the need for new understandings relating to the business models and the development of such innovations (Tripsas 2009, Yoo et al. 2010, Eaton et al. 2015, Al- Debei & Avison 2010, Hedman & Kalling 2003, Chesbrough & Rosenbloom 2002, Chesbrough 2012).

This point to the direction of business models since "business models seek to explain both value creation and capture" (Zott et al. 2011, p. 1020). Although several scholars have provided useful insights to the concept of business model and at the same time it has attracted the interest from across different disciplines (Al Debei & Avison 2010, Zott et al. 2011, Hedman & Kalling 2003), the breadth of perspectives in many different contexts, with different approaches, is creating divergence. The establishment of business models for new ventures more generally has been identified as problematic in past studies due to the "prospective nature" of such ventures, as the reality that the model seeks to describe or represent has yet to become fully visible (Doganova & Eyquem-Renault 2009). Nevertheless, although it is highly acknowledged that the concept of business model is vague (e.g. Magretta 2002, Chesbrough & Rosenbloom 2002, Zott et al. 2011) even though there is profoundly common agreement in these views that the notion of value is central

The development of business models for digital technology innovations is seen also as problematic due to the challenges related to the uncertainty and highly dynamic nature of such innovation (Al-Debei & Avison 2010) making it difficult to assess the market potential and to

establish upfront business models for them. The developers have unclear idea of the use of their novel digital artefact but also limited understanding of the multiplicity of values manifested in the new technologies and they face difficulties to assess the market potential Hence, how the value of such ventures is conceptualized, therefore, is seen as a crucial part of developing business models for such "prospective" ventures (Doganova & Eyquem-Renault, 2009).

Moreover, the developers of digital technology innovations face challenges to establish an upfront business model for them since the development of digital technology innovations is surrounded with uncertainty around the definition of, and relations between, business model components (Hedman & Kalling 2003, Chesbrough 2012). This, in turn, poses additional challenges of how to arrive at a value proposition as a crucial step towards the establishment of a business model and points towards the concept of the value proposition – or offering (Hedman & Kalling 2003, Ramirez 1999, Magretta 2002). Value proposition is often acknowledged as a key element in the conceptualization of value for an innovation and one that is seen as necessary in order to arrive at a business model (Doganova & Eyquem-Renault 2009, Osterwalder & Pigneur 2003, Hedman & Kalling 2003). It has been central to analyses of value co-creation, or co-production, in situations in which the distinctions between the producer and the user of a product, system, or innovation have become increasingly blurred as useful to focus research attention on (Sarker et al. 2012, Kohli & Grover 2008, Vargo et al. 2008, Prahalad & Ramaswamy 2004).

However, there is still a lack of empirical studies on how the value proposition is articulated and integrated with the business model (Osterwalder & Pigneur 2003, Carton et al. 2010). Attempts have been made to develop formal descriptions of value propositions (Osterwalder & Pigneur 2003) through which more explicit links between the conceptualization of value and other components of a business model can be established (Osterwalder & Pigneur 2003, Hedman & Kalling 2003, Carton et al. 2010). Attempts have been made to develop formal descriptions of value propositions (Osterwalder & Pigneur 2003) through which more explicit

links between the conceptualization of value and other components of a business model can be established (Osterwalder & Pigneur 2003, Hedman & Kalling 2003, Carton et al. 2010). Nevertheless, how the envisioning of the value of a future venture and the value creation logic that it will entail is performed by entrepreneurs in practice ahead of any formalization has received less attention (Doganova & Eyquem-Renault 2009).

1.2 Research rationale and objectives

Given the aforementioned motivations, I argue that the justification of value and the articulation of an emerging value proposition that presents convergence rather than the separation between economic/finance and non-monetary views of value is poorly developed at the level of theory, methodology and practice. The present research aims to investigate the justification of value for digital innovations. In particular, I seek to illuminate the justifications of value during the development of digital innovations for which the market potential is difficult to assess and how in such a setting the value proposition is articulated to address the challenges of establishing an up-front business model. This overall rationale leads to my key research question about *how do the actors involved in the development of digital innovations with lack of clearly determined use and market potential justify the value of their innovations as they attempt to articulate a value proposition*. This concern comprises a number of more specific questions which emerge from the review of the existing literature:

(*a*) ***"How do the actors involved in the development of digital innovations justify the value of their innovation?"***

(*b*) ***"How do the actors involved during the development of digital innovations arrive at a value proposition when there are inherent uncertainties about the use and addressable market of such innovations?"***

(c) ***How does an emergent value proposition contribute to more generally on the theorisation and development of business models when there is lack of clear idea of the use and an addressable market?***

These are in brief the questions this dissertation attempts to answer, however, in the next chapter (Chapter 2) I will elaborate on the rationale for each question.

I adopt an interpretive approach (Walsham 2006) in order to understand the interplay of the perceived values between the actors involved in the development process. I do this by focusing on the interplay between the design choices of the features being built into a digital innovation and the unfolding articulation of its value proposition as it is being developed. Moreover, I draw on the literature on the pragmatics of justification and the establishment of 'orders', or 'regimes', of worth through trials of justification (Boltanski & Thévenot 2006, Stark 2011) as a new approach regarding how humans justify their actions through recourse to a multiplicity of values. Through this combination of theoretical approach and in depth qualitative research I seek to bring to the fore the wealth of perceptions of value from the different actors involved throughout the development process. Empirically I focus on the complex system of value justifications, which construct the value proposition for an innovative digital technology and the actions and interpretations of the people who were involved in the innovation process through an in-depth research study of two 'serious games' development studios.

The innovation of 'serious games' which has gained momentum over the last decade as the digital games development community has started to focus on how digital games can be used for more than entertainment (Michael & Chen 2006) in order to train, educate, investigate or advertise (Susi et al. 2007). One of the more general claims is that with 'serious games' users become "active learners" in a virtual environment that simulates reality and can be trained to take risks or find solutions in a non-critical setting. Furthermore, users receive instant feedback on their actions and, as a result, they can gain 'hands-on' experience and enhance their decision-

making skills in a timely and on-going way. Alternatively, employees can be trained to be efficient in the workplace dealing with everyday problems as well as unexpected events.

While the digital games industry is already well established and users enjoy a wide range of games, the continuously growing technical capabilities, quality of computer graphics, and efficiency of games as educational means are thus creating a new segment of the games industry for games with radical uses not limited to providing entertainment. Developers of digital games, however, are seeking to find ways to commercialize 'serious games', and the market potential of such innovations is difficult to assess. The market potential for firms with a focus on serious games, therefore, is not yet fully known, even though the serious games markets are growing with the average annual growth rate for serious game sector is forecast to be 47% between 2010 and 2015 (Michaud 2010).

The contributions of my thesis are valuable for both researchers and practitioners who wish to understand digital innovations and their development and commercialization; in addition to contributing to digital innovation literature. The findings of this study reflect on several contributions on the digital innovation side. I seek to address the literature gap with an understanding of the justification of value for digital innovations with uncertain use and lack of clear market potential. I aim to provide a conceptualisation of the different forms of value that emerge during the development process of digital innovations in a way that economic/financial forms of value and social/non-monetary forms of value are not seen as antithetical. Second, I seek to provide an understanding of how a value proposition is articulated in an emergent way and the process out of which emergent value elements are combined and recombined to bring about an evolving value proposition. Seen in this way, I aim to glean the implications an emergent value proposition has for the business model within highly dynamic and complex conditions where the use, usefulness and market potential are uncertain. Finally my research aims to provide useful insights into a new theoretical approach to the study of justification of value and value proposition drawing from the pragmatics of justification. Along these lines, the

adaptation of pragmatics of justification and the establishment of "orders of worth" will offer a novel theoretical approach to study how the links between multiple values are forged.

1.3 Structure of the thesis

In this chapter I provided an introduction to the background of the topic under investigation and I indicated the motivations that lead to my research questions. The present study is organised into seven chapters and follows the structure detailed below:

Chapter 2: Literature review

This chapter features a review of the relevant literature that highlights the notion of value, value proposition and how these relate to the establishment of business models. I will review the existing literature and I will present this in themes. Moreover, I will discuss some of the key concepts around the pragmatics of justification and 'regimes of worth' proposed by (Boltanski & Thévenot 2006) as a new approach to the growing challenges of studying value in the highly uncertain development of digital technologies.

Chapter 3: Research approach

This chapter illustrates the research design and the methodological aspects for this thesis. The epistemological and ontological foundations will provide the basis for the discussion of how I collected the data together with a summary of the fieldwork conducted and the analytical approaches I used to answer the research questions.

Chapter 4: Case studies

In this chapter I will describe the empirical setting. First, I aim to outline the wider context of digital games industry and then I will elaborate on serious games' industry to provide the appropriate background of the empirical setting. Then, I will describe in detail the case sites of six game projects for the two serious game development companies I investigated.

Chapter 5: Empirical findings and Analysis

This chapter presents the analysis and the empirical findings from my study. Drawing on the empirical account, I will illustrate how I put forward the analysis and I will provide interpretation of the empirical material. Then I will discuss the three analytical themes that emerged during the analysis. Namely: (a) The interplay between the features and the justificatory arrangements, (b) the emerging value elements which condition value configurations, and (c) the articulation of an adaptive value proposition which evolves along the development process.

Chapter 6: Discussion

This chapter is the discussion section of the thesis where I draw upon the analysis to answer my research questions and formulate a conceptualisation of how the actors involved in the development of digital innovation justify the value of their innovation, how a value proposition is articulated when the use and market potential are uncertain and the implications this might have for the development of a business model.

Chapter 7: Implications and conclusions

This final chapter will outline the implications for research and practice. It will further provide the concluding remarks along with a reflection on the limitations, the future plans and the areas for further research.

Chapter 2: Literature Review

2.1 Introduction

This chapter provides a critical overview of the literature relevant to this thesis. My aim is to set the appropriate foundations for the following sections by presenting the core concepts relevant to digital innovations and the innovation process, and then I aim to clarify the notions of 'value' and 'value proposition' which are the centre of my focus. In particular, I begin this chapter by reviewing the existing literature on digital innovation, so as to clearly define the notion of digital technology, and I review the particular characteristics of digital innovation, which differentiate them from 'ordinary' innovation. This will offer the appropriate clarity since my research does not merely focus on the creation or use of an innovative technology, but on a distinct form of innovation that results in digital objects that provide often radical new uses for goods, services or procedures resulting, in turn, in a need to develop new understandings of value, exchange interactions and novel definitions of markets and ways of assessing markets and market potential. In this way, I seek to identify the research challenges and frame the key notions in terms of the aim and scope of this research.

The objective of this chapter is to discuss the theoretical foundations of this study by identifying the theoretical gaps and inconsistencies within different literature streams, namely IS-related literature in strategy, marketing and entrepreneurship. This overall rationale sets the appropriate theoretical background in order to frame the focus of the research on the justification of value during the development process and the articulation of a value proposition for a business model when there are inherent uncertainties about the use and the market potential. In light of this, I provide a more elaborate literature review on three emerging themes. Namely, the themes are: (i) use value and monetary value dimensions, (ii) relationship between the value dimensions and the value proposition, and (iii) the implications of an emergent value proposition on the establishment of a business model. Finally, I present key concepts around the

pragmatics of justification and 'regimes of worth' proposed by Boltanski and Thévenot (2006) as new perspectives on value and as a new theoretical approach to the growing challenges of studying value in the highly uncertain development of digital technologies.

2.1.1 The changing context of digital innovations

The rapid development and adoption of digital technologies, seen as the combination of "information, computing, communication and connectivity technologies" (Bharadwaj et al. 2013), and their ever increasing incorporation into a growing number of products and services is reshaping organisations, markets, and industries (Yoo et al. 2010, Bharadwaj et al. 2013). Digital technologies "embody the uncertain and distributed nature of innovation" (Doganova & Eyquem-Renault 2009). This transformation of prevailing organising logics (Byrd et al. 1992) has been associated by Yoo et al (2010) with the particular architecture of digital technology products which imparts context-transforming characteristics which differentiate them from non-digital innovation (Yoo et al. 2010, Eaton et al. 2011, Tilson et al. 2010).

Central to this transformative potential of digital technologies is "digitalisation", defined by Yoo et al (2010) as "the transformation of socio-technical structures that are mediated by digitalized artefacts and relationships". Viewed in this way, digital innovation is a distinct form of innovation that results in digital objects that provide often radical new uses for goods, services or procedures. Yoo et al (2010) point out that digital innovations are artefacts constituted of a composition of digital and physical characteristics. Namely, the attributes of digital innovations are: "re-programmability, homogenisation and self-reference" (Yoo et al. 2010).

Re-programmability is the attribute that offers discrimination between the operational logic and the realised use of the object by consumers (Yoo et al. 2010). For instance, a computer is able to perform a wide variety of functions: word-processing, browsing the World Wide Web or reproducing music. These functions are digitalised and this digitalisation enables a computer

processor to perform one or all of them. More specifically, the operational logic of a serious game can be the graphical and resource management architecture, which aim to represent a strategy that specifies how a process operates through a system with specific participants and behaviours (Mateas & Wardrip-Fruin 2009). Whilst the realised use of a serious game by the actors is the actual game or platform which includes the various stages of engagement and scenario architecture.

The second characteristic is the "homogenisation of data" and is strongly related to re-programmability. The re-programmability of digital devices leads to the compatibility of the data as the combination of digitalised devices with digitalised data offering a wide range of services, products and information (Yoo et al. 2010). For example, the distribution of music information from a digital device is feasible because the 'music information' is formed into 'digital music' that is compatible with a digital device. As such, some digital devices are able to reproduce or process the digitalised information. For example, a serious game considered as digital content can be displayed and utilised on portable devices such as tablets and smartphones, and also on desktops. Moreover, a serious game containing content such as audio, video and also text can be combined with additional digital data so as to accelerate the usage and services.

The last characteristic is "self-reference", which is defined as the interrelationship of digitalised devices (Yoo et al. 2010). For example, the use of a digital tool for the creation of content presupposes the use of another pre-existing digitalised technology such as a computer. This characteristic also exceeds the existence of direct and indirect network effects. In the case of serious games, the increased use of computers, tablets and mobile phones creates growth in the use of games, serious games and apps.

The combination of "re-programmability, homogenisation and self-reference" (Yoo et al. 2010) that characterises digital innovations results in highly dynamic yet uncertain reconfigurations of the socio-technical structures that surround both the development and use

of such products. Along these lines, the 'equivocal nature' of digital innovations (Berente et al. 2011) points, in turn, to the conceptualisation of digital innovations as distinct forms of technological innovations with indeterminate usage and a need for developers and users to share their common rationale, formulated on their intuition and social interaction (Berente et al. 2011). Often, users are not able to conceptualise the benefits of a digital innovation or exhibit incompatible understanding with those of developers in relation to the perceived use of such innovations. Meanwhile, the developers of digital innovation are constantly attempting to gain visceral insight into what is thought to be valuable to the potential users but also how, as entrepreneurs, they can increase their opportunities (Garud & Giuliani 2013) within a context of socioeconomic aspects.

Moreover, the development of digitalised artefacts is an innovation process that involves a complex system of interactions among stakeholders (Fischer 2000). According to Van de Ven (1999, p.23) the development process of innovation is a "a temporally and episodically structured, highly iterative design and decision process involving the creation, diffusion, blending and implementation of new ideas and knowledge at different stages". This complex system starts being shaped longitudinally over the course of the generation, development, and implementation of a novel idea. Transactions and interactions evolve within this system. A number of conceptual models discuss the stages of this process and the involvement of actors (e.g. Cooper 1993, Tidd & Bessant 2009, Rothwell 1994, Chesbrough 2007).

For some authors the innovation process is very linear (Tidd & Bessant 2009, Rothwell 1994), while they have argued that only internal actors in the company or organisation are involved. However, during the nineties, Rothwell and Zegveld (1985) described the innovation process as non-linear although sequential. Thus Rothwell has also argued that the innovation process is "a complex net of communication paths, both intra-organisational and extra – organizational, linking together the various in-house functions and linking the firm to the broader scientific and technological community and to the marketplace" (Rothwell 1994, p.10).

However, along these lines, little attention has been given to the external actors. Meanwhile, although initially the innovation process was considered as a "technology push" process, and the users were creating a 'need pull' which was the source for the generation of new ideas, Kline and Rosenberg (1986) have highlighted a 'push and pull' sequential process. This growing appreciation of the non-linear and dynamic innovation process has posed to the entrepreneurs the need to create and deliver radical new products and services, due to the increased competition in markets. This has recently led scholars to review their perceptions as to the innovation process, and to recognise it as an opportunity for "blending" different actors (Brown & Duguid 2001) that are internal and external to the company (e.g. Chesbrough 2007, Miles et al. 2005, Ahmed & Shepherd 2010) and who can work collaboratively (Brown & Duguid 2001).

An insightful view of the innovation process comes from Chesbrough (2007) who has defined the notion of open innovation with a model that looks both internally and externally for ideas. In this regard, he has put emphasis on decentralisation to acquire the necessary competencies and to bring together the additional distributed knowledge of the external groups of stakeholders, since a company cannot simply innovate despite the size and the capabilities it has. However, the development process of digital innovations is a complex phenomenon. As I have discussed earlier in this chapter, the nature of digital innovations, often characterised as 'ambivalent' or 'equivocal' (Kallinikos et al. 2013, Berente et al. 2011), and their realisation that is considered as 'incomplete' (Garud et al. 2008) create an ever-increasing ambiguity. This, in turn, points to the multiple and indeterminate uses that the digital innovations often exceed, along with proliferation of opportunities for potential adoptions of such new digital entities with unexpected uses across multiple industrial contexts (Yoo et al. 2012). Therefore, the incompleteness of digital innovations often leads to new and rapidly changing products with uncertain market potential (Garud et al. 2008) and lack of clarity about the use and usefulness of such digital ventures.

Within the different stages of the development process of digital innovations, complex systems of interactions take place along with a constant interplay between the actors involved in such processes and contentions of value. For instance, innovators/developers of digitalised objects endeavour to justify how consumers can use a digital artefact. Innovators of digital objects also attempt to determine unrecognised needs and gain visceral insight into what is valuable for potential users and how they justify the value of a digital innovation. However, despite the growth in the development and incorporation of digital technologies in a growing number of products and services, there has been less discussion in digital innovation literature regarding the contentions of value, the interplay of different perceptions of value and the justifications of value of such novel digital artefacts in relation to established views of value that the notion of digital innovations raises. It is therefore important to understand how a set of values ends-up as a unique value in the form of a price over the course of the process, and how it is possible to create, deliver and capture value in economic and social context, when there are not only inherent uncertainties about the use of the novel digital product or service, but also about the market potential

In addition to the problem of assessing the value of an innovation during the innovation process, which is further complicated by the particular transformative and re-configurative characteristics of digital technologies and the inherent uncertainties about the use and market potential that arise during the development process of digital innovations, the concept of value is itself contested. The notion of value embodies economic and social attributes at the same time. As Dougherty (1992) has pointed out, potential users are not always able to conceive their needs and the set of attributes of innovations, while users' needs possibly change before and after the use of a digitalised product. Moreover, the interplay of understandings of value is a vital criterion for a viable passage from one stage to the next during the innovation process. Within this complex system of interactions the justification of value re-transforms and new actors appear during the process. Hargadon and Douglas have concluded that innovators are challenged to introduce the value of their innovation, by invoking the existing understanding

within the shaped essential and invisible background in which an on-going process of interactions unfolds (Hargadon & Douglas 2001).

The exploration of the interrelation of social and economic notions of value can demonstrate how the conceptualised value for developers interacts with users and other stakeholders, and explain the reason why some digital innovations are thought to be more successful than others. For instance, the possible benefits of a digital innovation can be understood as social benefits for the users, e.g. the "prestige" that an iPhone is thought to offer. On the other hand it can offer economic benefits too, such as the reduction in communication costs through the existence of applications that can be added to an iPhone and offer cheaper communication solutions (FaceTime). It is common knowledge that there are also digital innovations such as WAP and Philips CDI that were designed for the "home of the future" but failed or exhibited disappointing adoption rates despite the promising forecasts that were made in the past (De Marez Lieven & Verleye Gino 2004). Moreover, digital artefacts like the Apple watch or Google glass, which exceed a value proposition different from that of the iPhone or any other smartphone. Meanwhile, right now, none of the Android Wear devices can be compared to Apple Watch in terms of user interface and capabilities[1]. Consequently, this points to a need for new understanding of value in the context of digital innovations since existing views cannot accommodate the uncertainty involved in the realisation of such innovations and a need for new value propositions.

Moreover, due to the aforementioned context transforming characteristics of digital innovations, it is often difficult for innovators to assess their market potential, making it challenging to establish an up-front business model. It has often been considered that the development of digital technology innovations is surrounded with uncertainty about the definition of, and relations between, business model components (Hedman & Kalling 2003,

[1] http://fortune.com/2014/09/09/the-apple-watch-what-the-analysts-are-saying/

Chesbrough 2012), as the developers have limited understanding of the multiplicity of values made manifested in the new technologies, and uncertainty of how to arrive at a value proposition as a crucial step towards the establishment of a business model. This is not only because of the uncertainty regarding the addressable market, but also the lack of a clear up-front idea of the usage of that technology (Chesbrough & Rosenbloom 2002). As a result, the innovators are engaged in a strenuous attempt to manage the uncertainty of a technology development process (Hanseth & Lyytinen 2010, Lyytinen & Damsgaard 2001, Tuomi 2002) and a longitudinal assessment of a continuously and often rapidly changing market potential.

To sum up, the rapid development of digital innovations has revolutionised organisations, markets and infrastructures (Yoo et al. 2010, Tilson at al. 2010b) at a pace that is remarkable (Lyytinen & Rose 2003), although not well understood. This volatility, along with their "equivocal nature" (Berente et al. 2011) and the context-transforming characteristics, contribute to the potential to create value in unexpected ways. In addition, within this context, the actual usage of such novel digital technologies and the potential users remain obscured until the eventual commercialisation (Chesbrough & Rosenbloom 2002). The developers therefore face challenges in discerning how to create and capture value, although they can rapidly develop digital products or services. As a result, they increasingly have to find ways to stimulate value through transient configurations of multiple digital capabilities so as to "construct the future of equivocal technologies" (Berente et al. 2011, p.686). Moreover, digital innovations exceed increasing embeddedness in products and services (Bharadwaj et al. 2013, Orlikowski 2009) resulting, in turn, in new ways to create and deliver value and a need for new insights relating to the role of business models in the development of such innovations (Tripsas 2009, Yoo et al. 2010, Al- Debei & Avison 2010, Hedman & Kalling 2003, Chesbrough & Rosenbloom 2002, Chesbrough 2012), and pointing to a need to develop new understandings of value, exchange interactions and novel definitions of markets and ways of assessing markets and market potential.

In the next section, I critically review the notion of value, values and evaluation, in an attempt to show that although this is a notion that has attracted the interest of many scholars across different streams it still remains under-theorised in terms of digital innovation. In the third section, I extend my focus to use and monetary value dimensions while I aim to explain how I draw inspiration to define and frame the concept of values. In the subsequent section, I continue the literature review based on the second theme that highlights the relation between the notion of value and the value proposition, and then I extend my focus on the implications of an emergent value proposition on the establishment of a business model. Finally, I conclude this chapter with a reflection on the identification of the scope of the thesis.

2.2 Value Dimensions

Following on from the above emphasis on the complex context of digital innovation, it is a fact that the development of digital technology projects are often characterised by a limited visibility of the multiplicity of value made manifest through the new technologies and lack of a clearly defined idea of the usage of that technology, which also creates uncertainty regarding the addressable market for the innovation. To elaborate, within the rapid, on-going, and reflexive transformation of production and use contexts, the value of such innovations can often be obscured until their actual commercialisation (Chesbrough & Rosenbloom 2002, Chesbrough 2012). With both developers and users struggling to make sense of the value and use of the innovations (Hanseth & Lyytinen 2010, Chesbrough 2012), and while, "existing cognitive and cultural perspectives on value have under-theorized the process whereby come to be practiced in organisations" (Gehman et al. 2013), there is a need to further explore the justification of value for digital innovations.

The notion of value is widely used across different contexts and streams of literature and many scholars aim to introduce different notions and categorisations of value, although the most common understanding is that of economic worth and is measured in different currencies.

Therefore, the notion of value sometimes moves away from the single dimension of monetary notion, since the actors can argue about the value they derive (Daft et al. 1987, Weick 1995) and elucidate social perspectives of value. Given the importance of the notions, the use of the word value or values has created long discussions and judgements among scholars while it is often acknowledged that there is lack of a unique socioeconomic definition for value (e.g. Schryen 2010, Barua et al. 2010).

At this point it is important to mention that traditional economic theory argues that "things which have the greatest value in use have frequently little or no value in exchange" (Smith 1776, p.28) . While a large body of literature in classical economics has been published on the concepts of "value in use" and "value in exchange" (Smith 1776, Plato 1892, Sewall 1968), Vargo and Lusch have drawn on this literature to define the 'value in exchange' as the value created by the company and distributed in the market, usually through an exchange of goods and money that is also known in literature as "good – dominant logic" (Vargo & Lusch 2008). Consequently, value often 'expresses the utility' of an object and, on the other hand, the 'power of purchasing' an object over another, but again there is not enough discussion to inform how this value is not seen as either economic/financial or as social/non-monetary, but it can be a coherent portrait of socioeconomic values that are woven together while they transform over time. In addition, most of the research on strategic management argues that by opening up new markets it is crucial to substantiate value by focusing on creating advantages in the user's value rather focusing on competition which is no longer an important factor (Kim & Mauborgne 2005). Taking the point further, Drucker (2001) has concluded, "customers pay only for what is of use to them and gives them value" (p.172), whilst, he has related the notion of value to the utility of the characteristics of a product that users conceptualise, and this is demonstrated by a certain price.

From another traditional point of view, within marketing literature the notion of value has been defined in tandem with the product and as "a promise, a cluster of value expectations"

to the customers (Levitt 1981, p.94). However, the discussion remains underdeveloped regarding how value can be created and delivered when the potential customers and users are not predefined and there is high uncertainty about the use of the product or service along with the market potential. Therefore, as digital innovations are constantly being embedded in organisations, markets and industries, and due to the aforementioned inherent uncertainties, it is crucial to further explore the justification of value of such novel digital technologies since an unsuccessful understanding of their value can invoke failure in the market, or a lack of exceeding the expected economic profitability. This can reflect why some digital innovations have been unsuccessful in the market in terms of profitability and why users have failed to perceive their benefits fully.

To this end, some studies on strategic and operational management contribute to a better understanding of value by defining that the existence of value in goods, services or acts appears when they satisfy a need or produce a tangible or intangible benefit. However, this definition takes for granted the existence of users/customers and the presence of a clear idea about a current need or about the usage of the artefact. Seen in this way, this does not clarify if the value appears as monetary value or as the value that arises from the customers' satisfaction (Haksever et al. 2004, Baier 1969) and puts forward a complex discussion of how the value, in terms of a value provided to users, can distinguish the innovations from the products with the same use and characteristics. Therefore, this, in turn, points to the direction of multiple dimensions of value but lacks discussion regarding the emergence of different forms of value, especially for digital innovations, while it is not clear how the actors involved in evaluation processes justify their perceptions of value for digital innovations.

To understand the manifestation of value in artefacts, several scholars have discussed how the values that emerge from an organisation are adopted by individuals (e.g. Ford et al. 2008, Scott & Davis 2007, Selznic 1957). Although this literature is classic and cannot be disregarded, there is lack of direct discussion about the values of digital innovations which

exceed characteristics that differentiate them from the "ordinary" innovation. In this regard, although the definition of innovation according to Van de Ven (1986) does not exclude technological innovation and digital innovation, the context transforming characteristics of digital innovations challenge the aforementioned traditional views and require an extensive consideration of the fuzzy values that appear during the development process of such novel digital products and services.

In particular, the notion of value is not context-free in the sense that the justification of value enables the enrolment of key partners and entities who often have different or even conflicting understandings of the value of such entities, while the inherent characteristics of digital innovations are not easily preconceived by the different actors such as potential customers or users, and also developers. An indication of the complexity of the phenomenon is that although the existing literature provides useful insights, there is still limited discussion for the emergence of socioeconomic value from the development digital innovations, the dynamic relation of the features of digital innovations and the reconciliation of multiple value perceptions.

Yet, in the social engineering field of political sciences, Popper (1959) has viewed the development and launch of a new technology or product as conducting a "piecemeal social experiment". His approach to "societal uncertainty" has introduced the concealed damaging side-effects that derive from or influence different stakeholders. In order to provide a broader understanding, Popper has attempted to explain that under high degrees of complexity and uncertainty, a social approach is appropriate. A social context can elucidate the reasons why companies may be reluctant to invest in radical innovation. They may find the accumulation of new capabilities difficult and may express unwillingness to give up the old ones because of the societal resistance (Christensen 1997). An alternative perspective has been discussed by Stark (2000) who has argued that values are not quantifiable. Yet, he has also explained that "if values are the inclusion for value that somehow makes calculation possible" (Stark 2000, p.4) and he

has prompted discussion for the need for further research with a focus on a 'plurality of value spheres' and 'evaluation mechanisms'. In this direction, Stark (2000) has drawn attention to the fact that evaluation is a constant process in the market since economic value is not only an economic concept but also 'a notion of social worth'.

Klecun and Cornford (2005) have argued "the scope and content of evaluative activity, as seen in the IS literature, has begun to change. The application of rigorous 'scientific' methods, for example, cost and benefit analysis, or return on investment, have been often questioned, although such questioning has been equally robustly refuted […]. The result has been the emergence of a number of alternative or complementary methods including critical success factors, value analysis, and other 'subjective' multi objective, multi-criteria methods." (p.230). Thus, Land (1999) has argued "the evaluation process is ideally a sociotechnical one. That is, it is an iterative process of involving all classes of stakeholders. Technical and social considerations are equally acceptable. Evaluation is regarded as mutual exploration of the issues, not as a mere recording of technical data. It is considered that evaluation is a political process (Hawgood & Land 1988), and is seen as an arena for fighting for cherished objectives or alternatively for denying other's objectives which are seen as harmful to one's own interests." (p. 5).

My review of the diverse literatures on value reveals that there is also little empirical detail about how a reconciliation of the perceptions of value for a novel digital technology can be achieved in practice between producers/developers and users/customers, which, in turn, highlights the limited attention existing literature gives to how social and use value is negotiated versus economic/financial value. Thus, there is lack of empirical regard of how economic/finance forms of value are linked to social/non-monetary forms of value and their dynamic hierarchical constitution. Moreover, the notion of value can have both dynamic and static meaning and is the result of an evolving process rather than an explanation of a static phenomenon, which can have important implications for the individuals and organisations

(Klecun – Dabrowska & Cornford 2000, Avgerou 1995). For instance, at a certain moment the innovators/developers or potential users/ customers justify the value of a digital innovation with certain attributes. At that single moment the digital innovation has a static value for the innovator/developer or the potential user/customer. The justifications differ or are re-shaped when the engaged stakeholders regard the value of the same novel technological artefact over time, and along with their pervasive nature, as discussed earlier, can create unexpected changes and have direct impact on the underlying business processes. This dynamic process that takes place during the innovation process lacks clarity, especially for digital technology innovations for which there are inherent uncertainties about the lack of clear idea of their usage and their market potential

During the discussion of the aforementioned literature, it is argued that most studies have restricted their focus, and on the one hand economists study the value and claim the economy, while on the other hand economic sociologists study values and focus on the social relations in which the values are embedded (Stark 2000). Several scholars, in order to avoid confusion between the use of the notion of value and values, and to highlight on the existence of multiple values, have presented different typologies for individual values while they argue that individuals prioritise their values to construct value systems (Rokeach 1973, Schwartz 1992). In line with their attempt to conduct considerable research to explore multiple values they have investigated cognitive perspectives on value (e.g. Vessey & Galletta 1991, Taylor 1986, Leidner & Kayworth 2006). However, there is not enough discussion of how the value reshapes over time or how the actors involved in evaluations make common rationales of their conflicting perceptions of value, and how these values are practised in order to demonstrate a coherent offering that does not see economic and social forms of value as antithetical

Therefore, all the above are meanings cannot fully describe value as it is encountered in digital innovations. It is necessary to explain and structure a dynamic theoretical background since, apart from being technological artefacts, digital innovations are also social artefacts that

re-define economic value justifications. For this reason, it is crucial to supplement the research with the views and evidence on value theory presented with use and monetary notions in literature. In the subsequent section I will review the existing literature that highlights the notions of use and monetary value dimensions and appraise how this literature has contributed to the understanding of these notions of value in the context of IS literature.

2.3 Use value and monetary value dimensions for digital innovation

As mentioned in the earlier subsection, apart from the nature of digital innovation, a number of complications occur regarding a twofold view of the notion of value. In particular, the value manifested in the development of a digital innovation is explained and analysed, not only in economic/financial terms, but also in non-monetary terms. Digital innovations offer the opportunity for new ways to create and deliver value since they exhibit characteristics that differentiate them from traditional technological innovation. It is widely recognized that the value of digital innovations is obscured until their commercialization (Chesbrough & Rosenbloom 2002) and a number of complications occur regarding the value of digital innovation raising the question of the need for a new understanding of value since existing views cannot accommodate the uncertainty involved in their realization. In this section, I examine the existing literature and clearly identify the problems in tandem with the use and monetary dimensions of value of digital innovations.

It is a fact that a number of complications occur regarding a twofold view of the notion of value explained and analysed, not only in economic/financial terms, but also in non-monetary terms. This has ramifications regarding the views of value associated with an innovation by its producers/developers and users/customers and how they can be reconciled. Gordijn et al (2000) have described the “tangible” and “intangible assets/resources” that are needed to create and deliver value, and Bonaccorsi et al (2006) have argued that in an attempt to bridge the values of entrepreneurs and those of an open source community, non-monetary such as

motivational factors should be taken into consideration. Again, there is little empirical detail about how this is achieved in practice during the development process and this highlights the limited attention in the existing literature given to how different forms of value emerge and how social and use values are woven together with economic/financial value.

This also echoes some of the concerns found in the value sensitive design literature regarding the taking into account in the design and development of technologies but also innovations, moral and ethical notions of values (Friedman et al, 2013). The value sensitive design literature highlights the relation of value to what one or more people "consider important in life" (Friedman et al, 2013). The key insights here relate to an emphasis on how agreements are reached regarding features of an artefact that are seen as more valuable for certain activities and the highlighting of omitted values. However, the notion of value is still subtle and there is not enough practical discussion in settings where usage is uncertain and the market potential is vague. There is no detailed explanation of how the design choices and features of a product under development relate to different notions of value identified and how such multiple values are interrelated and constantly transform along with the development process.

Furthermore, there are scholars who have considered that the individual and aggregated values are compatible (e.g. Schwartz 1999, Callon 2009). This also reflects some of the concerns by those scholars who have explored cognitive values and who have shed light on different types of value which are not only economic but more abstract. Nevertheless, there is lack of discussion on the transformation of these values, the dynamics between them and there has been given little explanation of how from these values the organisational practices emerge (Gehman et al. 2013). To understand values, some of the aforementioned scholars have discussed how values emerge from a range of actors within an organization but they have stopped short in explanation of how the system of values reshapes when new actors bring new perceptions of value. A key exception comes from the literature related to open systems (Scott &

Davis 2007, Freeman 2010, Greenwood et al. 2010, Amis et al. 2002). Nevertheless, they have not discussed how values emerge longitudinally and particularly in relation to digital innovations for which there is lack of clear idea about their usage that surrounds both developers and users.

Chesbrough and Rosenbloom (2002) have placed emphasis on the implicit value of technology as a way to create value when its market potential is not fully known and also have raised the issue of the multiple dimension of value that emerge from the actors involved in the development process as well as the potential customers. However, they have suggested that a clear value proposition and a targeted market segment will offer to a company the opportunity to discern the appropriate features for the technology. However, it is not clear what – or how – a company can interpret as valuable from the potential customers so as to create a digital technology innovation that will incorporate these multiple perspectives regarding its value, while "technical uncertainty" is also intertwined with the market uncertainty.

Thus, some IS scholars have illustrated the performativity of value (Gehman et al. 2013). An insightful perspective comes from Gehman, Trevino and Garud (2013) who have argued that values explain action and they are embedded in organizations. Additionally, in order to investigate how values are practiced in organizations, how they emerge and they are practiced they have brought forth the notion of value practices as "sayings and doings in organisations that articulate and accomplish what is normatively right or wrong, good or bad for its own sake" (p.84) and they have theorized the inherent process. Although this a very insightful approach it cannot accommodate the uncertainty and messiness intertwined with the distinct form of innovation that results in novel digital artefacts that often provide radical new uses for goods services and procedures while the exceed lack of clear market potential (Gans & Stern 2003). In this direction, Burgelman and Grove (2007) have pointed out that the digital innovations open up new markets where the potential user and customer face challenges to understand the use

value. The innovators/developers are facing difficulties to measure the use value and monetary value of their innovations of novel digital artefacts with the existing traditional approaches.

Meanwhile, the complications that surround digital innovations create ramifications to the scholars who aim to investigate the relation of IT investment and the organizational performance (Chaya & Mitra 1996, Kohli & Groover 2008) since there is lack of clear idea about the performance measures or clear idea of the "path from IT assets to sustainable competitive advantage" (Nevo & Wade 2010, p.163). Thus, the notion of value capture has contributed to understanding the competitive advantage (Bouwman & Ambrosini 2000, Pitelis 2009) and it is of central focus for a firm in order to create business value while it is acknowledged as " the perceived power relationships between buyers and sellers" (Bouwman & Ambrosini 2000, p.1). However, it is still questioned how a firm can capture value and maximize the revenues when the innovators/developers are uncertain about the usage of the artefact and when there is lack of clear idea concerning the market potential as well. However, the existing literature lacks of adequate discussion in tandem with a theoretical perspective that can consider factors from many of the disparate literatures and can shed light on new value perspectives that collectively can provide consistent rationales out of uncertainty.

To sum up, within IS literature 'value' has been discussed in relation to different variables such as productivity (e.g. Brynjolfsoon & Yang 1996, Dedrick et al. 2003), market value (e.g. Brynjolfsson & Hitt 2002, Hitt & Brynjolfsson 1996), financial value (Bharadwaj 2000, Kim & Mauborgne 2005, Mahmood & Mann 2005) but also in terms of social values or the ways value can be derived (e.g. Grover & Kohli 2012, Kohli & Grover 2008, Vargo et al. 2008). Another approach to values is found in the context of IS business model literature since the notion of value is intertwined with the notion of business model and value proposition. For example, Doganova and Eyquem-Renault (2009) see the value proposition as the "passing test" that indicates reconciliation between the vendor and the potential customer and go on to consider

the value proposition in terms of its articulation by different "embedded values" that are woven together and transformed constantly during the development process.

In the subsequent section, I will continue this literature review based on the second emerging theme about the relation between value dimensions and the value proposition. I will focus on the IS literature for business model design and development to explore the relation between the different notions of value and the value proposition. In particular, I aim to explore the existence of a theoretical perspective that takes into account the many and heterogeneous and dynamically interacting aspects of value found in digital innovation in association with the value proposition.

2.4 Value dimensions and the value proposition

It is widely recognised that the literature shows that the notion of value is intertwined with the value proposition since by definition it is related with a valuable offering. Linking this back to the previous sections, the developers of digital technology innovations have limited understanding of the multiplicity of values manifested in such new digital technologies and how to reach a value proposition which is, rather than static, evolving and emergent. Most of the research in the area of IS has claimed that the development of digital innovations is surrounded with uncertainty about the definition of, and the relations between, business model components (e.g. Hedman & Kalling 2003, Chesbrough 2012, Al-Debei & Avison 2010). This section aims to review the existing literature and focus on the challenges of studying value and the articulation of a value proposition.

Within the existing literature the value proposition has been discussed primarily as a component for the constitution of a business model (Pateli & Giaglis 2004, Shafer et al. 2005, Doganova & Eyquem-Renault 2009) and regarding the information systems, scholars have explained and analysed the value proposition as a key element of the business model (Al-Debei

& Avison 2010, Zott et al. 2011, Hedman & Kalling 2003, Shafer et al. 2005, Afuah & Tucci 2000, Osterwalder & Pigneur 2003), associating it with the measure of performance of the "stakeholders, market share, brand, reputation and finance" (Hedman & Kalling 2003). Attempts have been made to develop formal descriptions of value propositions (Osterwalder & Pigneur 2003) through which more explicit links between the conceptualisation of value and other components of a business model can be established (Osterwalder & Pigneur 2003, Hedman & Kalling 2003, Carton et al. 2011). Nevertheless, how the envisioning of the value of a future venture and the value creation logic that it will entail are performed by entrepreneurs in practice, ahead of any formalisation have received less attention (Doganova & Eyqueum-Renault 2009). There is little concurrence, however, regarding what this component is, and little empirical evidence about how it is involved in the constitution of the business model or how this transforms within the development process.

In particular, the value proposition has been broadly referred to as an element for leverage of the economic value of a company (Keen & Qureshi 2006, Kallio et al. 2006) and as being shaped as part of a "profit oriented" business logic (Shafer et al. 2005) on the way to creating value and challenging a company to gain profits through implementing its future plans (Hitt & Brynjolfsson 1996). More specifically, Keen and Querashi (2006) have argued that "value" is one of the central points in the literature of business models, describing it as "value to the company as the goal with that value depending on consumer satisfaction. Cost, market share and price were the main variables of management" (p.5). However, there is lack of discussion on how to articulate a value proposition or how, with uncertain market share, the value offering can be justified. This view tends to see the value proposition as intertwined with the social or use value of an innovation or system. This also echoes some of the concerns found in the value sensitive design literature regarding the taking into account of the design and development of technologies' and innovations' moral and ethical values (Friedman et al. 2013). The value sensitive design literature has highlighted the relation of value to what one or more people "consider important in life" (Friedman et al. 2013). The key insights here relate to an emphasis

on how agreements are reached regarding features of an artefact that are seen as more valuable for certain activities, and the highlighting of omitted values that, it is argued, cannot be disregarded in the articulation of a value proposition.

From another point of view within literature, some scholars have described the value proposition as the value received by the customers and a core component of the business model in the form of a "proposition, which is accepted, rejected or unnoticed by the customers" (Vargo et al. 2008, p.149). From the same perspective, Doganova and Eyquem-Renault (2009) have delineated the value proposition as a "passing test" that indicates the reconciliation between the vendor and the potential customer. Thus, from the same viewpoint, Baden-Fuller and Morgan (2010) have discussed the interrelation that exists between the value of suppliers and that of customers and the overall industry due to the "cognitive and economic dimensionality" that is intertwined with the value proposition. However, this offers the opportunity to investigate and propose a theoretical perspective that considers factors from disparate theories to build upon these foundations, so as to provide a combined socioeconomic understanding of the articulation of an emergent value proposition.

Given the importance of the notion of value and the relation it has to the value proposition, Gordjin and Akkermans (2003) have considered it important to highlight the distinction between value models and process models. They have argued that a value model shows what is exchanged in economic value and by whom, while a process model shows how this process is operationally performed, plus they attempt to elucidate the conceptualisation of a 'sound and clear economic value proposition yet unknown to market'. Although, this has provided useful inspiration for the present study, it does not, however, provide enough discussion about the different forms of value that emerge and why they have conceived the development of a value proposition as a value model distinct to a process model. Thus, they do not provide enough understanding on how different values emerge during the development process of a digital innovation and their dynamic prioritisation along this process.

Antero et al (2013) have suggested that business process and value structures explain the offering and they have referred to a broader "structure of value" and "value configurations" that is produced, delivered and materialised when providing increased quality or reduced cost. However, these points have been made in terms of the resources of the company rather than in terms of the values as they emerge and constantly transform from the actual artefact and its potential uses. Within this context, the 'offering' has been primarily discussed based on quality and cost. In a similar manner, Morris et al (2005) have brought into the debate the multiple forms of value for a product with uncertain nature and usage, and they have highlighted the lack of clarity that exists due to the highly dynamic relation of these values in relation to the overall offering.

To focus on the notion of value I also draw inspiration from Vargo et al (2008), who have combined different forms of value related to service systems, while these service systems are connected by value propositions. They have defined value in terms of "improvement of a system". Therefore, the concept of value creation for digital innovations has become a complex area of consideration and although scholars have scrutinised the concept across marketing, strategy and management literature, it still remains underdeveloped for digital innovations. Literature has attempted to explain and describe how technology emerges and evolves and the process of value creation and co-creation. Developers and users then have to interact to discover value through converting their capabilities into new digital products or services.

With regard to this, the notion of value co-creation or co-production is central, especially in situations in which the distinctions between the producer and the user of a product, system, or innovation have become increasingly blurred (Sarker et al. 2012, Kohli & Grover 2008, Vargo et al. 2008, Prahalad & Ramaswamy 2004). At this point it is important to mention, Norman and Ramirez (1993) whose aim has been to contribute to the discussion of value co-creation and co-production and who have introduced the notion of value configuration as the "value-creating system [itself], within which different economic actors – suppliers,

business partners, allies, and customers – work together to co-produce value. Their key strategic task is the reconfiguration of roles and relationships among this configuration of actors in order to mobilise the creation of value in new forms and in new players. Plus, their underlying strategic goal is to create an ever improving fit between competencies and customers" (p.64). Although, I draw inspiration from these value configurations because linear configurations are not created and the actors involved perfom value activities, however, they do not provide clarity related to the nature of the value or the dynamics between the value that are revealed by the actors.

Since the notion of value is subtle, at this point it would be useful to frame how I conceive this notion of value for the present study in order to avoid confusion between the different concepts of value. I draw on Vargo et al (2008) and their theorisation of 'value in use' and 'value in exchange', which mediate between the developers and the potential customers. Seen in this way, 'value in use' embodies social/non-monetary and also economic/financial notions related to the "improvement of a system" and are proposed as value in exchange to the potential customers. So far, along the lines of Vargo et al (2008), the value in use does not presuppose the existence of value in exchange, but the creation or "co-creation of value is mediated and monitored by value in exchange" (p. 150), and I wish to explain the longitudinal process of emergence of value in relation to the articulation of a value proposition that will not disregard omitted values, but will bring clarity and stability to the constitution of value proposition.

In the subsequent section I aim to continue this literature review based on the third emerging theme regarding the relationship between the value proposition and business model. I seek to explore the existing IS literature of business models that highlights the notion of value proposition and how this relates to the establishment of business models.

2.5 The value proposition for business models

Following on from the above emphasis on the relationship between the value and the value proposition, the notion of value proposition is interrelated with the constitution of a business model. However, overall, little has been written in detail regarding the involvement of the value proposition in the development of business models, particularly in relation to how digital technologies enable new ways of value creation and delivery. In this section I present the third emerging theoretical theme and I continue with the literature review, focusing on how the value proposition relates to the establishment of a business model. Overall, there is a breadth of perspectives in many different contexts, with different approaches creating a divergence of views rather than a common ground (Hedman & Kalling 2003, Al-Debei & Avison 2010, Zott et al. 2011). This has primed research interest in how a greater conceptual coherence regarding what constitutes a business model can be brought about (Hedman & Kalling 2003), and how diverse insights resulting from recent research and studies might be integrated (Al-Debei & Avison 2010). I aim to build on such efforts by focusing on the value proposition, one of the key elements – or components – of business models encountered across many of the diverse perspectives identified in these integrative approaches.

In the existing literature, the importance of the business model has been discussed primarily in relation to what the components of a business model are (Al-Debei & Avison 2010, Hedman & Kalling 2003) and how a business model relates to the creation of value and company performance in the context of e-business (e.g. Shafer et al. 2005, Zott et al. 2011, Dubosson-Torbay et al. 2002, Rappa 2004, Malone et al. 2006, Petrovic et al. 2001). Other studies on marketing and strategy have focused on the role of the business model and its components in relation to competitive advantage (e.g. Teece 2010, Amit & Zott 2001, Chesbrough & Rosenbloom 2002, Carton et al. 2010). Within this context the notion of the business model has been related to value concepts, along with understanding of business logic, or decision making functions. However, for some authors like Magretta et al (2002) the value

proposition has been considered as a part of a "story, it can be used to get everyone in the organization aligned around the kind of value the company wants to create" (p. 8), and as such the value proposition is the way a company creates value for its customers. Thus, for other scholars such as Stähler (2002) the value proposition has been considered as the value a company creates for the involved stakeholders and it has been conceptualised mainly in terms of the price that the customer is willing to pay for a product or service (Dubosson-Torbay et al. 2002).

Another insightful dimension concerning the value proposition and business model is from Al-Debei and Avison (2010), who have described it as an offering which should be included along with the business model and should describe the product or service. They have gone a step further by suggesting that "the business model needs also to describe the value elements incorporated within the offering" (p.367). There is little concurrence, however, regarding what this component is, and little empirical evidence about how it is involved in the constitution of the business model, especially when there is limited discussion about the nature of the value elements and how these emerge from the digital artefact. At this point it is relevant to point out a notable issue that Magretta (2002) and Bouwman (2012) have referenced to value elements. On the one hand, Magretta (2002) has considered the business model components and she has argued that the value elements are one of these, along with the customers and the revenues. On the other hand, Bouwman (2012) has discussed the value elements as a central notion closely connected to the choice of a market segment for the formulation of a value proposition, and he has argued that the value elements consist of a group of aggregating elements of added value for that market segment.

One alternative view comes from Doganova and Eyquem-Renault (2009), who have drawn attention to business models for new ventures more generally, since these have been identified as problematic in past studies due to the "prospective nature" of such ventures, as the reality that the model seeks to describe or represent has yet to become fully visible (Doganova

& Eyquem-Renault 2009). How the value of such ventures has been conceptualised, therefore, has been seen as a crucial part of developing business models for such "prospective" ventures (Doganova & Eyquem-Renault 2009). This, in turn, has pointed towards the concept of the value proposition, – or offering – (Hedman & Kalling 2003, Ramirez 1999, Magretta 2002). In this context they have drawn attention to how the business model helps to explain what value has been created and shared, providing a "synthetic explanation of complex processes and conveying a coherent portrait to an audience" (Doganova & Eyquem-Renault 2009, p.1567). Thus, they have considered the business model as well as its 'building blocks' being articulated longitudinally, although they do not provide enough discussion as to how the different values that emerge from a digital innovation can be used for the articulation of a dynamic but also emergent value proposition.

Moreover, the literature on business models has considered the notion of the value proposition primarily as a component for the constitution of a business model (Pateli & Giaglis 2004, Shafer et al. 2005, Doganova & Eyquem-Renault 2009, Osterwalder & Pigneur 2010, Osterwalder & Pigneur 2003, Al-Debei & Avison 2010 Zott et al. 2011 Hedman & Kalling 2003, Afuah & Tucci 2000, Dubosson-Torbay et al, 2002). The literature on business model ontologies in particular has extensively discussed the notion of value proposition within the context of the Service-Technology-Organisation-Finance (STOF) and CANVAS models (Bouwman et al. 2008, Osterwalder & Pigneur 2010). From the point of view of the STOF model (Bouwman et al. 2008), the value proposition has been described as the added value of a service offering and has been discussed as part of a formalised step-by-step method for developing a business model. Core to the STOF model has been to provide an understanding of critical design issues and critical success factors in an attempt to develop "an approach that combines the design [of a mobile service] with the design of viable and feasible business model" (Bouwman et al. 2010, p.18). Considering the design process needs in conjunction with the business models has provided "an intermediate step [that] helps process designers to model fine grained business processes in a BM-driven way, regardless of the modelling approach" (Bouwman et al. 2012, p.22).

From another angle of the existing literature, that of entrepreneurship, Morris et al (2005) have discussed the value proposition as a value offering in terms of the product and service. Thus, they have argued that the value proposition is always defined and it provides "a justification of the business entity" (p.729) and it is embedded in the business model which is considered as a focusing device while it elucidates the way a company can create value. The concept of value proposition has been considered as an integral part of the business model and has been discussed within a profit oriented logic due to the market opportunities. However, they have drawn a line between business strategy and business process since the focus of a business model is to bring together all the components from which it is constituted, rather than depicting a competitive strategy. Within the same literature Rajala and Watsrelund (2007) have discussed the value proposition as an offering with focus on the level of homogeneity of the offering in relation to the degree of involvement in customer relationships. They have also presented the existence of four types of offering alongside the four types of business model, namely" software tailoring, applied formats, resource provisioning and standard offerings". Within this context the value proposition has been considered either as a typical offering or as a set of modular components. Nevertheless, there is not enough discussion about the nature of the modular components that constitute the offering and they have not explained how such an offering can exceed adaptability to accommodate the uncertainty in relation to their usage and market potential as well.

Bouwman et al (2008) have argued that the value proposition relates to the customer needs targeted by the developers while Faber et al (2004) have described the "added value service offering" and how it enables "value elements". The concept of 'value elements' is central here because it is closely connected to the selection of a target group by the developers and the formulation of a compelling value proposition for that group, aggregating elements of added value offered to them such as fun, efficiency, accuracy, speed, personalisation, trust and so on. Although this approach has described the interdependences of critical design issues and critical success factors and has provided useful insights in relation to expected, perceived, delivered

and intended value for digital services, it has not focused on the actual technological and design choices involved in the development of a digital artefact and how these have been materialised in the artefact, or how this may be done in practice. Bouwman et al (2010) have considered the development of a mobile service along the lines of the design cycle and design stages found in the analysis of the development of specific artefacts in the design science literature (Peffers et al. 2007, Verschuren & Hartog 2005). However, there has been no detailed explanation of how the design choices and features of a product under development relate to different elements of value identified, how such value elements are interrelated within the emergent articulation of a concrete value proposition, and how the prioritisation of such value elements might relate to the sensing and probing of market potential

In the CANVAS model (Osterwalder & Pigneur 2010) the value proposition has been identified as one of the nine 'building blocks' that "describes the bundle of products and services that create value for a specific customer segment" (p.22) so that a company can create qualitative and quantitative value for a customer segment. Although they have argued that the value proposition is a description of the value a company can offer to their customers to "alleviate" their problems, it strongly depends on the assumptions that can be made about potential customers. There is, however, little concurrence regarding how a value proposition is arrived at and little empirical evidence relating to cases of high usage and market uncertainty. However, Osterwalder and Pigneur (2003) have provided "a conceptual approach to modelling value propositions" (p.429) but have not explained and analysed empirically how the technological features that constitute the actual artefact can address different use value aspects through an emergent value proposition. They have, however, called for methods to capture the value proposition which can be a "plug-in tool to business model CANVAS"[2].

To sum up, I have examined the approaches in association with the relationship between business model and value proposition found in the existing literature and how these

[2] http://businessmodelalchemist.com

are challenged by the particular transformative and re-configurative characteristics of digital technology. Understanding the relationship between business model and value proposition is further challenged on account of the inherent uncertainties about the use of a novel digital artefact and the lack of clear market potential. Therefore, it can be seen how the concepts of value underpin existing views of business models are no longer as relevant (Ramirez 1999), while it is undeniable that the aforementioned literature points to a need to explore new ways to create and deliver value and a need for new insights relating to the role of business models in the development of such innovations (Chesbrough & Rosenbloom 2002, Hedman & Kalling 2003, Tripsas 2009, Al Debei & Avison 2010, Yoo et al. 2010, Chesbrough 2012).

In the next section, I aim to review the theoretical approach of Boltanski and Thévenot (2006) in an attempt address the lack of a combined usage and monetary approach to theorise the value in relation to value proposition for a business model, and to develop an alternative perspective that will take into account the many and heterogeneous aspects found in digital technology innovation.

2.6 Orders of worth and new perspectives on value

It is widely recognised that the value of digital innovations is obscured until their commercialisation (Chesbrough & Ronenbloom 2002). The way economists and sociologists have explained and analysed value differs and creates ramifications. It is important, on the one hand, to recognise that several studies have been conducted for either the economic or social evaluation of innovations. On the other hand, the breadth of perspectives in the relevant literature reveals that the controversies between social and economic views of value are not bridged in an attempt to justify the value of digital innovations. Furthermore, in developing justifications, stakeholders involved in innovation have to substantiate their concepts of value in order to "provide consistent rationale" (Patriotta et al. 2011). For this reason, it is important to understand the way different stakeholders involved in the innovation process reshape their

justifications of value in digital innovations as a result of their interactions and the evolution of controversies.

A notable challenge for the theorisation of a value proposition is related to the twofold meaning of value. The value proposition can be seen as both dynamic and static phenomenon. For instance, at a certain moment the developers or potential users justify the value of a digital innovation with certain attributes. At that single moment the digital innovation has a static value for the innovator/developer or the potential user/customer. The justifications differ or are re-shaped when the engaged stakeholders regard the value of the same digital artefact over time (Boltanski & Thévenot 2006, Patriotta et al. 2011). The past–to–future direction of value is a dynamic process that takes place during the innovation process, and the novel justification of value is the result of the interplay of values with the system of stakeholders longitudinally. However, many scholars have argued that the actors do not simply apply technologies. As such the value proposition exceeds a dynamic character which needs further investigation.

So, while the above studies have recognised the value proposition as an important part of trying to arrive at a business model, and also the importance of reconciling multiple views of use value (and also values) and financial value in new ventures and technological innovation, it is Doganova and Eyquem-Renault (2009) who have discussed the articulation of the business model and the value proposition in a new ontological light, analysing it as a longitudinal process in which "people and tools that they use are performing a collective action" (p.1561), in a dynamic relation that creates a trajectory of justifications and transformations.

A key purpose of the value proposition in this study has been to provide adaptability to the business model so that it can perform its function of demonstrating value "in terms of profit, for an investor, or in terms of advantages for a customer or a partner" and thus contribute to the enrolling of key partners by the entrepreneurs (Doganova & Eyquem-Renault 2009, p.1566). In this way it can act as what Chesbrough and Rosenbloom (2002) have referred to as a "focusing device". To explore this 'performative' view of value propositions and by extension value and

value practices (Gehman et al. 2013, Doganova & Eyquem-Renault 2009) I reviewed Gehman, Trivino and Garud (2013), who have accentuated that values explain action and that they are an integral part of organisations. However, they have highlighted the need to explain the longitudinal "process of emergence and performance of value practices in organisations" (p.84). These perspectives have focused on processes of value emergence and co-creation and can contribute to organizational strategies (Gehman et al. 2013) and have pointed to the issue of performativity by demonstrating the process of transforming fragmented forms of value into the configurations required to inform a business model.

These perspectives have provided inspiration to explore the values as they emerge during the development process of digital innovations, and their configurations play a performative role to exploit "the knowledge required to produce and stabilise" (Muniesa et al. 2007, p.5) in order to construct a business model. Thus, the value proposition which is central to the development of the business model, because "it provides a crucial link between the narrative and calculative" aspects of the business model in order to explain how the value of a digital technology innovation is conceptualised during development, and within this context, Doganova and Eyquem Renault (2009) have discussed the business model as a 'market device', which, rather than representation – or depiction – of the financial aspects, instead shapes performance (Doganova & Eyquem-Renault 2009).

Another group of studies conducted by sociologists have attempted to show that value embodies economic and social characteristics. One of the most significant of these is the work of Boltanski and Thévenot (2006) who have demonstrated that economies pose a plurality of inherent values or 'regimes of worth' and the actors act, debate or make decisions associated with their judgements of value creation. At the same time, they have also argued that economic value is a basic part of the 'construction of value' of a digitally based innovation in the process of evolution from the idea to the development and finally the commercialisation. Regimes of worth are a number of logics that are used to measure the value or, in other words, they are thought of

as higher principles that bring forth general concord in case of disrupted institutional arrangements. Patriotta et al (2011), have stated that the "orders of worth are legitimate forms of common good, which provide universal principles of logical coherence as well as justice" (p.6).

In addition to the issues described above, Stark (2000, p.8) has pointed out that "organisational forms are hierarchical not only because they have flattened hierarchy, but also because they are the sites of competing and coexisting value systems". Non-hierarchical organisations are permanently poised to pursue innovation because they are capable of capturing the knowledge and establishing procedures to reshape, recognise, redefine, recombine and redeploy resources for further innovation. These organisations "invest in forms" that allow for reconfiguration and hence minimise the costs of "divestment" or re-organisation (Grabher & Stark 1997).

Alongside this, Stark, referencing White (1976) has explored the relationships that appear as social constructs and has argued that "markets are not simply embedded in social relations but they are social relations" (Start 2000, p.3), thus, he has developed a sociological theory of markets. In organisation science literature, taking this idea a step further, one can pinpoint the tendency to move beyond studies of reactive adaptation to disruptive changes and address the generative processes that drive digitalisation. The organisations that use digital technologies have become increasingly virtualised (Benner 2007) and the individuals interact with digitally-based innovations. The individuals embody relations with the environment which inevitably adds a social dimension to the digital innovations.

The lack of a uniquely socioeconomic justification of value offers the opportunity for researchers to propose a theoretical perspective that considers factors from many of the disparate theories, so that new research can build upon the rich existing foundations. Boltanski and Thévenot (2006) as hinted above, have argued that within the 'construction of value' the value that exhibits economic notion is a basic part, however, it is not seen as incompatible or

antithetical with other multiple regimes of worth that are used to measure value, and can be thought of as principles through which a general concord arrives. Orders of worth result from a common accord between the different regimes of justification of different actors during a certain time (Bergquist et al. 2012). In other words, these regimes can be seen as "tools that may function to manage uncertainties or fragile organizational circumstances associated with the adaptation to new phenomena" (Bergquist et al. 2012, p. 124). Boltanski and Thévenot (2006) have argued that a person can refer to many different regimes and that justification takes place through the combination of different values with different requirements (Bergquist et al. 2012).

In terms of the relevance of this view of value to the research setting being investigated here, existing theories of value assume the existence of a clearly defined market (Dubosson-Torbay et al. 2002, Buellingen & Woerter 2004, Von Hippel, 2009) and, as a result, they have not yet exposed cases in which the innovation has not yet been introduced to the market, or the market does not display the traditional characteristics of supply and demand that can be drawn on for the articulation of value proposition and the development of a business model. The justification of value which has a core role in the development of a business model will not only have monetary, but also social dimensions, and the aggregation of social and economic value is challenging since it is influenced by many factors. The concept of 'regimes' can be a useful tool to analyse ill-defined and competing views of value that appear at the beginning of an innovation process, when there is an idea for the development of a digital innovation and the developers start to struggle with finding a way of articulating a value proposition and developing a business model that evolves longitudinally as new perceptions and relations of value appear, and new actors become involved with new perceptions of value that need to be managed, creating the need to reshape any initial value proposition.

The theoretical approach of Boltanski and Thévenot (2006) has addressed how humans justify their actions through recourse to a multiplicity of values and how those values are

reconciled and ordered so as to make possible the evaluation of different courses of action. In our case this enables us to understand how the many different values that come to bear on the development process are reconciled in order to arrive at a common agreement regarding the value of different features of the digital innovation under development. This, in turn, enables a clearer articulation of the value proposition for the innovation to emerge, and what this is worth in terms of the costs it will entail. Seen in this way, the value proposition is an important discursive device that makes possible the transitioning from a qualitative and imprecise definition of the parameters of a value proposition to more clearly defined and calculable ones.

2.7 Identification of the scope of the thesis

The evaluation of digital technology innovations is widely acknowledged as a complex phenomenon which is still underdeveloped. There is a wide range of studies and promising publications along with the special issue of digital business strategy, from scholars who have contributed to evaluation methodologies. However, there is a notable lack of discussion on a uniquely socioeconomic justification of value of digital innovations. The above perspectives often cannot fully describe the value as it is encountered in digital innovations. It is necessary to explain and structure a dynamic theoretical background since, apart from technological artefacts, digital innovations are also social artefacts that redefine economic value justifications.

As highlighted in section 2.1.1, the existing literature first demonstrates the developers and users are struggling to make sense of value and use of innovations (Hanseth & Lyytinen 2010, Chesbrough 2012). Second, the nature of digital innovations creates complications. It can be explained in economic/finance terms but also in social/non-monetary terms. It also differs among the actors involved in evaluation processes for digital innovations. Most of the debate does not provide answers on how to justify the value of digital innovations for which the market potential is difficult to assess, and how the stakeholders reshape their justifications, since the stakeholders themselves struggle to understand their value because they are reconfiguring the

social and technical environment around them. This rationale leads to my first research question in section 1.2 about how the actors involved in the development of digital innovations justify the value of their innovation.

Moreover, the literature echoes an emergent call for new ways of assessing market potential (Hedman & Kalling 2013, Al-Debei & Avison 2010, Chesbrough 2012) and new business models (Tripsas 2009, Yoo et al. 2010, Hamel 2000). As I highlighted in section 2.4 within this context the value proposition has a central role because it is often considered as a key component of the business model (Pateli & Giaglis 2004, Shafer et al. 2005), or as an element to leverage economic value (Keen & Qureshi 2006, Kallio et al. 2006) or as a variable decision to create competitive advantage (Morris et al. 2005). Others have recognised the value proposition as a passing test that indicates reconciliation between the vendor and potential customer (Doganova & Eyqueum-Renault 2009), or as an offering (Hedman & Kalling 2003). Although there is a range of different perspectives in relation to value proposition which I reviewed in section 2.4, it is widely acknowledged that the notion of value proposition is intertwined with the notion of value. Therefore, the establishment of value propositions for digital technology innovations of uncertain market potential is challenging because it is associated with the difficulties in conceptualising the value of such ventures. Within this context, there is also limited empirical material on how digital entrepreneurs and innovators assess the emerging value of novel digital technology in practice in the early stages of its development. These concerns raise my second research question in section 1.2 about how the actors involved during the development of digital innovations arrive at a value proposition when there are inherent uncertainties about the use and addressable market of such innovations.

Overall, section 2.5 highlights that there is limited discussion regarding the involvement of the value proposition in the development of business models, particularly in relation to how digital technologies enable new ways of value creation and delivery. A key exception comes

from Doganova & Eyquem-Renault (2009), who have discussed the articulation of the business model and the value proposition as a longitudinal process in which "people and tools that they use are performing a collective action" (p.1561) in a dynamic relation that creates a trajectory of justifications and transformations. In this study, a key purpose of the value proposition is to provide adaptability to the business model in order to "demonstrate the value in terms of profit, for an investor, or in terms of advantages, for a customer or a partner" and in the enrolling of key partners by the entrepreneurs (Doganova & Eyquem-Renault 2009, p.1566). However, there are key questions that the existing literature leaves unanswered. For instance; how is it possible to create, deliver and capture value, in economic and social context for digital innovation, when the usage and market cannot be fully known up-front, how does the value proposition enable the enrolment of key partners and entities (Hedman & Kalling 2003), and how are the perceptions of value of the internal and external actors reconciled? This overall rationale encompasses my third research question outlined in section 1.2: How does an emergent value proposition contribute to more generally on the theorisation and development of business models when there is lack of clear idea of the use and an addressable market.

I aim to investigate the justifications of value during the development of digital innovations for which the market potential is difficult to assess, and the possible radical changes in the justification of value because of the changing dynamics between involved stakeholders throughout the innovation process. Moreover, I seek to investigate how these values of a digital innovation with under-determined uses and addressable markets are arrived at in an emergent way during the development process, and how they articulate a value proposition for an evolving and constantly informed business model. I aim to contribute on value and justifications of value for digital innovations literature, and to reflect on new understandings for the articulation of an emerging value proposition that will add to, and elaborate on the way socioeconomic motives can create trials for the development of new business models as the traditional erode (Berente et al. 2007, Tripsas 2009, Yoo et al. 2010).

Empirically, I focus on the interplay between key design choices made during the development of the games, the articulation of the value of these choices, and how these choices are justified in terms of appeals to what and why something might be considered of value to the user, how feasible it may be to achieve, and what impact it might have on costs. In this way I seek to show how an 'order', or 'regime', of worth is arrived at through trials of justification (Boltanski & Thévenot 2006, Stark 2011).

2.8 Summary

In this chapter I highlighted the knowledge gap regarding academic research into a socioeconomic evaluation in digital innovations and presented three themes. Namely, the themes are; (i) use value and monetary value dimensions, (ii) relationship between the value dimensions and the value proposition, and (iii) the implications of an emergent value proposition to the establishment of a business model. In particular, I have attempted to present the 'lacuna of value perspectives' (Gehman et al. 2013) in order to illustrate the gap I have identified in the IS literature. The literature review has demonstrated that it is necessary to explain the value of digital innovations and the trajectories of justification of value during the development process when there is uncertainty about the usage of the digital artefact and lack of clear market potential. Moreover, the notion of value is intertwined with those of the value proposition, and since the existing literature does not provide enough discussion in relation to the discursive aspects of the value proposition and how the value of a digital technology innovation is conceptualised during development process, my literature review has shown the need to provide a new understanding concerning the articulation of a value proposition for a business model.

As well as positioning the study in this way, the literature will be drawn on during the theorisation of this study, depending on the themes that emerge from the data. In the next chapter, I will present in detail the way in which the aforementioned theoretical concerns will

be used for the design of my research, and how they influenced the collection and analysis of the necessary empirical material

Chapter 3: Research Approach

3.1 Introduction

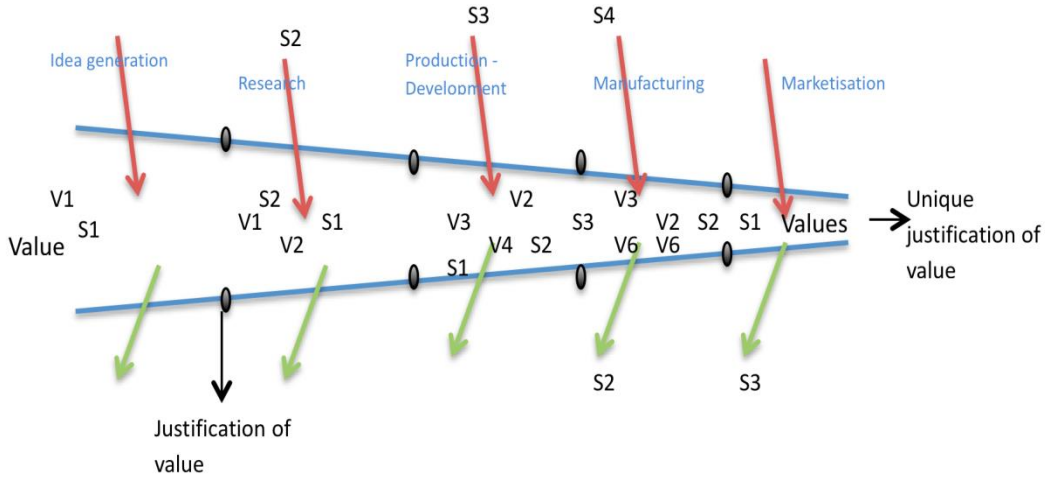
This section provides the research design and methodological aspects for the present research project and I am to explain how this empirical study was carried out systematically. The epistemological and ontological foundations of the research will provide the basis for the discussion on methodology including the data collection and data analysis techniques. In particular, I will describe the reasons this methodological foundations were appropriate for my research and I will reflect on the weaknesses of longitudinal research approaches to explain how I attempted to avoid the pitfalls of a superficial analysis in such a setting. Last, I will highlight the theoretical concepts of Boltanski and Thévenot (2006) which were presented in section 2.6 and I will explain how I draw on them as the appropriate sensitising concepts (Nicolini 2009, Walsham 1995) for the analysis of the empirical material.

3.2 Research Design

In the previous chapter (Chapter 2), I reviewed a number of the literatures considered in relation to the research setting and I highlighted the theoretical concerns that underpin my research. Now I will outline the research design taking into consideration the research aim. Hence, given my aim to investigate how digital entrepreneurs and innovators assess the emerging value of a novel digital technology with inherent uncertainties about their indeterminate use and lack of market potential and how they arrive at a value proposition in such a highly uncertain context. Taking into consideration the aim of the study and the relation of digital innovations with serious games, I used serious games as a case of digitalised innovations and within the next chapter I will explain in detail the reasons serious games are considered a good example of digital innovations. I sought to investigate the different

understandings of value by taking into account the digital innovations process and the involved actors together with the possible radical changes of the justifications of value along with the articulation of a value proposition. In view of the aim and scope of the research outlined above, the following section provides the research design of how I conducted a empirical study and addresses the methodological aspects of the collection and processing of the empirical data necessary to answer my research questions.

The figure below (Figure 3.1) depicts the channel of the innovation process. It is a traditional representation of the innovation process according to Tidd and Bessant (2009). The innovation process within different streams of literature has been widely recognised as an evolutionary process and a number of models have been developed to shed light on the stages and the actors involved. Some of the scholars have focused on the entrepreneurs (Schumpeter 1954) or mainly on the process and the stages of this like the "Stage Gate Model" (Cooper 1993). Some other scholars have explained that the innovation process is an internal very linear process (Tidd & Bessant 2009, Rothwell 1994) while recently an alternative view has come from scholars who have described the innovation process as a process where internal and external stakeholders are involved (Chesbrough 2007, Miles et al. 2005, Ahmed & Shepherd 2010). However, the figure below (Figure 3.1) does not aim to demonstrate the exact stages of innovation process, but to depict that during the process different actors who are internal and external to the company were expected to be involved and interplay. I aim to show my focus at tracing the different actors, their notions of value of a digital innovation along the innovation process and their attempts to articulate a value proposition. For example, at the beginning of this process it was anticipated the existence of an idea for a novel digital product and an ambivalent general perception of the value for this product. At this stage the concept of value was expected vague; over time new actors were awaited to appear and different perceptions of value would unfold and re-transform in order to end up in a unique value with economic and social characteristics.



V1, V2, V3, V4, V5, V6…; Different perceptions of value

S1, S2, S3, S4…; Different Actors

; Development Process

; The Different Actors (internal and external to the company) that interact

Figure 3.1: Research scheme.

To make sense of the phases of the development, the process is considered in continuous time without discrete points separating the passage from one phase to the next since multiple justifications of value take place, even at each stage. The dynamic and constantly rising perceptions of the actors involved in the process shape trials of negotiations and decisions which can be recursively constituted.

Further to explaining my research design and taking into consideration the aforementioned discussion of the development process, the actors involved were expected to be

both internal and external to the development company. During the innovation process the actors were anticipated to constantly interact and attempt to identify and articulate the value elements of the innovation that would embody multiple notions, not only economic but also social At key stages of the process a common justification of value would be needed to be achieved and then this justification would be possibly re-shaped as a result of further interactions. At the end of this process a unique justification was expected to be arrived at in terms of a price for the innovation.

In order to achieve the aim of my study I traced and elucidated the controversies of understandings and justification for diverse natures of value that arose in the relevant to the development process through social and economic lenses. Since not much is known about the justification of value of digital innovations in a dynamic and uncertain socio-economic context, it was important to follow the development process in order to achieve the aforementioned aim of this study.

Actors were regarded as a key part of the system within which the process of digital innovation began and evolved. The channel of actors was considered to interact or shape the process of digital innovations through an evolving procedure of justification of value of the digital innovation. The actors who were considered to be involved in this evolving procedure would be identified by tracing this process. To do this in practice, my research design focused on starting with the justifications of value set out by developers and designers of a digital innovation. By tracing their evolving concepts I encountered more actors whose justifications of value in the digital innovation interplay with the initial concepts of the developers creating controversial perceptions of value and justifications of value throughout the process. According to the aforementioned literature, the economic and social aspects of a digital artefact are inherently intertwined with justification of value and they were taken into consideration during my data collection and analysis.

The challenge for the proposed research is that the justification of value has both dynamic and static meaning and is the result of an evolving process rather than an explanation of a static phenomenon. For instance, at a certain moment the innovators or potential users were expected to justify the value of a digital innovation with certain attributes. At that single moment the digital innovation would have a static value for the innovator or the potential user. Later the justifications would differ or would be re-shaped when the engaged actors would regard the value of the same digital artefact over time (Boltanski & Thévenot 2006, Patriotta et al. 2011). Potential users are often involved in the development process and their perceptions of value of the novel digital artefact "have an input into the value creation that occurs" (Vargo et al. 2008, p.146) throughout the process. The past–to–future direction of value was considered as a dynamic process that takes place during the innovation process and the novel justification of value is the result of the interplay of values with the system of actors longitudinally.

In the following section I elaborate more on the epistemological position I adopted, thus I will contrast it with other approaches to explain the reasons it was deemed appropriate for phenomenon under exploration.

3.3 Epistemological position

Epistemology is concerned with the assumptions made about "the nature of human knowledge and understanding that can possibly be acquired through different types of inquiry and alternative methods of investigation" (Hirschheim et al. 1995, p.20). Orlikowski and Baroudi (1991) have suggested three epistemological approaches of studying information systems phenomena, namely positivist, interpretive and critical research stances. Given in my interest in providing answers on how the actors involved in the development of digital innovations justify the value of such innovations and how they arrive at a value proposition when there are inherent uncertainties about the use and the potential market potential and while some kind of social reality is presumed, an interpretive research approach is deemed

appropriate. I start from the position that the notion of value and therefore those of the justification of value are a social construction created by different actors and their interpretations. Within such an agenda the value judgments and decisions can be made and are inter-subjectively assessed, at the same time and I seek to provide answers on how that reality is constructed out of a plurality of actors. Hence, considering the nature of the aim of this research which is dynamic and must be recursively constituted, even if that may be over long temporal frames I argue that an interpretive epistemology taken from IS research angle is the most appropriate (Hirschheim & Smithson 1987, Walsham 1993, Orlikowski & Baroudi 1991). In the next section I elaborate more on interpretivism, the reasons that make it appropriate to adopt an interpretive research approach and how this shaped the way I pursued my research.

3.3.1 Interpretivism

In the Philosophy of Science, Interpretivism or Social Constructionism (Easterby-Smith et al. 2012, Klein & Myers 1999, Chen & Hirschheim 2004) is the epistemological stance that assumes that the "knowledge of reality, including the domain of human action, is a social construction by human actors" (Walsham 2006, p.320) and as such social phenomena must be understood within the social context they have been produced so as to allow the inclusion of the interpretations of the actors as for their performance or actions. Information Systems scholars widely adopt interpretivism (Orlikowski & Baroudi 1991, Klein & Myers 1999, Walsham 1995, Chen & Hirschheim 2004) and according to Walsham (1993) it is a useful epistemological entry point for studying the influence and impact between information systems and their context and vice versa. Thus, it considered appropriate stance to ask questions that will "generate descriptions, insights, and explanations of events so that the system of interpretations and meaning, and the structuring and organizing processes, are revealed" (Gioia & Pitre 1990, p.588) in a way that the 'world' is rather than pre-existent and pre-determined but it is socially constructed by the meanings and interpretations of actors (Pinch & Bijker 1987).

The motivation for the use of interpretivism comes from a key tenet of this "epistemological position, concerned with approaches to the understanding of reality and asserting that all such knowledge is necessarily a social construction and thus subjective" (Walsham 1993, p.5). Hence, by adopting this approach I gained a profound understanding of the phenomenon from the participants' perspective, (Orlikowski & Baroudi 1991, Walsham 1995) and I gained in-depth understanding of the complex phenomenon (Orlikowski & Baroudi 1991) under investigation. In addition to this, Orlikowski and Baroudi (1991) have argued 'interpretive studies' seek "a relativistic, albeit shared, understanding of phenomenon through accessing the meanings that the participants assign to them."(p.5).

Moreover, my theoretical approach based on the pragmatics of justification and regimes of worth literature (Boltanski & Thévenot 2006, Stark 2011, Patriotta et al. 2011) presumes some kind of social reality within which value judgments and decisions can be made and inter-subjectively assessed. At the same time, this implies that reality is socially and recursively constituted. Hence, this makes necessary the adoption of an interpretive approach because it emphasizes on "the importance of subjective meanings and socio-political as well as symbolic action in the processes through which humans construct and reconstruct their reality" (Orlikowski & Baroudi 1991, p.13). Moreover, the justifications of value of digital innovations incorporate both social and technical aspects that are interrelated and my aim is to investigate these aspects within the context they are embedded so as to understand their role in the innovation process and the organizational evolution (Orlikowski & Baroudi 1991) and it is a key epistemological entry point for studying how different notions of value are reconciled during the development of a novel digital technology and how through this process humans justify their actions to arrive at a value proposition.

To sum up, as an interpretive researcher, I espoused the assumption that the social world is constructed and the social reality is constituted by the meanings the actors attach to their actions (Easterby-Smith et al. 2012). Using the interpretive approach I conducted an

interpretive research starting from the position that the justifications of value are a "social construction" created by different actors and as a "neutral" observer biased only by my academic background and without predetermined variables or hypothesis, I aimed to become involved uninfluenced, gain deep knowledge of the phenomenon and the reasons behind the actions of the actors which in turn result in their multiple interpretations (Walsham 2006). This required access to the actors involved in the phenomenon to gather verbal descriptions of activities, behaviours and events and to seek further explanations in cases where there was either lack of understanding or 'nods, silences, humour and naughty nuances' (Altheide & Johnson 1994, p.297) that may carried ambivalent meanings.

Last, as an interpretive researcher I adopted reflexive practices to reach profound understanding of the meanings of the informants while I was aware of the deficiencies of interpretivism as discussed by Orlikowski and Baroudi (1991). Namely, the weaknesses of interpretivism are; lack of examination of "the conditions, often external, which give rise to certain meanings and experiences" (p.18), lack of explanations of "the intended consequences of action, which by definition cannot be explained by reference to the intentions of the humans concerned" (p.18), and lack of insight to the "structural conflicts within society and organizations, [and ignores] conditions which may be endemic to social systems., and lack of explanation of the "historical change; that is, how a particular social order came to be what it is, and how it is likely to vary over time" (p.18). Since I was aware of the aforementioned weaknesses of an interpretive approach, I took into consideration aspects and recommendations from interpretive studies (e.g. Walsham 1995, Nandhakumar & Jones 1997, Brown et al. 2008) to adopt the appropriate methods to conduct this empirical study, therefore, to address the methodological aspects of the data collection and analysis of the empirical data to address all the deficiencies in advance.

In the following section I review the interpretive methodologies widely used in the information systems design field, which I drew upon for the present research.

3.4 Interpretive in-depth case study research

Within interpretive research there is a wide range of methodologies and case study methodology is widely used in the information systems field (Orlikowski & Baroudi 1991). A case study approach is deemed appropriate for the aim of scope of my research because I aim to be observer rather than participant in the setting I aim to explore. And gain exhaustive understanding of the interpretations of the actors.

To elaborate, Benbasat et al (1987) argue that "a case study examines a phenomenon in its natural setting, employing multiple methods of data collection to gather information from one or a few entities" (p.370). A case study research is deemed applicable when the researcher lacks of predefined knowledge of the proposition, the hypothesis and the 'variables of interest' and has the goal to examine multiple entities by high degree investigation of each unit without involving any manipulation (Benbasat et al. 1987, Kaplan 1986, Yin 2014). Moreover the lack of initial knowledge of the variables is accompanied with lack of clarity as for the measures.

The adoption of a case study research is more appropriate than other methods for the data collection for the present study because it allows an "investigation to retain the holistic and meaningful characteristics of real-life events, such as organisational and managerial processes" (Yin 1994, p.3). The case study research is more appropriate than other methods because it offers a 'thick description' (Miles & Huberman 1994) which would be otherwise omitted since the phenomenon of justification of value cannot be quantified in a comprehensive way that can explain the process through which the different values are woven together. Consequently, due to the aim of the study to seek to investigate the fragmented notions of value, the complexity of value justification, the actions and the interpretations of the people who are involved. into the context of the development of digital technology innovations for which the use and market potential are uncertain, the phenomenon of interest presents 'exploratory nature' (Kaplan 1986, Yin 2014) and requires to be investigated within the real life context and with focus on the

evolving events; I empirically captured the aforementioned aspects through an in-depth study of two 'serious games' development companies.

I carried out an in-depth case study (Walsham 1993) because of the 'exploratory nature' (Kaplan 1986, Yin 2014) of the phenomenon under investigation. An in-depth case study is the appropriate empirical method to obtain detailed information about the interpretations of the actors involved (Walsham 1995) in the development process of a novel digital artefact. Moreover, my research requires longitudinal analysis and as such an in depth case study has been conducted "over a reasonably long period with the opportunity to directly observe the unfolding events over time" (Walsham 1993, p.14) to capture and gain detailed accounts of the longitudinal process within which the interpretations of the actors have appeared and have been justified. Moreover, the in-depth case study has been "often supplemented by detailed historical reconstruction of earlier periods" (Walsham 1993, p.14). As a consequence, through an in-depth case study approach I captured high level of detail longitudinal data to investigate this complex phenomenon for which there is limited existing knowledge.

One important concern for the present study relates to the levels of objectivity I could reach since a "longitudinal research is often supplemented by detailed historical reconstruction of earlier periods" (Walsham 1993, p.14). It is common in process studies to face serious weaknesses, as the actors involved in such processes do not recognise the importance of an incident or decision. Moreover, the actors involved in longitudinal phenomena, ex post, may be biased or misinterpret events or actions because they are biased from the outcomes. To address this retrospective bias problem, I decided to involve two companies of 'serious games' since "evidence from multiple cases is often considered more compelling (Yin 1994, p. 45) and the exploration of similar challenges within two cases is "strengthening the precision, the validity and stability of the findings," according to Miles and Huberman (1994, p. 29) and therefore the use of multiple sites can "ensure that the findings would be grounded in the empirical evidence" (Scarbrough et al. 2014, p.202). Moreover, to eliminate this deficiency of a retrospective study I

involved supplementary material (Van de Ven & Huber 1990). Therefore, I collected historical data and documents from both companies, such as research reports, conference papers and presentations, commercial reports. Moreover, I collected financial statements published material such as articles on press release, and other documents such as customers' feedback forms and blog-posts. In this way, I was able to explore contemporary cases where the past experiences have played important role in current decisions and actions of the actors involved.

In the subsequent section I aim to present the data collection approach I used to obtain rich data for the phenomenon under investigation.

3.5 Data collections approach

While an in-depth case study approach (Walsham 1993) has formed the appropriate foundations of the methodological approach of my research, the field study involved conducting semi-structured interviews, together with collection of documents and historical data on the phenomenon (c.f. Walsham 1995, Nandhakumar & Jones 1997). In the next section, I will describe in detail the data collection methods I used.

3.5.1 Interviewing

In this research, I employed semi-structured in order to obtain significant amounts of information that could potentially disclose new information and meanings (Nandhakumar & Jones 1997). Interviews is the most appropriate way to explore the understandings of humans (Fontana & Frey 1994) and the meanings that are obtained is relevant to the level of the structure of the interviews. More specifically, I decided to conduct semi-structured interviews so as to reach high degree of knowledge and meanings of actors (Nandhakumar & Jones 1997) involved in the development process. As far as my decision between structured and structured interviews, I am referring to Fontana and Frey (1994, p.56) who argue "the former aims at capturing precise data of a codable nature in order to explain behaviour within pre-established

categories, whereas the latter is used in an attempt to understand the complex behaviour of members of society without imposing any prior categorisation that may limit the field of inquiry".

The interview questions mainly focused on issues such as: 'how did they start development for each product?', 'Who were involved throughout the development process? What were their justifications for each design choice?', 'What were the responses from stakeholders? What were the major challenges?'. Appendix 1 presents the guide of semi-structured interviews I included to the interviews to direct the discussion drawing up in advance the areas of discussion (Rubin & Rubin 1995). The list of interviewees counts all the members of the companies and since the direct interview of external to the company actors was particular difficult and not highly significant since the external actors were involved in the process to provide their input/expertise concerning a specific issue such as the best practices to extinguish a fire in a household. However, these insights were interpreted by the developers so as to find the best ways to adjoin this information to the game. I argue that there was not needed further investigation of the external actors since the developers are responsible for the final decisions and for the reconciliation of the different perspectives. Seen in this way, I consider important to focus on an in-depth investigation of the interpretation of the developers as for the perceptions of the external actors to trace the manifestation of value elements associated with the design features. Taking into account this limitation/challenge I paid particular attention during the empirical analysis to differentiate whether a statement from an actor reflects his own perceptions or his interpretation over an external actors' perception.

Interviews took place between October 2012 and February 2014 and I conducted 26 structured and semi-structured interviews (6 structured and 20 semi-structured) with 21 individuals in both companies including, founders, designers, programmers, software engineers, software artists, project leaders, non-academic content experts and academic experts. The interviews lasted on average around 45mins and were voice recorded and transcribed. Finally, I

ended the formal part of the interviews at the point I noticed that a "point of diminishing returns, when nothing new is being added" and data saturation was reached, as Bowen (2008, p.140) argues.

3.5.2 Archival material

As I have briefly mentioned earlier, for this research I also collected archival material for both companies, which include documents "made or received and accumulated by a person or organization in the course of the conduct of affairs and preserved because of their continuing value" (Franks 1993, p.342). More specifically, I collected historical data and documents from the companies, such as research reports, conference papers and presentations, commercial reports, financial statements. Moreover, I collected published material such as articles on press release concerning the company, their games and their business strategy and vision and other documents such as customers' feedback forms and blog-posts. Throughout my field study, I also had several informal conversations with participants and several email exchanges to inform my cases.

3.5.3 Observations

I also decided to make observations (Kaplan & Maxwell 2005) to supplement the interviews and the archival material and to enhance the quality of evidence available providing direct evidence of the phenomenon under consideration. However, I had the opportunity to do observations only in the U.K based company. During each visit to the second company (Orora), based in U.K, I was able to spent time observing the developing process making handwritten field notes during or soon after the observations. My data from the fieldwork observations yield detailed descriptions and capture the context within the observations were made (Patton 2002). As I result, I had the opportunity to further supplement my data with field notes totalling 8543 words.

3.6 Data collection process

Preliminary data collection began in October 2012 when I started communicating with development studios of serious games so as to gain deeper insight of the industry. I had the opportunity to contact with developers at national and international level and I spoke to a number of people from various companies. I exchanged several emails with entrepreneurs, I started a group discussion on the LinkedIn but I also contacted with the Serious Games Institute in Singapore and U.S while I visited and attended presentations of the Serious Games Institute in U.K.

The process of gaining access was very challenging and time consuming. Most of the studios are start-ups that are not willing to cooperate with researchers because they either believe that they will reveal the future plans and sensitive data or they consider that the researcher would create disruption of their employees. At the same time, I was aiming to gain the type of access that would allow me to reach sufficient knowledge and meanings of the participants to various actions, decisions so as to develop their perceptions (Nandhakumar & Jones 1997). Furthermore, because of the aim of my research, to unfold the perceptions of value of the actors involved in the development of serious games that are expected to be both internal and external to the development company, the process of gaining access become more challenging. I spent time to establish a trust relationship and I motivated them to support my research by participating in a project related to market research. Moreover, I offered them the opportunity to sign confidentiality agreements. The appendix 5 demonstrates the letter I used to approach the companies for the fieldwork and provides the details I gave to the companies as far as the aim of the study and the confidentiality of the obtained information.

In the subsequent section I present the context in macro (industry context) and micro level (organisation level).

3.7 Data collection sites

I aim to develop a conceptualisation with respect to my research question through the analysis of an empirical study that aims to the justifications of value and the articulation of the value proposition for digital innovation when there are inherent uncertainties about the actual use of the artefact and the market potential. Hence at this point it is important provide details about the empirical context of serious games. My aim is to explain thoroughly the reasons I consider serious games as a good example of digital innovations and as I briefly mentioned earlier the reasons serious games are seen as an appropriate case to study in order to explore the phenomenon under investigation. Finally, I will describe the organisations' context, while, I will explain the criteria for this case site selection.

3.7.1 Industry Context

An important case of digital innovation with under determined use and lack of clear market potential relates to 'Serious Games'. The growing adoption of serious games and the proliferation of digital technologies which incorporate them have led to a reshaping of organisations and markets. Companies involved in the development of such innovative digital products face major challenges to make a clear understanding of the use and usefulness of their games and their effectiveness. On the other hand prospective customers and users, in turn, struggle to understand their contribution. Their scepticism has as a starting point the definition or identity of these innovative digital products since they cannot be easily convinced about the contribution of a 'game' to more serious purposes such as training or education.

To begin with, serious games are used in this study as a case of a digital innovation because they exhibit the kind of characteristics that distinguish a digital innovation from non-digital technological innovation (Yoo et al. 2010, Eaton et al. 2011, Tilson et al. 2010, Sørensen et al. 2005). To elaborate, the first attribute of digital innovations; 're-programmability' offers a distinction between the operational logic and the realized use of the object by consumers (Yoo

et al. 2010). In terms of serious games, the operational logic is seen as the graphical and resource management architecture, which aim to represent a strategy that specifies how a process operates through a system with specific participants and behaviours (Mateas & Wardrip-Fruin 2009). Whilst the realized use of a serious game, by the actors, is the actual game or platform, which includes the various stages of engagement and scenario architecture. The second characteristic of digital innovations, 'homogenisation of data', is seen in serious games as the capability to use the serious game along a number of devices such as a computer, an iPad or a mobile phone. All the content of a game such as audio, video, text, and image is formed into digital content and can be accessible across different digital devices. Last the characteristic named as 'self reference' is related to the compatibility of digital devices which implies that the use of a digital tool for the creation of content presupposes the use of another pre-existing digital technology. For example the use of haptics and virtual reality head mounted displays presupposes the use of another digital device such as a computer or a game console.

Furthermore, serious games change the environment around them by creating a new market, which, however, is uncertain in terms of established profitable business logics. For many authors such as Young (2010), 'serious games' have failed to attain the expected levels of success and profitability, despite the growing technical capabilities and realistic setting they provide. In this context, the development process of serious games is seen as the innovation process which is "temporally and episodically structured, highly iterative design and decision process involving the creation, diffusion, blending and implementation of new ideas and knowledge at different stages" (Van de Ven 1999, p.23) and it involves tight budget constraints and high risk on the way they operate (Tschang 2007). Finally, the benefits that developers introduce to potential users on the one hand and the constraints of users on the other, offer an intriguing example of a digital innovation for which the managers struggle to discern the value proposition and establish a pre-determined business model and as a result they are in a constant attempt to reduce the uncertainty that surrounds them and to create and capture value for their firm with.

My research, therefore, will focus on serious games used for training and decision making purposes; some of them have already been commercialised while some others are on the process of commercialisation and this offers the opportunity to trace the entire development process. In the next section, I will describe in detail the data collection sites with details for the reasons they are deemed an appropriate case to study in light of the aims and scope of the study.

3.7.2 Case sites

The study was conducted at two different serious games companies, one based in Canada (QueGames – a pseudonym) and the other in the UK (Orora – a pseudonym). Following on from the above the selection of cases was motivated by several factors, for example: both companies exhibited the characteristics which I sought to investigate in that they were digital technology innovations (serious games) without a well-understood usage and market. The developers/innovators faced challenges to articulate their value proposition and constitute their business model. Thus, they were also struggling to commercialize their digital products and they were constantly attempting to define the market, as described earlier. Last, the companies exhibited contrasting characteristics in terms of size, complexity and country contexts (Table 3.1), and the market segments that were in their focus to address their products. For example, Orora's products were highly priced (e.g. some of the games were sold for £500,000) targeted at profitable industrial sectors, whereas products from QueGames were mainly targeted at public organizations for improving the quality of human life. These two cases therefore provided ideal sites for exploring broadly similar challenges across different case contexts (Majchrzak et al. 2012).

3.7.2.1 QueGames

QueGames (a pseudonym) is relatively new, founded in 2012, representing innovative digital technology developers. At the time of the study QueGames had a small team of 5

employees (including the founders) in their Canadian office. They are developing interactive, multiplatform games mainly targeted at training and education of fire safety. The following table (Table 3.1) presents the team members I interviewed and their position in QueGames.

QueGames	
Name	Position
Josh	Graphic designer and artist
Nick	Software engineer
Andy	Project manager
Alex	Designer, artist and animator
Peter	Programmer

Table 3.1: Interviewees of QueGames.

During the period of my fieldwork, QueGames was mainly targeting at the development of games with their main aim that of training and education of fire safety. Different scenarios with specific learning goals constituted the games. For example, one of the games begins in a virtual setting of a common kitchen in a house and the player takes part in the game in first person and is represented as an avatar. The player has to extinguish an unexpected fire in the kitchen by making a decision concerning the "tool" to use or the "way" to achieve the desired outcome. The reactions of the player receive immediate feedback since the decisions of the player increase or decrease his score.

The data I obtained concern the development process of three games namely: 'Fire', 'Recycle' and 'Diabetes' (pseudonyms). Thus, in QueGames I conducted 10 semi-structured interviews that lasted around 7 hours from October 2012 until January 2013. All the interviews

with the members of QueGames took place through Skype. I also exchanged around 20 emails, I collected historical data and documents such as research reports, conference papers and presentations, commercial reports, financial statements. Moreover, I collected published material such as articles on press release concerning the company, their games and their business strategy and vision and other documents such as customers' feedback forms and blog-posts. I also had several informal conversations with participants that lasted approximately 2 hours.

3.7.2.2 Orora

Orora (a pseudonym) is also relatively new start-up, founded in 2012, with main focus on the development of business applications based on serious games applications for companies in diverse industrial sectors. Orora is based in U.K and has two divisions, one in USA and one in Singapore and they have overall 26 employees. The following table (Table 3.2) illustrates the team members I interviewed and their position in Orora.

Orora	
Name	Position
Alf	Graphic designer and artist
Allan	Software engineer
Chris	Project manager
Eddy	Business Development Director
Helen	Technical Software Developer
Sven	Technical Software Developer
Lu	Programmer
Simon	Graphic designer and artist
Ian	Technical Designer
Leo	Designer
Liz	Style artist
Mary	Artist
Peter	Programmer
Richard	Lead game designer
Sandy	Sales director
Tony	CEO

Table 3.2: Interviewees of Orora.

When I pursued fieldwork Orora the member of the company were focused on designing novel "bespoke" solutions to new customers, and modifying exiting products targeting at

customers in different industrial sectors. For example, a game developed by Orora offered a virtual 'human' representation (avatar) of an interactive tourist guide, which was initially designed for tourism industry to promote and enhance a visitor's experience in tourist attractions. This avatar had capabilities to interact with the users through their mobile phones or tablets while the game incorporates augmented reality in order to offer the user a virtual tour guide by scanning the QR codes located in various areas around the attractions. This concept was further enhanced and modified to suit new customers in healthcare and automotive industries.

The data I obtained concern the development process of three games namely: 'Virtual Tour Guide', 'Car Insight' and 'Real Driver' (pseudonyms). In Orora, from March 2013 until February 2014, I conducted 16 semi-structured interviews that lasted around 12 hours. I also exchanged around 50 emails and again I collected historical data and documents such as research reports, conference papers and presentations, commercial reports, financial statements for Orora. Additionally, I collected published material such as articles on press release concerning the company, their games and their business strategy and vision and other documents such as customers' feedback forms and blog-posts. I also had several informal conversations with participants that lasted approximately 6 hours. I was also able to spent time observing the developing process making handwritten and detailed field notes during or soon after the observations and I participated in a market research for the company. This was a very good opportunity for me to observe the way the members of Orora were attempting to articulate their value proposition for each industrial sector they were aiming to focus on.

3.7.3 Summary of fieldwork data

Data collection took place between October 2012 and February 2014 and I conducted 26 semi-structured interviews with 21 individuals in both companies including, founders, designers, programmers, software engineers, software artists, project leaders, technical

software developers, graphic designers and artists, style artists, project managers, business development directors and CEOs and founders. The interviews with the members of QueGames all took place through Skype whereas those with the members of Orora took place face to face. The interviews lasted on average around 45mins and were voice recorded and transcribed. Following on from the previous section, the interview questions mainly focused on issues such as: 'how did they start development for each product?' 'who were involved throughout the development process?', 'what were their justifications for each design choice?', 'what were the responses from stakeholders?', 'what were the major challenges?', 'how was their value proposition constructed?'. The Appendix 2 provides a detailed list of the guide I used for the interviews in both companies. In addition to formal interviews I also had several informal conversations with participants and several email exchanges.

During each visit to Orora I was able to spent time observing the developing process making handwritten and detailed field notes during or soon after the observations. During the process of my data collection I had to interview more than once some of the participants. The past–to–future direction of the trajectory of evaluations which was a dynamic process that took place during the innovation process and the novel justifications of value is the result of the interplay of values with the system of the involved actors longitudinally. Although it would have been interesting to understand the perceptions of all the actors involved in the process, it was not practically possible. Some actors who involved in the development of the projects had left the company. Moreover, some of the external actors were involved in the process to provide their input/expertise concerning a specific issue such as the best practices to extinguish a fire in a household but these insights were interpreted by the developers so as to find the best ways to adjoin this information to the game. In order to eliminate this limitation I relied on other data sources such as documents that contained customers' feedback.

Another important point to mention is that all the games were different and the companies displayed some difference: (a) in the development process, and (b)their set up as

noted in Table 3.3, they shared a number of important norms and practices and the differences between the case sites was not the focus of the research. However although I acknowledge the aforementioned differences between the companies, the focus of this research is to identify similarities in the justification of value during the development process of digital innovations with under-determined use and market potential and how the actors involved in such justifications arrive at a value proposition rather than to compare the case sites and the practices across these cases (Langley 1999, Monteiro et al. 2012).

Finally, the case studies were also informed by supplementary material and Appendix 4 includes the list of the supplementary material I used. Thus, another very useful aspect during my fieldwork is that I had the opportunity to actually participate in a project related to market research. I had the chance, on the one hand, to follow their perceptions, practices and methods to assess the market in local, national and international level but also on the other hand the opportunity to observe their perceptions concerning their offering as they were attempting to communicate with potential customers. I ended the formal part of the field study when I found that the interviewees were repeating themselves and I was not exploring new data.

Pseudonyms	QueGames	Orora
Organization	Canada-based, multiplatform serious games, simulations and training applications, 5 employees/founders	U.K-based and 2 divisions in USA and Singapore, multiplatform serious games, applications, virtual environments and data presentation software, 28 employees
Market Segmentation	Public services	Automotive, healthcare, corporate training, retail, tourism, military sector, aerospace and education
Interviews	10 interviews, approx. 7 hours in-depth interviews, 20 email exchanges and 2hours approx. informal conversations	16 interviews, aprox.12 hours in-depth interviews, observations, 50 email exchanges, 6 hours approx. informal conversations and participation in

		research for the market potential
Documentation	Research documents, published material on press for the team, commercial reports, games and business, photos, commercial reports, conference papers and presentations, blog posts.	Research documents, financial reports published material on press for the team, games and business, commercial reports, conference papers and presentations, meeting notes, customers' feedback forms, blog posts.

Table 3.3: Summary of the data collection.

3.8 Data Analysis

At the beginning of the analysis I initiated a preliminary stage of data processing. The raw data were in different forms as text, e-mails, voice records and I transformed them into textual format this was time consuming and extensive due to the transcription of the interviews. Moreover, I classified in terms of the sequence of the events and as Latour (1999) has argued this is a key analytical entry point for the temporal organisation of the events. The data had to be coalesced as for their significant relation to the core research questions in order to remain focused (Lincoln & Guba 1985, Patton 2002).

For the data analysis first, I identified the sequential order of the key events throughout the development process of each project and across each site (e.g. involvement of new actors or actions and effects). I sought to relate this initial analysis of the transcriptions to the material from the observations and the collected documents (interview transcripts, observation notes, documents and the other material from the field study) while I was focused on the constant recurrence of the local development practices. Hence, I draw upon a 'practice based approach' (Levina & Vaast 2005, Schatzki et al. 2001) to recognize "the importance of practices in the on going operations of organizations" (Feldman & Orlikowski 2011, p.1240). I used spread sheets to display all the extracts of text relating to design choices and justifications of their values throughout the development sequence. I related the trajectory of design choices for particular

features with justifications associated with these design choices. This involved identifying and highlighting extracts relating to the design choices as for the features of each game. The design choices were related to the purpose and content of the game, the budget constraints and the technical capabilities that either pre-existing or were under consideration for further investment. I categorised in sequential order for each design choice the interactions, conflicts, agreements, discords that have conditioned justifications of each design choice. This process was very puzzling and I iterated several times between the data and the actual analysis to ensure "display and conclusion drawing/verification" (Miles et al. 2013, p.14). Then, I grouped the passages under the justificatory arrangement for each feature, and I sought to code them in terms of value elements (Figure 3.2). For this initial stage I focussed on issues such as 'what was the first feature?', 'why this feature was used?', 'what was the next design choice?' and 'why z choice was not first?'(Antonopoulou et al. 2014).

For the next stage of the coding process I focused on the recognition of first order categories (cf Okhuysen & Bechky 2009) based on the identification of value elements. "Value elements" are considered in relation the relevant literature about the different forms of value and I was looking for value elements that ascribe economic and social aspects and which are "considered important to explain action in and around organizations" (Gehman et al. 2010, p.2012). For this initial stage I focussed on issues such as 'why is a feature valuable?', 'how is it going to be useful/ valuable?', and 'why this design choice is more valuable than another?'.

When I pursued to the next stage of the analysis I recognized the importance to categorize the value elements into two groupings: the users' value elements and the developers' value elements. The users' value elements emerged as justified values related to design choices that add value to potential customers/ users; and the developers' value elements emerged again as mutual agreements associated with the values of each design choice for the development of the actual artefact. At this point I paid particular attention to discern whether the value elements was product of the interpretation of the developers or their interpretation based on

the perceptions of the external actors. Therefore, this was reflecting the importance of each category at each stage and was demonstrating the difference between facts and interpretations. This was been highly useful and had at least two implications. It offered a representation of the relation of each design choice with both groupings, which were interrelated, and it also depicted the transformation of value elements. For instance, value elements that at the beginning had been related to the developers then had been related to both or only the customers/users. I mainly focused on issues such as: Why is a feature valuable? How is it going to be of useful/ valuable? Who is going to be benefitted?

Finally, the analysis of focused on the integration of first order categories (value elements) into higher order themes (Figure 3.2) where the value elements of each company were transformed to articulate a value configuration which conditions the value proposition. I induced themes (Scarbrough et al. 2014) drawing on Boltanski and Thévenot (2006). I drew upon the justificatory regimes as sensitising concepts (Nicolini 2009, Walsham 1995) to develop the common rational of the value elements emerged from the first order categories to identify second order themes. My intention was to understand the mutual adjustment and reconciliation between value elements, orders of worth, value configurations and value propositions. I was able to identify six major clusters: Quality, Functional, Market, Industrial, Civic and Performance. Under Quality I grouped the value elements in relation to the conformance of the design choices, under Functional those associated with the set of objectives for which the actual artefact is developed and under Market, the value elements that encompass economic/ monetary value. In addition, under the Industrial I clustered the value elements emerged in relation to added productivity or efficiency the product is to offer whereas under the Civic all the value elements in terms of social influence and under the Performance the value elements associated with the pre-existing architecture or connectivity. I recognised that the aforementioned higher order themes are appropriate for all the data I had obtained and I did not identify the need to develop different categories for each game. While this part of the analysis was unfolding I considered critical to 'member check' (Lincoln & Guba 1985) the

analysis and as such I presented and explained the decisions to my supervisors to enhance the trustworthiness of my analysis (Holloway & Wheeler 2013). I used a 'unit of meaning' (Miles & Huberman 1993, p.56) for each cluster with the meaning I have already discussed so as to provide a clear idea and my supervisors critically commented upon the analysis and the interpretations and we have made sure the consistency of the coding after multiple iterations. The following figure (Figure 3.2) summarizes the key stages of coding and analysis of the empirical material. The first two columns of the figure below map onto the interplay between the features and the justificatory arrangements while the third and fourth column map onto the emerging value elements, which condition value configurations. Last, the final column demonstrates the articulation of an adaptive value proposition which evolves along the development process.

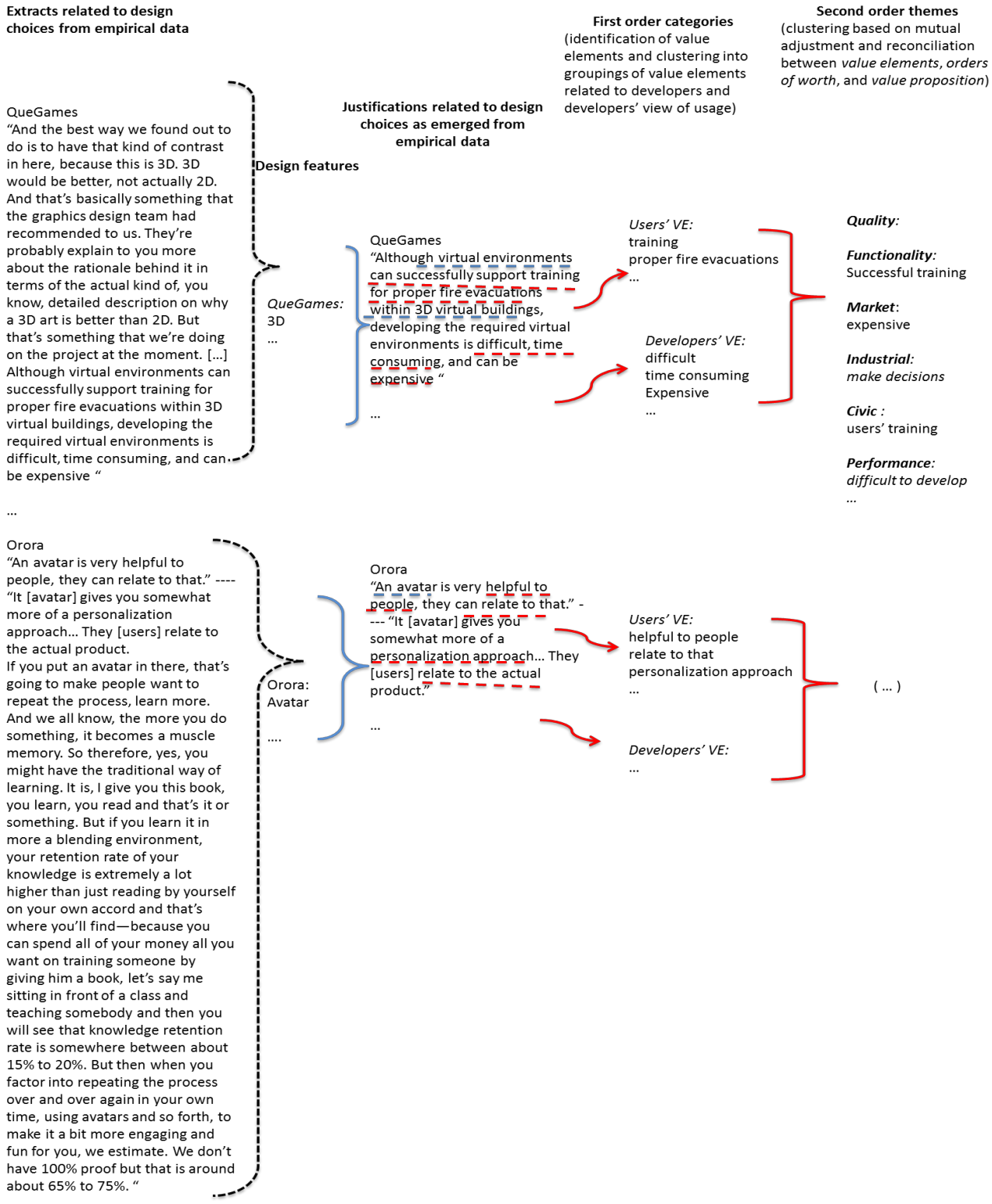


Figure 3.2: Example of the coding of the empirical material.

In the next sub-section, I will drew upon the pragmatics of justification of Boltanski and Thévenot (2006) to explain how they were applicable as the appropriate sensitising concepts

for this study and hence, their contribution to develop common rationale and discern how different value elements condition the articulation of an adaptive value proposition

3.8.1 Illustrating sensitising concepts and data analysis

In this section I explain the purpose of using sensitising concepts and the way I drew on them to my data. The sensitising concepts are seen as 'interpretive devices' (Glaser 1978, Padgett 2004, Bowen 2006) for qualitative research. Blumer (1954) explains the difference between definitive and sensitising concepts. He has argued that a "definitive concept refers precisely to what is common to a class of objects, by the aid of a clear definition in terms of attributes or fixed bench marks. [. . .]. A sensitising concept lacks such specification of attributes or bench marks and consequently it does not enable the user to move directly to the instance and its relevant content. Instead, it gives the user a general sense of reference and guidance in approaching empirical instances. Whereas definitive concepts provide prescriptions of what to see, sensitising concepts merely suggest directions along which to look" (Blumer 1954, p.7).

I drew upon sensitising concepts to induce themes during the research process for the analysis of the data and more specifically I analysed inductively the first order categories by means of thematic codes. At this point the framework set out by Boltanski and Thévenot (2006) served as the coherent principles of evaluation, which advanced the analysis by bringing together different fragmented forms of value. More specifically, I drew on the 'common worlds' as the coding system to classify the value elements of the first order categories. At this stage, I drew on the coding process of Patriotta et al (2011) and I developed semantic descriptions as 'units of meaning' (Miles & Huberman 1994, p.56). I grouped under this clusters the value elements associated to these descriptions. However, I identified value elements that were not related to these descriptions and these allowed me to identify new clusters. I gave clear descriptions to the new clusters and then my supervisors revised these clusters and their distinctive aspects, they checked the consistency of the coding and finally the 'robustness and

reliability of the interpretations' (Patriotta et al. 2011, p.1816).

The pragmatics of justification are seen as a key epistemological entry point for building my analysis of how multiple value elements emerge and how they are reconciled during development while they are woven together. I viewed that the multiple value elements are better understood as organized by different regimes while I "constitute a constructive vocabulary that generate practices (and practicing)" (Nicolini 2009, p.1391). Moreover, relating this to the interpretive underpinnings of this study and my focus in processes through which humans construct and reconstruct their reality. Therefore, some kind of social reality is presumed within which value judgments and decisions can be made and inter-subjectively assessed, at the same time, how that reality is constructed out of a plurality of actors is central Furthermore, it is also a dynamic and must be recursively constituted, even if that may be over long temporal frames. The orders of worth are "discursive resources and as such they are subject to interpretive flexibility" (Patriotta et al. 2011, p.1831) and their application as sensitising concepts provide the opportunity to formulate theory.

Following on from the above discussion, the following sub-section will offer an extensive description of the theoretical framework set out by Boltanski and Thévenot in "On justifications – Economies of worth".

3.8.2 Summary of key theoretical concepts

In section 2.6 I reviewed Boltanski and Thévenot's framework (2006), thus, in this section I provide a summary of the aforementioned key theoretical concepts which I drew upon and built on as the sensitising concepts of my research on the empirical material In order to identify the factors that shape the worthiness of digital innovations I examine the six regimes of worth framed by Boltanski and Thévenot as most closely allied with the justification of value as a socio-economic term. Inspired, Domestic, Fame, Market, Industrial and Civil are the regimes

already mentioned. Drawing from their framework, I provide a definition and an example of these regimes.

To begin with, the '*inspired regime*' of worth is the approach through which new theories are shaped and knowledge is generated by new ideas. For example, the innovation of the mobile ticket is an artefact that introduces an alternative way of buying a ticket for the cinema, theatre or means of transportation. This innovation can change the traditional way of buying a ticket thus causing change to the known market and knowledge and theories can be formed through the inspired regime of worth. Moreover, the *'domestic regime'* of worth is the approach related to families, kinship groups and in friendship relations. Digital innovations are evaluated according to the hierarchical relations that are created among users. In the example of m-ticketing one of the hierarchical relations that can be observed is the power that the firms which offer their customers the opportunity to buy a ticket via their mobile, gain against the companies who sell tickets in more traditional ways.

The third regime of worth, *'fame'*, is the approach that can be identified in literature as the "follow the crowd" approach which implies that the reputation of a company is of major importance. A new product introduced by a firm that is thought by customers to be generally reliable and innovative in general has major possibilities of success because of the fame of the company. '*Market regime'* of worth is the approach related to the value that the "market" puts on objects according to the desires the object can satisfy. In the m-ticket example, a number of different desires can be satisfied via the simplification of the process of buying a ticket. One does not need to stand in a queue or even use the internet to purchase a ticket; all it takes is a simple mobile phone text message.

In the *'industrial regime'* of worth, digital innovations are valued as a mean of production. This regime of worth is linked to the efficiency of beings, their performance, their productivity and their capacity to ensure normal operations respond usefully to needs. In the m-ticketing example productivity is augmented via the requirement for fewer cashiers or

inspectors. Last but not least, *'civil regime'* of worth is the approach that relates the value of the objects with the degree they serve a common collective good. This approach in the example of the mobile ticket augments the community's public service as passengers can buy a ticket easily and are less likely to substitute public transport with other means of transportation because they cannot buy a ticket (lack of cash or time).

Moreover, these authors seek to provide an integrated framework for understanding the relations between "agreement and discard" as well as develop a model that "accounts for the confrontation with circumstances, with a specific reality that accounts for the involvement of human beings and objects in a given action" (Boltanski & Thévenot 2006). They argue that a person can refer to any and all the different 'worth' as explained above. The value systems are not always linked to the members of a solitary community but a person, throughout their life, can also respect the values without the existence of ethical precepts. Thévenot and Boltanski identify six worlds and each of these worlds represents a particular regime of worth where individuals can identify the link between these regimes and themselves.

'Common worlds'	*Market*	*Industrial*	*Civic*	*Domestic*	*Inspired*	*Fame*
Mode of evaluation (worth)	Price, cost	Technical efficiency	Collective welfare	Esteem, reputation	Grace, singularity, creativeness	Renown, fame
Test	Market competitiveness	Competence, reliability, planning	Equality and solidarity	Trustworthiness	Passion, enthusiasm	Popularity, audience, recognition
Form of relevant proof	Monetary	Measurable: criteria, statistics	Formal, official	Oral, exemplary, personally warranted	Emotional involvement and expression	Semiotic
Qualified objects	Freely circulating market good or service	Infrastructure, project, technical object, method, plan	Rules and regulations, fundamental rights, welfare policies	Patrimony, locale, heritage	Emotionally invested body or item, the sublime	Sign, media
Qualified human beings	Customer, consumer, merchant, seller	Engineer, professional, expert	Equal citizens, solidarity unions	Authority	Creative beings, artists	Celebrity
Time formation	Short-term, flexibility	Long-term planned future	Perennial	Customary part	Eschatological, revolutionary, visionary moment	Vogue, trend
Space formation	Globalization	Cartesian space	Detachment	Local, proximal anchoring	Presence	Communication network

Table 3.4: The framework of six worlds (Thévenot et al. 2000, p.241).

Boltanski and Thévenot's framework can be applied to explain the way different actors are involved in transactions and public interactions. Theories that rely on the "willingness to pay" assume the existence of a market and, as a result, they do not elucidate cases in which the innovation has not yet been introduced to the market or the market does not display the traditional characteristics of supply and demand. The justification of value with social dimensions and the aggregation of social and economic value is a challenging issue since it is influenced by many factors. For this reason further investigation should be conducted in order to offer a unique justification of value.

To sum up, in this section I show how the theoretical framework set out by Boltanski and Thévenot is applicable as the appropriate lenses to justify the value of digital innovations. Having discussed the different regimes of worth, this section also presented the notion that the justification of value is intertwined with the interplay of and controversies between the various involved actors.

3.9 Summary of research approach

In this chapter I presented in detail the research design and the methodological aspects for this research. I also explained how an empirical study based on such an approach was carried out in practice. The epistemological and ontological foundations of the research provided the basis for the discussion on methodology. Moreover, the data approaches were thoroughly discussed along with the methods to outweigh possible weaknesses which involved a substantial literature review and personal familiarization with different methods and approaches. I provided valuable discussion concerning the setting of my study, the data collection process and the empirical material I obtained from two development companies of serious game. Finally, I described in detail the process of data analysis and while longitudinal studies exceed confusion (Gehman et al. 2013, Langley 1999, Poole & Van de Ven 2004), at the same time, I sought an appropriate analysis in view of the aim and scope of this research to

answer my research questions. Last, I presented the theoretical framework of Boltanski and Thévenot (2006) from which I drew the sensitising concepts to induce themes during research process for the analysis of the empirical material.

The initial assumptions of my research are summarised in the following table (Table 3.5) while it brings together all the above sections.

Empirical Setting	Serious Games Innovation
Epistemology	Interpretive
Unit of analysis	Justifications of value of design choices
Data collection	Interviews, observations, notes, documents, archival material
Data presentation	In-depth multiple case study
Data analysis	Interpretive
Sensitising concepts	Boltanski and Thévenot theoretical framework
Theoretical formulation	Broadly emergent

Table 3.5: Assumptions for the research approach.

The following chapter I will present the empirical setting. In particular, I will outline the wider context of digital game industry and then I will elaborate on serious games' industry. Then, I will present the case sites of six game projects of the two serious game development companies I investigated.

Chapter 4: The case studies and empirical setting

4.1 Introduction

In this chapter I will describe the empirical setting. I will outline the case studies and describe in a detailed manner the game development process as it took place in both companies. The case studies will be described in line with my aim to investigate the justification of value during the development of digital innovations for which the market potential is difficult to be assessed, the possible radical changes of the justification of value because of the changing dynamics between involved actors throughout the innovation process and the constant articulation of a value proposition for these entities. Therefore, I will describe how I sought the different understandings of value that emerged and transformed throughout the development process by taking into account the design choices made by the involved actors.

The chapter is constructed as follows: First, I will provide a detailed overview of the wider context of digital game industry and elaborate on serious game industry to provide the appropriate background for the description of the case studies. Secondly, I will describe the development process, which I observed for the games at each case study company: QueGames and Orora. Within this context, I will focus on the local practices tracing the design choices, the interplay between features and the justification of their value. Finally, I will summarise the case studies providing the required material to pursue the next chapter of analysis and findings of the empirical material

4.2 The wider context of the case studies

Over the last decade the digital games has reached a worth over 56$ billion[3] a year

[3] https://ec.europa.eu/jrc/en/publication/industry-and-policy-context-digital-games-empowerment-and-inclusion-market-analysis?search

according to the European Commission and has reached profound maturity while the developers have come to recognise that it is oversaturated. The rapid growth and adoption of mobile and online platforms accompanied with other digital technologies has led to new ways of assessing the market potential and diversifying the audience. Video games are often described as 'computer or console software for entertainment' and create an "ecosystem of hardware, software and online platform providers, game developers, publishers and other service providers drawn from the interactive media, software and broader ICT industry" (Stewart & Misuraca 2012, p.12).

4.2.1 Online and mobile gaming

The digital game industry has evolved due to the emergence of online and mobile games. In online games a local or wider network connects one or multiple players and the games are either integrated to other online services such as social networks or they have independent use. Thus, a step further to the categorisation of online games is the massive multi-player online games which involve millions of players. Good timely examples of multi- player online games are the Worlds of Warcraft and the RuneScape. This type of games is usually very impressive and sophisticated with audience that includes people from all age groups and genders.

The proliferation of mobile phones and tablet computers' capabilities has opened up entrepreneurial opportunities. Touch screens, motion sensors, storage capacity, high quality audio and high definition cameras are incorporated to phones and tablets. These in combination with the evolution of telecommunications, with 3G and 4G networks that are provided with affordable mobile plans, create changes to the previously saturated games industry. The rapidly growing market of application stores and the wide use of smartphones have created an enormous increase of the gamers and a survey of Information Solutions Group (2012)[4] has

[4] http://www.infosolutionsgroup.com/popcapmobile2012.pdf

highlighted that the 60% of tablet and mobile phone owners play mobile games in the U.S and U.K.

An important characteristic of online and mobile games is that the game is not anymore a hardware that belongs to the player but a service on a platform. This creates several ramifications such as the shift from a product-based to a service-based logic and revolutionizes the ways entrepreneurs crate and capture value. Moreover, Feijoo et al (2012) have highlighted the difficulty to develop mobile games although Apple and Google exceed interests other than content, at the same time, new social media platforms are in a constant attempt to revolutionize the market and the developers aim to exploit new business opportunities.

4.2.2 Serious Games

As described in sub-section 3.7.2 serious games were considered as a good example of digital innovation because they exhibit the composition of characteristics of digital innovations, namely; "re-programmability, self-reference, homogenisation" (Yoo et al. 2010). Now I aim to describe in detail the context of serious games and broadly illustrate the reasons they are good sites for exploration since apart from the characteristics of digital innovations, they also exceed inherent uncertainties about a lack of clear understanding of their use and market potential. Over the last decade the digital games development community has come to recognize that digital games need more than simply to be of use to entertain. Digitally based games can also be used to train, educate, investigate or advertise (Susi et al. 2005). Developers are seeking to find ways to commercialise serious games but the market potential is difficult to be assessed.

One of the key claims of developers is that with 'serious games' (Michael & Chen 2005, Susi et al 2007) users become "active learners" in a virtual environment that simulates their reality and can be trained to take risks or find solutions in a non-critical environment. Users receive instant feedback on their actions and, as a result, they can enhance their decision-

making skills in a timely and on-going way. Alternatively, employees can be trained to be efficient in the workplace dealing with everyday problems as well as unexpected events. “Fire Department Training” for example was created by the Virtual Worlds Lab at the Georgia Institute of Technology. It is a simulator that enables fire fighters to train in different emergency situations in order to fight fires in the best possible way. Moreover, a number of games have been developed by the Comparative Media Studies Program at MIT in order to meet instructive needs (Squire & Jenkins 2003). One is “Biohazard: Hot zone”, a game designed “to help emergency first responders deal with toxic spills in public locations” (Wilen-Daugenti 2009, p.41). It offers training for emergent situations that require instant response such as a catastrophic incident caused by a gas attack in a suburban shopping mall (Susi et al. 2005).

While the computer games industry is already well established and users enjoy a wide range of games, the continuously growing technical capabilities, quality of computer graphics, and acceptance of games as educational means are creating a new segment of the games industry for games with radical uses not limited to providing entertainment. The market potential of serious games, therefore, is not yet fully know, even though the serious games sectors are growing. In particular, the average annual growth rate for serious game industry is forecast to be 47% between 2010 and 2015 (Michaud 2010).

4.2.3 Serious Games Market

Today, serious games are employed in a wide variety of sectors, including education, training, defence, health, simulation, communications, marketing, ergonomics, civil security, politics, religion, art, industry, museography, finance, sales, telemarketing, workplace safety, and career management. Drawn up by research laboratories, institutions and businesses, this list is also far from exhaustive. As serious games are designed to offer more than pure entertainment, they can be employed in a vast number of areas.

Serious games can be in the form of "simple web-based solutions, online virtual environments, complex 'mashup' applications, 'grown-up' computer games, mixed reality games and finally mobile applications" (Anderson et al. 2010, p.256). Serious games are usually produced by small or medium-sized development companies/studios and they are often commissioned or supported by intermediaries who provide the games to the end users. According to an IDATE report, Alvarez (2008) has highlighted that there are four categories of stakeholders that are involved in the serious games industry. The first category includes the software companies that are constituted by developers, publishers, distributors and retailers. Thus the second category includes the investors that involve universities, public authorities and enterprises. Another category of stakeholders are the intermediate players such as media companies, marketing agencies, and potential firms and finally, while, the last category regards the target sectors. However, this is a very initial categorisation as the involved stakeholders may vary and they are highly dependent to the game or the target sector. Almost by definition, the development of serious games require to work with Subject Matter Experts (SMEs) as the developers need to clarify the learning/training content versus simply creating a game and the game designers must work with instructional designers who are aware of learning theories and methods. Instructional designers can be designers, writers or even researchers. Finally, it is important to mention that the technical infrastructure of serious games is the same to the technical infrastructure of entertainment games and as Zyda (2005) has highlighted "applying games and simulations technology to non-entertainment domains results in serious games" (p.25).

The former discussion of this sub-section provided an understanding of the serious games industry and market and highlighted the differences with video games. In the later part of this sub-section I will shed light on the inherent uncertainties of serious games while I will elaborate on the reasons that make them a good example case for the present research. In the first place, the challenges of serious games start with the difficulties to provide a clear definition. They are ill-defined and even the developers are struggling to provide an identity for

their products/ services or to explain the differences between games, simulators and serious games. Moreover, many scholars and practitioners aim to explain whether entertainment or pedagogy is more important. Despite the fact that "pedagogy is an implicit component of a serious game it is often thought to be secondary to entertainment because the development of a game that is not 'fun' to play would be useless, independent of its pedagogical content" (Anderson et al. 2010, p.3). Thus, this further supports the stigma of the 'serious benefit' of a game, when challenging the level of training or educational outcomes someone can achieve with the use of serious games and their cost effectiveness, particularly in comparison to other conventional methods. Moreover, the market potential for firms with a focus on serious games is not yet assessed even though the serious games market is exceeding development. The figure below provides a comparative demonstration of serious games and training simulations, computer games, and board games according to Laamarti et al (2014, p.4).

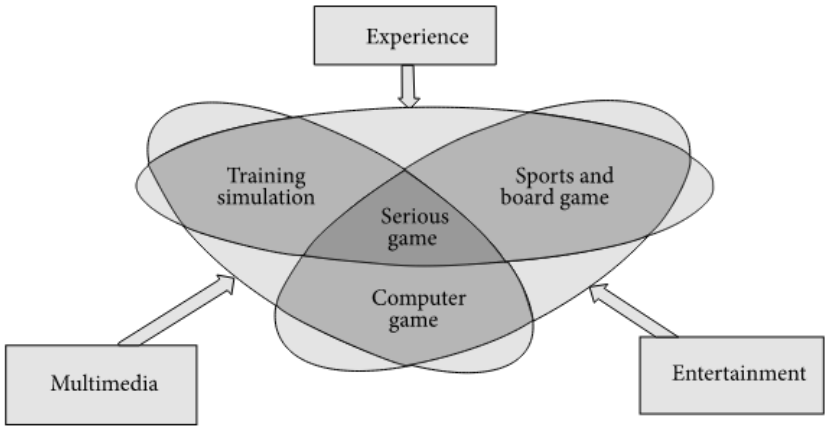


Figure 4.1: Serious games (Laamarti et al. 2014, p.4)

However, for many authors such as Young (2010), serious games have failed to attain the expected levels of success and profitability despite the growing technical capabilities and realistic settings they provide. In other words, although serious games provide several opportunities for the developers and customers/users, they also involve uncertainty since their use and usefulness is constantly contested. Therefore, the creation of a new market segment is

more challenging and risks seeking and especially when even the developers/innovators are not certain how the serious game might be used. Often, the developers/innovators lack of clear understanding about the appropriateness of their serious game in respect of the 'instructional problems' (BinSubaih et al. 2009). Finally, there is lack of successful business models that could support the serious game development, marketing and distribution activities thus the lack of a clear offering creates further complications. For some authors like Hauge et al (2014) the firms that operate on serious games development exceed niche strategy while their business model exceed the development of games with high cost, high degree of customization and low market shares. Thus, the industry exceeds new trends to exploit the market opportunities and face the challenges. The developers are seeking for up-front or early commissions, funding in an effort to assess the market potential, gain a competitive advantage and exploit future possibilities. At the same time, the rapid changes of digital technologies increase the risk of failing to attain the entrance to a certain market but they open up possibilities for reusability and interoperability and these can illustrate new value propositions ensuring return on investment (Hauge et al. 2014).

In the subsequent section I will provide detailed description of the organisational level since it is the context I investigated and obtained the empirical material for my research project.

4.3 The context of two case companies

In this section I will describe the organizational context I investigated to collect my empirical material I will provide an extensive description of the two companies that were chosen as appropriate sites in the way it has been discussed within the previous chapter. I will describe the constitution of the companies as well as the development process for three games for each company. The inclusion of multiple games for each site aims to ensure that the findings will be 'deeply grounded in the empirical evidence' (Scarbrough et al. 2014, Eisenhardt & Graebner 2007). Rather than focusing on the differences between the companies, the actors

involved in the development processes and the difference in the sequence of events, I am concerned to describe the development process and the justifications of values as they evolved longitudinally.

4.3.1 The game technology projects developed by QueGames

As described in sub-section 3.7.2 QueGames (- a pseudonym) is one of the companies from which I obtained rich empirical material for my research. QueGames was founded in 2012 and it is focusing on creating serious and educational games mainly for public organizations such as hospitals and municipalities. The members of the company are five ambitious friends who studied together game development and entrepreneurship. They have experience on developing serious games and doing research behind them, hence, at some time, the members of the company felt that the video games' market was oversaturated and they decided to 'battle fight' for the new and un-fragmented market of serious games that lacks of dominant players. They saw this as a challenge to exploit the opportunity for developing something radical new, become a new entry to the industry of serious games, get known and later become international in scope.

Initially the company was launching bespoke games, for customers only in Canada because the members of QueGames were mostly interested in the improvement of the performance of the business and the development of a technical portfolio. Moreover, the members of the company highlighted that due to the small size of their firm, they were not sure how they could expand their operations to other countries because they were not aware of the market potential For the development of the games, often they were attempting to combine mechanisms and techniques with the use of pre-existing digital technologies due to their tight budget constraints. At the same time, the members of QueGames were attempting to find access to subject matter experts. The purpose was twofold; on the one hand they were attempting to gain access to different environments and effectively become subject matter experts themselves

and on the other hand they thought that this was the most appropriate way to explore 'the pressure points' of industries or organisations in order to develop games with clear usefulness and offering and consequently to manage to increase the market potential of their novel digital artefacts. In this way, they were attempting to directly engage the potential customers/users through the development stages and this, in turn, could enable the potential customers/users to better appreciate the integration between learning and playing, and navigate through a virtual environment with actual consequences and experiences. The following figure (Figure 4.2) demonstrates Nick, the software engineer of QueGames, during the development of Diabetes and especially while he was making trials of the brainwave monitoring technology.

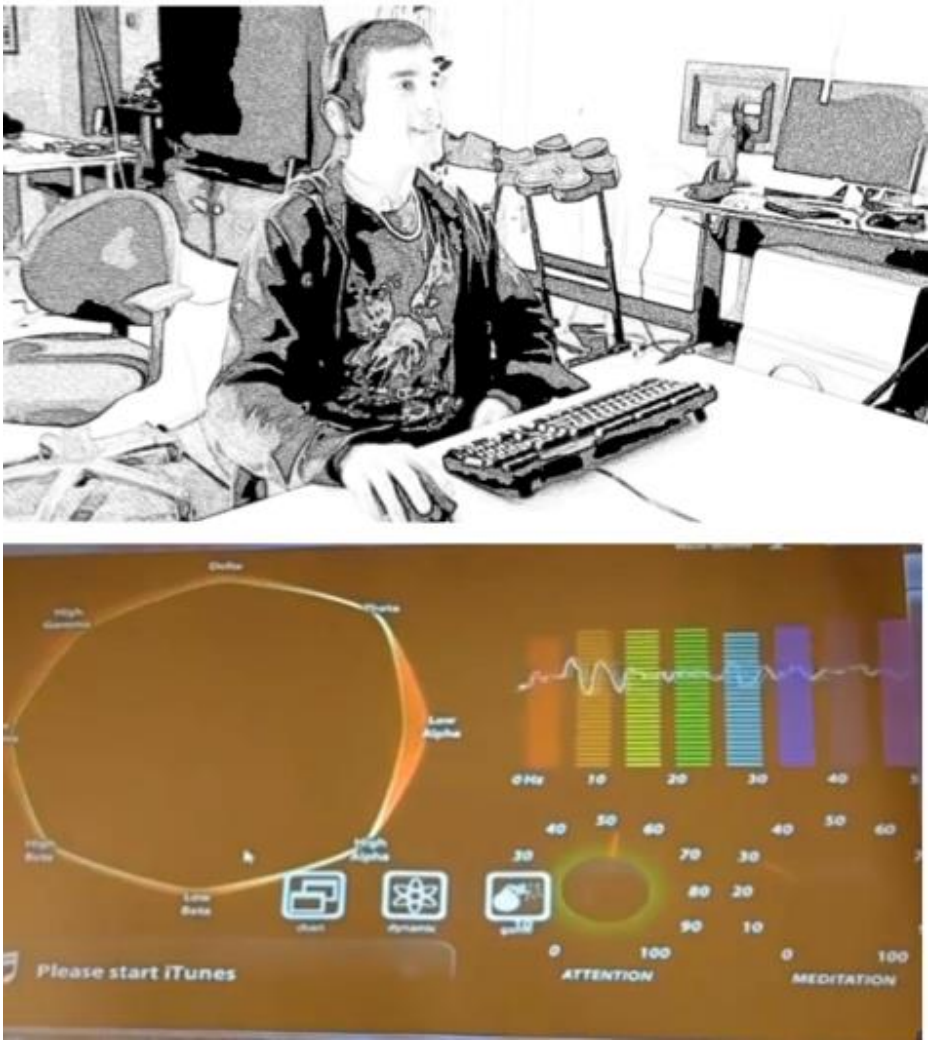


Figure 4.2: Nick, the software engineer of QueGames, during the development of brainwave monitoring.

Now in the subsequent section, I will describe three technology game projects of QueGames for which I obtained empirical material and I will describe in detail their development process at QueGames.

The development process of 'Fire'

'Fire' is a serious game aimed to educate in fire safety awareness and prevention the members of a household. Different scenarios, highly interactive and with specific learning goals constitute the game. More specifically, the game begins in a virtual setting of a common kitchen in a house and the player takes part in the game in first person and is represented as an avatar. The player has to extinguish an unexpected fire in the kitchen by making a decision concerning the "tool" to use or the "way" to achieve it. The game allows the players to make decisions and they are given immediate feedback upon the completion of a scenario to improve themselves and make correct decisions.

This is the first of the serious games that was developed in QueGames and the members of company were able to use only very limited software to achieve their goals. They used Unity Pro, a game development tool, and all the models and animations were created using Autodesk Maya. 'Fire' is a single player game and the player can view the environment through a "first person perspective from the viewpoint of the user's avatar" (commercial report Q2). In addition, the game does not require advanced software from the users who can play the game online. More specifically, the users only need a web browser, Unity Web Player (can be installed to the computer free) and Microsoft Windows XP or Mac OS X 10.5. However, the outcome is very sophisticated with a very realistic feel to the game. Finally, 'Fire' has been developed to support the re-use of common assets/code to allow the maintenance and extension of the scope of the game with more scenarios or to allow the potential to change the aim into a training game for fire fighters. Having given a sense of 'Fire' project, I now proceed to describe how its development process evolved.

In October 2012, during my first contact with Andy, the project manager of QueGames, he gave me a detailed description of the serious games industry in Canada and the key issues in general that affect the developers of serious games, including themselves, and he provided me with information about the foundation of the company. Once I had explained to him that the interviews would remain confidential and all the names would be substituted with pseudonyms, I started asking questions with regard to the development of 'Fire' and the chronological evolution of the events.

The development of 'Fire' was initiated in June 2012 and lasted 5 months. During the very early stage of idea generation, the concept was vague and was described as a "generic role playing serious game" (Nick, the software engineer of QueGames). During consecutive meetings the members of the company tried to narrow down the initial idea and justify the usefulness of the serious game. They had to bridge their differing value perceptions, however, in order to make a decision regarding the continuation of the project and the undertaking of further research. They were aware of the usefulness as well as the aims of the artefact, but had to evaluate the reasons why their 'serious game' was better than the existing methods of fire safety education. Andy, claimed, "There is a huge need to get an understanding why the game is beneficial, and to bring forth strong reasons for which it induces a chance to employ game mechanics in the workplace and daily lives".

One key issue was that 'serious games', because they incorporate art and entertainment characteristics, often create misconceptions regarding their use and effectiveness. The idea for the game was very generic and there was neither an identified gap in the market nor an enquiry from a specific interested customer. While the founders were aware of the existence of other 'serious games' for fire safety, that have been already implemented for use in the workplace in other countries, the market potential for their idea/project, however, was still uncertain since the proposed game aimed to educate the members of a household. In other words, the aim of

the game had an impact on the elements of the game and this was conditioning uncertainties about its perceived usefulness to potential customers.

Later, at the research stage, the founders made an agreement that the project would continue, and decided to pursue further research into it. There was a growing need for content for the game, but also now for a potential market. They contacted subject matter experts (SMEs) to gain specific knowledge and expertise. On one hand the SMEs were academics, such as instructional designers, that had to integrate modes of representation of knowledge in the virtual environment and develop instructional strategies to provide multiple learning intelligence avenues for diverse players. On the other hand, the founders also contacted non-academic individuals such as fire service staff, in order to investigate the context of a fire in a household and the best practices to deal with such an incident. Moreover, the game developers conducted, in collaboration with fire service staff, a survey to measure the importance of the level of awareness of household fire safety measures and the fatal incidences that had occurred over the last few years.

Despite the programmes to promote the best practices to extinguish a household fire supported by the fire services, only a small percentage of citizens were concerned about such practices. In addition, the SMEs highlighted the problem of hoax calls that reduce the productivity and effectiveness of the services, and at the same time they pointed out the issue of the annual expenses associated with raising fire safety awareness. A common agreement was reached for a serious game to provide effective education on this issue. Moreover, such a serious game was considered better than the traditional methods of educating how to extinguish a fire, as it could provide the players with 'first-hand experience' as well as 'hands-on skills'. In parallel, the developers conducted research to measure the number of potential customers in an attempt to assess the risk of failing to commercialise the 'Fire' project.

During the development stage, strong interactions took place because of the interplay of the perceptions of the internal and external actors. The developers, SMEs and artists had to

develop a game design checklist and an analysis of the learning needs. First and foremost, they had to prioritise the content elements. More specifically, they had to decide if entertainment was more important than education, and vice versa. This was a core decision because the impact of a greater emphasis on the educational components would also influence the technological design. For instance, if education was the main purpose then the learning activities to achieve it would be via imitation and practice through a timed and reflexive game. Moreover, in such a case there was no need for stereoscopic displays, haptics and sensors. However, if entertainment was the first priority for the developers then they had to create a very interactive environment with glossy graphics and motivating sounds. In order to increase the players' interaction they had to consider the different options they had to create a 3D environment, and the potential to use hardware devices such as sensor gloves or position sensors. The learning needs were raising issues concerning the usefulness of 'Fire' and these, in combination with the design choices for the game, had an impact on the capital and the investment that was required for the development of the game.

During the marketing stage, the artefact was in production and the developers focused much more explicitly and consciously on the construction of a value proposition. They mapped the usefulness of the game and by using very traditional strategies they shaped their diffusion strategy, as Nick, a software engineer and one of the founders stated, "We use very traditional strategies to assess the value of the product. It is dependent on the type of the game, the quantity of content, the desired quality and the used technology".

The founders were now trying to decide on the best practices to commercialise their artefact and maximise their profits. They had to measure the game's usefulness, the relative advantage in relation to their profitability and revenue streams, the initial cost, and finally, the potential savings they could make in time and effort. At the same time, the developers attempted to implement some trials in order to measure the degree to which the serious game is consistent with the existing needs and the past experiences of the potential users.-"Usability

studies were initially comprised of alpha testing to obtain feedback regarding the user interface (including the use of colours, sounds, etc.) and to gauge participant perceptions. Following any changes made to the game due to the results of the alpha testing, usability tests were conducted in the form of pre- and post-testing to determine the effectiveness" (Josh, the company's graphic designer and artist).

The development process of 'Recycling'

QueGames developed an educational game aimed at pre-teens and teens to train them how to properly dispose waste. It is a 3D game with educational content and it was developed with the initiative of the council to invest on a serious game that would be available to the citizens from the web site of the council. More specifically, the council required the development of an accessible digital means for engaging a variety of social groups to increase public awareness of issues, improve understanding of waste disposure by motivating citizens to take action but also help to the reduction of the cost for advertising and door to door information. With this really new way which is informed by both pedagogical and game-like, fun elements they were aiming to engage kids and why not their parents so they can actually learn more about recycling with very high retention rate and direct impact to their mind set in a consistent way. It seems that the members of QueGames had a clear idea of the pressure points of the council and they were able to develop a game with clear offering, however, it was less obvious and more puzzling process to come up with a novel digital artefact and a coherent value proposition. For example, one of the difficulties for the members of the company was the justification of the design choices that would maximize the value of the game in a way that would make obvious its usefulness and would increase the relative advantage. The members of the council could not preconceive the usefulness of the game since the members of QueGames could not provide proofs of clearly delineating the power of the game in terms of training and education away from misconceptions of vacuous play. Meanwhile, the members of the company

were struggling to provide a consistent rationale that their offering could improve the existing processes of the council for a long period of time and could also increase their returns on investment.

The game was developed with a game engine called Unity 3 and incorporated Neurosky Mindset technology. The Mindset uses signals from the player to affect the game environment and mechanics. Moreover, all the textures, models, and artificial intelligence were created from scratch using Adobe Photoshop, Autodesk Maya, and JavaScript/ C#. 'Recycling' is a single player game and the player can navigate in the virtual environment from the viewpoint of an alter ego avatar. This is a web game and it is accessible from any device able to connect on the internet. Having given a sense of 'Recycling' project, in the following paragraphs I will describe how the development process evolved.

The members of QueGames initiated the development of 'Recycle' in October 2012 and the process lasted 4 months. At the beginning, and while the members of the company were at the stage of idea generation, the concept was fuzzy and they were considering developing a game for correct waste disposal and recycling. However, they could not assess the potential of their idea and Andy, the company's project manager claimed that "nobody knows quite what the opportunity looks like or who's going to pay for it, but everybody seems to feel that there is an opportunity and for me this is an exciting thing". For this reason, they decided that it would be useful if they could find an intermediary or a potential customer to commission the project, and as the project manager Andy, of QueGames explained, "We tried to find potential customers before we actually developed anything, so for making our own idea, we want to go out there and talk to as many people as possible, just to make sure that it is something that has a need. So if we want to develop a game for recycling, we want to talk to a whole bunch of municipalities and get their ideas about whether this would be something that is necessary, whether it would be something that they would need, or and whether it would be something that they would pay for".

As I mentioned in sub-section 3.7.2.1, the developers of QueGames managed to agree the development of 'Recycle' with the support of the local community that was interested in an accessible digital means to engage a variety of social groups, to increase public awareness of waste disposal issues, to improve understanding of recycling by not only motivating citizens to take action, but also to help with the reduction in advertising costs and door to door information. Thereafter, the members of QueGames started discussions regarding the learning goals, and they pursued a task analysis of what this game would actually teach people, along with the possible ways to achieve their aims. Later they "got content experts in the team to help them flesh out all that knowledge which can be part of the game and from there" they "decided as for the game mechanics which would be reinforcing those learning objectives", the company's project manager, Andy, explained. The content experts were members of the community and they cooperated by providing all the necessary knowledge for the serious game. For example, Peter, the QueGames programmer, gave me an example by stating that "things are getting thrown away because people don't know that the item is recyclable, one example was tea bags, I think, was one of the big ones, where people don't realise that you can actually recycle tea bags, everyone's just throwing them in the garbage. So, that kind of stuff, that they [the council] wanted to make people more aware of what things are recyclable and what things aren't. So that they would have less problems when picking up the waste when they actually have to recycle it".

Several problems appeared during the development stage because the game was taking shape and the actors involved in the process were interacting and reviewing their decisions while they were often making new ones. Alex, the QueGames designer explained that they were "expecting the game to enhance kids' knowledge to learn all this stuff about the recycling and that was the original intention. But I [Alex] think what ended up happening, was a lot of parents were playing with their kids and they may have gotten some benefit from that as well". At the same time, Peter the studio programmer, claimed that "the audience was a problem. It's predominantly pre-teens and teens but how then, how about guys, 18 to 24 or even older?

These guys respond to games because when they're not working, that's what a lot of these guys are doing, they're playing games. So if we can deliver training or skills or awareness through game play but we should make changes and then it works".

Lastly, during the final stage, the developers were not immediately searching for more customers because the game was commissioned up-front, but they were considering exploiting the possibility of selling the game to another council. Nick, the software engineer at QueGames explained that they "sell or distribute a game with another organisation's branding on it, guess-customise the games to different institutions without actually having to change a lot, so that kind of stuff is something fairly easy". However, they were lacking a business model and formal ways to justify the price of the product. For this reason they were trying to satisfy the council committee that had commissioned the project up-front, while the members of the company were considering this as an opportunity for further projects, and as Andy, the company's project manager, pointed out, "If we prove the usefulness of the game and if they're very satisfied with the product then we can re-skin and sell it again, probably".

The development process of 'Diabetes'

QueGames pursued the development of 'Diabetes' in collaboration with experts from the local healthcare system. It is an innovative and interactive game based on strategy games while the aforementioned field provides an ideal application area of serious games in healthcare and opens up further opportunities in the same field. While the developers of QueGames had been working to enhance training and assessment in situation awareness, critical thinking and planning with focus on safety procedures and forms of equipment, they decided to explore the potential of a game for healthcare. The aim of the game is to educate kids and teenagers how to face diabetes and it addresses implicitly and explicitly core elements of diabetes numeracy skills. The cooperation with experts was crucial for the development of this game and the input

of education researchers offered the appropriate background to capture the learning needs and desires of young people with diabetes.

The game incorporates simple game mechanics and aims to engage the users through a fun and engaging way. Hence, the game tracks various statistics as for the time the player needs to complete a level, the number of times a level has been replayed, and the correct answers, thus it embodies competitive elements such as scoring and trophies. The players aim to balance their blood sugar level but in an environment that is allegorical rather than frustrating for them. The game includes an alter ego avatar and the players must keep their character's diabetes under control by collecting the correct amount of food and insulin by monitoring blood sugar, providing insulin and managing food intake. 'Diabetes' was developed using the Unity Pro game development tool while Autodesk Maya was used for the development of 3D models and animations. Last, it is accessible only on computer devices able to connect on the internet. Having given fundamental information about 'Diabetes', I now proceed to describe how its development process evolved.

The members of QueGames came up with an idea for a game that could provide holistic and engaging education for healthcare. They envisioned a practical and intuitive system that would empower patients with the confidence to engage the in regular monitoring of a disease. The members of QueGames initiated research and they attended a conference named Games for Health. This took place in Boston where the members of QueGames presented their idea, what they could do, and what their serious game could offer to future customers. This gave them the opportunity to see that there was interest in such initiatives and the sector offered possibilities. After the conference, the members of QueGames started discussing how they could narrow down their idea and they came up with an idea for a game associated with diabetes. Although, in the beginning they were not sure whether it was better to develop a game for adults or children, and they could not discern what would be close to the real needs of the health system or the

people with diabetes. Finally, they ended up with a vision for a game that could help children to understand how diabetes can be managed.

Before the initialisation of the development of the game, the members of QueGames contacted contents experts, such as doctors and nurses from the national healthcare system, and researchers from within academic institutions. Andy, the project manager of the company, noted, “There’s lots of study now around those games that we can point to but also the interaction is very important in order to secure the quality of the deliverable. Medical training is very difficult to break it because healthcare system is very solo, they ‘ve got their own little budgets and it is very hard and the interaction with medical staff was deemed necessary, essential to develop a commercially successful game.”. However, difficulties appeared during the early stages of the development. Josh, the company’s graphic designer and artist explained, “The problem is if particularly for kids, the expectations of a game are very high because at home they’re playing PlayStation3 and Microsoft Xbox. So we can't go along with something that looks like it was made 12 or 15 years ago. If we develop something, it has to look really good. That costs money, so who pays? So how does this value chain work?” They decided that the game must incorporate game mechanics to engage the users, while being fun and challenging, since they used very glossy 3D models and animations.

When they finished the development of ‘Diabetes’ they started contacting potential customers. Andy, the company’s project manager, explained the difficulties they faced in assessing the market, although the sector offered opportunities. He pointed out the importance of the social impact of the game that was adding value, and he explained: “But the great thing about healthcare is the concept, everybody agrees it’s fantastic. So you're not trying to convince like some of the very old conservative sectors. Have you looked at like finance, banking or insurance, which are conservative and sure sectors? You go along and speak to somebody in the healthcare sector and say what about games for education? For games for educating children, they’re like, ‘Oh yeah, fantastic! Brilliant!’ So you did the first step which is so much easier in

that sector but you still have the problem of who's picking up the bill for these games to be developed". At the time I finished the interviews the members of QueGames were still attempting to commercialise the game.

Now in the subsequent sub-section, I will describe the three game technology projects of Orora for which I obtained empirical material and I will describe in detail their development process.

4.3.2 The game technology projects of Orora

As I described in sub-section 3.7.2 Orora (- a pseudonym) is the second company used to collect rich empirical material for my research. Orora is a serious games studio founded in 2012 with main focus on the development of serious games, simulations and training applications for businesses, both in public and private sectors. The members of the company have precisely worked from the digital media industry, and are highly experienced in emerging, interactive technologies as well as game industry. Therefore, the members of Orora felt that games-based applications have an important role to play in creating effective training games for employees, corporate simulations and innovative methods of distributing information. The products of Orora use digital media with the objective to improve organisational practices and as such to offer a range of solutions including 3D/2D graphics with application to combine the fun and engagement of video games with the personnel development. The developers had the vision of applying gameplay techniques that would be an effective means of conveying information in several industries and organisations. Seen in this way, the members of Orora were aiming to develop serious games able to engage users more fully so as to increase their knowledge retention in certain practices or activities such as training, learning and development in sales, marketing human resources areas while they had the expectation that their potential customers could dramatically increase their returns on investment and their overall organisational efficiency.

Figure 4.3: Chris, the project manager of Orora, during trials with virtual reality head mounted display.

The studio offered serious games for customers in the following eight industry sectors: automotive, healthcare, corporate training, retail, tourism, military sector, aerospace and education. The development of the games involved either repurposing "off the self-solutions" or designing novel "tailored" solutions. Orora employed around 25 people: the senior team including CEO, business development director, project manager sales director and the designers including the lead game designer, programmers, software engineers, software engineer, technical designer and style artists. In the figure above (Figure 4.3), Chris, the project manager of Orora, is trying the virtual reality head mounted display and discusses his expressing his perceptions and his experience to the other members of Orora within an unofficial meeting.

The development process of 'Virtual Tour Guide' (VTG)

Virtual Tour Guide is an intelligent 3D avatar technology, which according to Orora works on a similar basis to the Apple Siri Product. The difference is that VTG technology offers companies a 3D computer generated character to accompany the voice and act as the 'face' of the business. More specifically, VTG is a personalized avatar with many possible applications as it can become the face of a carer for people with impaired memory or sight, a virtual hostess on an airplane, a virtual receptionist in a hotel to provide information anytime. For the development of VTG programmers and designers have worked together in different design aspects to build the avatar with special focus on the physical fidelity of the avatar (the degree to which the avatar looks and sounds like real human representation) and different versions of VTG were created based on their vision for the potential customers. The information is "added by means of a search engine which enables the avatar to search the company's database or the internet while it can 'build' additional knowledge over time using its artificial intelligence and by responding to the input of customers, employees or guests. VTG can be also utilized across a business as it can be optimized for multi-platform distribution via PC, tablet or even mobile device" (commercial report O2).

The first version of VTG incorporated augmented reality and it was designed to promote and enhance a visitor's experience to tourist attractions. This novel serious game initiative uses a combination of new digital technologies and cutting edge technical expertise to digitize vast archive of historical documents. "Using augmented reality the attractions are brought to life with the presence of a virtual tour guide when users scan QR codes located in various areas around the properties. Virtual Tour Guide is available in 7 languages and each tour guide gives a unique introduction based on how the location relates to them through the app lists which offers details in many items of interest that can be found at each user". (commercial report O3). By utilizing AR/3D visualization technology the developers offered the opportunity to their audience/users to interact virtually with the surroundings. With access to virtual versions of augmented reality and audio tour experience visitors have also the ability to browse digital

archives without leaving the tourist location, keeping up to date on all the sites, developments, history and heritage. At the same time, the website of the tourist attraction provides an overview of the area using 3D digital content and the film encompasses 'fly through' and 'time lapse' imagery to illustrate the passage of history. The visitors can take souvenir pictures which can then be digitally printed at the gift shop. An important fact is that it is the first time this form of technology has been available from a mobile device and the first time it is of use for tourism sector. The cost of Virtual Tour Guide was significant and reached £500,000 while the designers spent 18 months working on this serious game app. Having given a sense of 'VTG' project, I now proceed to describe how its development process evolved.

During my first visit to Orora, I met with Tony, the CEO, and he introduced me to many members of the company. Tony described in detail the foundation of Orora and he explained to me the company aims, while at the same time he provided me with information about the existing games and their customers. Following the same process I described earlier for QueGames, I explained to Tony that the interviews would remain confidential and all the names would be kept secret and replaced by pseudonyms. Thereafter, I started asking questions regarding the development of Virtual Tour Guide, in order to capture the sequence of the evolutionary and revolutionary events through which all the actors were involved, interpreted different actions and events and made decisions for the continuation of the project.

In June 2012, the members of Orora initialised the development of "Virtual Tour Guide" that lasted 4 months. Chris, the project Manager in Orora, pointed out that "Orora is set to play a leading role in the gaming technology initiative, whose goal is to help firms transform their business models using game technology". He also mentioned that their crucial assets were the members of the company who have previously worked in the digital media industry, and who were highly experienced with cutting edge expertise in developing serious interactive games as a means of enhancing visitors' experiences at tourist attractions. Eddy, the business development director, pointed out the lack of clear idea of the market potential and he

explained: “We didn’t know whether it was a big opportunity or small opportunity and we’re still discovering that now, to be honest.”

During the very early stage of idea generation there was a very generic idea to develop an “avatar to welcome the visitors and the customers of the studio” (Richard, Orora’s lead game designer). Richard added that “‘VTG’ was done very cheap and for this we just used textures so we took pictures of a person with high quality camera and then we have basically a grid… So it’s just dragging points, all done in a simple grid. We are not even modelling the actual face, we are not modelling 3D hair but it actually looks well…”. The VTG could welcome the visitors in different languages and at the same time it could offer a description of the company and its members. The avatar interacted with the people and it could recognise voice instructions.

Soon, the members of Orora realised that VTG could be an opportunity for an interactive serious game to welcome visitors to tourist attractions, while it could offer a description of the location and attractions. “The customers do not really know well, and VTG looks well so we could re-skin it for different sectors, imagine… a virtual greeter or receptionist, virtual enquiry officer, virtual immigration officer, virtual translator, a virtual career or just simply for entertaining people at your event or venue. The possibilities are endless…” said Chris, the project manager, and he continued, “For us it is work, and we don’t really mind what people call it”. The members of Orora soon developed an avatar for multiple platforms and as Sandy, the sales director explained, it was one of the “items we want to productise, things we can always sell from the self you know and that is quite quick, quite fast” and when “we identify a client we think ok we‘ve got this technology for tourism for example that would work well with entertainment, with airports whatever, that would be quite easy then because we ‘ve got that particular product that would interest them”.

During the development process, more issues regarding the content, the use and the artistic elements, were creating issues and long discussions between the members of the team concerning the technological features. They were thinking of placing computer generated

graphics in the user's vision through their mobile phones or tablets, while the game would incorporate augmented reality in order to offer the user a virtual tour guide, by scanning the QR codes located in various areas around the attractions. As such, they changed their initial decision for an avatar that would simply welcome the visitors, and they decided to create an interactive serious game to enhance visitors' experiences at tourist attractions and provide guided tours through mobile or tablet devices.

According to the needs of the customer, the VTG could be fairly sophisticated, and this was setting in motion a trajectory of discussions concerning the development and more precisely the aspects of the artefact. For instance, the decision concerning the texture of the skin on the avatar is very important as it is one of the factors that can increase the price of the avatar. "The skin is very complex, it has […] well some of the light passes through the surface of the skin underneath to blood vessels and then is back out again and this surface is scattering. We can write programmes to simulate this. It is called sub surface scattering and that is very complex and expensive. If we write the avatar for an iPhone because that is what the customer wants then we should find out how much we can do to look real with or without these textures or if we goanna add baked shadows… ", explained the lead game designer, Richard.

For the development of VTG, programmers and designers were working together on different design aspects to build the avatar with artificial intelligence. For example, the VTG is able to offer information by searching the Internet, and it can bring someone's destination and archived data to life in a fun and engaging way, or it can be a useful twenty four hour receptionist solution, at least during the nights when less people work in a hotel reception. During this process only the members of the company were interacting but the final version of the VTG was created after meeting the potential customer.

During the marketing stage, Chris (project manager) explained, "We involve the customers because we get their feedback and that helps to manage their expectations, give them something that makes them happy and decrease the time that it takes to do something". This

process is a key point for future projects. Sandy, the sales director of Orora explained "Not everyone is ready for games technology in the business environment because they are not used to it, but it is becoming easier as we get through it and also it is difficult because when I started last July there was no technology, basically we were selling an idea and now we 've got case studies, we 've got examples to show people, we 've got customers we now work with all that kind of stuff to make it a lot of easier". Eddy, the business development director, added, "It is a challenging process because of the very long sales cycle. So when you first speak to someone and they have never heard of what a serious game is, you have to talk to them, tell them what it is, tell them what we do for them, identify their main points and then basically come up with the plan for them. That takes a long time, once we are in with the trial, develop something deliver something that is easy is about 3 months but initially it's a long process."

The development process of 'Car Insight'

The members of Orora developed also another serious game called 'Car Insight'. It is a bespoke visualization tool of the showroom for an automotive company. According to Eddy, the business development director of Orora, they had been working with 2D architects, several plans and photography and they created a visualization of a car company's showroom featuring stunning graphics. The aim of 'Car Insight' is to promote the merchandise range of an automotive company. The main aims of the members of Orora were to demonstrate the architecture of the showroom with special focus on the cars in stunning high fidelity graphics. The aim of the game is to improve the customers experience, provide a simple and cost effective solution for the automotive company to create an engaging 'front end' to grab the users; attention and increase their sales. According to Tony, the CEO of Orora, "they created an expectation and they had to provide a solution".

The development of the game was commissioned from an automotive company who decided to invest on the game. Therefore, the members of Orora agreed to a fee at the beginning

and before the actual development of the game and then they had to consider how they could develop a digital product according the expectations they had created and their perceptions to provide something valuable and a profit logic. The members of the company incorporated "panoramic photography, 3D modelling, video sequences and hot spots the stunning result enables users to interact virtually with merchandise through web, tablet, intranet and mobile applications" (published material O2). They involved multiple interaction points to access content (pdf, video, audio and animations) and they combined all the assets to create stunning 3D, high fidelity landscapes, architectures and environments.

'Car Insight' is an impressive game with stunning quality of the graphics and the visualization can be distributed through mobile, tablet, intranet or a web browser making it suitable for a wide range of applications. It was developed with Unity Pro game engine while innovative techniques were used on this project to produce a very high quality end result. The technology also incorporates hot spots. Hence, this serious game position individually in a shop without the existence of an avatar and the user can view the virtual environment through a first person perspective and can navigate inside the store. In addition, the user is able to pose questions and he can receive real time advice and information by chatting with a seller. These offer the opportunity to the user to zoom in on different product ranges, creating engagement with the brand and go through the ultimate in customer experience" (commercial report O4).

During the time the Virtual Tour Guide was under development, a leading automotive company was interested in improving their online customer service and increasing sales, and they were considering visualising their showroom, so they approached the members of Orora to discuss the realisation of their idea. Chris, the project manager of Orora, explained how the automotive company approached Orora and gave his view for the reasons such a product is considered to be a serious game. Chris, said, "Virtual games that simulate a real environment help their potential customers make the mental leap that they don't need to go to a simulation company. People realise that video games can bridge the gap in those aspects, those individuals

would come to us and they are nearly knocking our door to say could you apply the fidelity the production values of a video game to be posit in a serious game? In my head there is no difference between a serious game with the traditional meaning, we struggle with the words games, serious games, and simulators and I struggle with the difference actually with how the offerings differ".

For 'Car Insight' the members of Orora worked closely with the automotive company to develop this premium visualisation of their showroom. They had to make clear "the scope of the project, the platform they would like to build it on, the style and theme but also the time [we need] to deliver the game" as Tony, the CEO of Orora, explained. Meanwhile, many sequential meetings were taking place between the members, and they were attempting to make decisions around the features and the usefulness of the game. Richard, the lead game designer of the company stated, "There is always tension, hopefully constructive tension between the technical guys, the artist and then the commercial guys. And it's really good. Sometimes it's terrible but it's always there. It's the same here. So I look at something with a purely commercial set of eyes and I think it's fantastic. Richard looks at it or Peter looks it from a development perspective and hates it. The other finance person looks at it from a purely ROI point of view." He also explained the process they were following to make final decisions, "We have what we call a green light committee. So every new opportunity that we want to do, we come in and whether it's me or Sandy or one of Sandy's team, we have to present it and then we make a decision. Tony has the final vote. So that's now part of the process by which we assess and we discuss and we review what projects we go. And in reality, you have to leave your preconceptions at the door when you come in and act constructively and creatively, you may hate an idea but, you know, you just have to forget that [...] and that's the way that we approach things.". Orora created a world of stunning 3D, high fidelity landscapes, architectures and environments, and the project was delivered quickly and met all specifications in the field of visualisation.

During the last stages, the members of Orora demonstrated the final version of 'Car Insight' to the executives of the automotive company and explained to them how this would attract more customers. Chris, the project manager of Orora explained, "Having been at the forefront of cutting edge technology in the sector, we utilised the technology to generate computer graphics that are placed in the vision of the user through their mobile phones or tablets to offer a snapshot of the future of the perfect transaction". Alan, the software engineer, added that "By providing a glimpse into the future this technology provided the ultimate benchmark to further aid the company's global outreach and it is in line with their vision of a community of fans [of the automotive company]." The members of Orora were confident that their serious game would contribute to the increase in sales of the automotive company.

The development process of 'Real Driver'

The third game that was developed at the time of my fieldwork in Orora was 'Real Driver'. It is a serious game that offers an unrivalled and immersive simulation experience of different cars. The aim of this serious game is to train basic physical car driving skills, educate the users how to drive though signalled and unsupervised crossings and enhance their retention rate to remember road signs and traffic lane markings. In particular, the members of the company have been working to create an effective simulation game that could train the users on parking and manoeuvres, they could learn how to avoid and recognise hazards and finally they could benefitted by immersive learning about the dangers of driving whilst intoxicated. The cooperation with experts was crucial for the development of this game.

The game is featuring the world's first 180 degree, spherical projector screen and variable driving position cockpit, completed with different seating and console configurations. It also houses three cameras and three projectors all of them immersed in a single screen so it is a stunning, high performance simulator that can simulate any vehicle. Some of the features of 'Real Drive' include 6 or 7 million pixel options, 220 degree horizontal and 65

degree vertical field of view (FOV), the interior renders of any vehicle on the screen creating a real life feeling. Last, it operates in high frequency and low amplitude motion in the 3HZ to 10Hz. I now proceed to describe how the development process of 'Real Driver' evolved.

During the development of 'Car Insight' the members of Orora initiated market research to explore the different industries to which serious games could be applied, in addition to the needs of the potential emerging markets. They observed that an increase in sales of large and more luxurious cars is expected, and customers' behaviour is deemed to change because "the online presence is becoming vital and all the more consumers are using the Internet to help choose their cars" (doc31). Meanwhile, they started contacting potential customers to attempt to learn from their experiences and from their individual backgrounds, so as to assess the market potential and identify the pressure points of their potential customers. By definition, they came up with the idea of a simulator to bring a fresh and innovative approach to imitating driving. Tony, the CEO of Orora, claimed "Primarily the business meets with the industry part to identify a particular need or a business that they think that would be applicable to video games and starts align".

However, there is an important difference in the development process of 'Real Driver' compared to the development process of 'Car Insight'; this was not a bespoke serious game and as such it involved higher risk in terms of its commercialisation. The members of Orora had the vision of developing a high performance game, but this would be expensive. They came in contact with potential customers from the sector with the aim of signing an up-front contract for the development of the serious game in order to commission the project. Chris, the project manager, explained, "When I am involved and the budgets are small I am looking for an existing idea that could be repurposed with a more serious role. Therefore, when the budgets are big then you have to be very creative as well, you have to find out what is needed, what you want to sell and then we work back and say we can do this, we can do that and then we provide them with creative solutions so it's not just selling, its solutions." He pointed out, "There is no point of

developing something and then hoping that someone buys it. It's much better to develop something for a customer, re-skin it and then sell it to another customer".

When the members of Orora pursued the development they had not yet managed to find a customer, and due to this they changed their initial idea and widened the scope while they tightened the concept. More specifically, they decided to develop a driving simulator that would be beneficial to the emergency services, train-drivers, medical staff, and company car drivers, while ensuring drivers learn the vital skills to operate their vehicle safely and effectively. The main objectives were to train basic physical car driving skills, learn how to drive though signalled and unsupervised crossings, remember road signs and traffic lane markings, learn to park and perform manoeuvres, learn how to avoid and recognise hazards, and also understand the dangers of driving whilst intoxicated. The developers decided on the incorporation of minor motion movements within a 180 degree blended screen, while having the ability to insert a variety of driving and flight scenarios. The members of Orora were very passionate about making an impact on people's lives using this game technology, and they thought that the benefits for consumers would be countless, as Eddy, the business development director of Orora explained and highlighted, "We consider this as a developing opportunity that will add real value to our product portfolio"

At the marketing stage the members of Orora were attempting to approach customers and capitalise on their presales activities. At the time I finalised the data collection the members of Orora were negotiating with the army, and also with the fire services of another European country.

4.4 Summary

The above chapter described the empirical setting of serious game context and the data collected within two serious game development companies pertaining to the development process of six game projects. The cases focused on the evolutionary process of the games'

development. Although they do not exceed a standardised process, I observed that in both cases the original idea for the project started with a very generic concept, without clear idea of the market potential, a lack of clear business model and business strategy. Thus, the product development was based on the effort of the developers to probe and visualise possible usages and market opportunities through the launch of an innovation within the existing budget and technological capabilities.

In the following chapter I will further describe my interpretation of the empirical material, along with the findings. I aim to understand the trajectory of design choices concerning the features built into the game, their interrelationship, the interplay between the perceptions of the actors involved throughout the development process and lastly, the reconciliation of multiple fragmented values leading to value propositions and resulting in plausible rationales out of uncertainty.

Chapter 5: Empirical findings and Analysis

5.1 Introduction

As described in the data analysis section of Chapter 3 (3.8) for the analysis of the empirical material, first, I identified the sequential order of the key events throughout the development process of each project and across each site (and I focused on the constant recurrence of the local development practices). Following on the previous chapter where I described the development process of the case site companies, QueGames and Orora that provided in depth understanding, in this chapter I aim to provide an interpretation of the empirical material and the three analytical themes that emerged during the analysis. Namely: (a) the interplay between the features and the justificatory arrangements, (b) the emerging value elements which condition value configurations, and (c) the articulation of an adaptive value proposition which evolves along the development process. As also explained in section 3.8, the themes map onto the key stages of the analysis and coding process.

In particular, first, I focused on tracing the perceptions of value of the actors involved in the development process, the trajectory of the design choices and the interplay between the features along the evolution of the development process. In this chapter, I map onto the first analytical theme and the interplay between the features and the justifications of the design choices. Later, as I described in a former chapter (section 3.8.1), I sought the justificatory arrangements to identify a range of abstracted value elements. At the same time, I sought to identify how the value configurations re-shape throughout the development process and in this chapter I will illustrate how I mapped this onto my second analytical theme; the emerging value elements which condition value configurations. Finally, I drew on the justificatory regimes as sensitising concepts (Nicolini 2009, Walsham 1995) with the intention to understand the mutual adjustment and reconciliation between value elements, orders of worth, value configurations and value propositions. These map onto my last emergent analytical theme

related to the articulation of an adaptive value proposition which evolves along the development process.

5.2 QueGames: The interplay between the features of 'Fire' and justifications of the design choices

As described in the previous chapter (section 4.4), in the first case site company, QueGames, the members were pursuing the development of each game with sequential order. Different scenarios with specific learning goals constituted the games. For example, for 'Fire', the game begins in a virtual setting of a common kitchen in a house and the player takes part in the game. The player participates in first person and is represented as an avatar. The player has to extinguish an unexpected fire in the kitchen by making a decision concerning the "tool" to use or the "way" to achieve the desired outcome. The reactions of the player receive immediate feedback since the decisions increase or decrease the score of the player. The concept was fuzzy initially and the developers were trying to figure out what it was they wanted to achieve and how to develop it.

Having a specific budget tied to the technological infrastructure for the development of the game, the developers had only a blurred outlook of the objectives of the game, the instructional design and the appropriate technological features to flash out all that knowledge which would be part of the game. Both the objectives and usefulness along with the technological considerations of the game were not easy to be pre-specified clearly. For example, Alex (the designer, artist and animator of QueGames) explained they were often starting a new product concept with uncertainty whether they "had something to get across". Therefore, when the project team of QueGames began the development; it set in motion a trajectory of evaluations during which they were attempting to decide which technological features were more appropriate for the development of such a game. For instance, they were debating if 3D models and animations would be better for the game in comparison to 2D. As such, they decided

to create 3D animations and models “in-house” using Autodesk Maya. They could re-use common assets/code for the simple development of additional fire safety scenarios and that was decreasing their cost of development as this was an animation software package they already had.

Furthermore, 3D features were offering more realistic setting and the users would be “actively engaged with something that’s fun and entertaining” according to Peter, programmer in the company. According to Nick, the software engineer of the company, 3D features were also considered as more “effective means of promoting interactivity and active learning”. Real-time shadows were possible using the Unity Pro game engine (the software that interacts with the target platform’s hardware), which, was an existing game technology in the company, but also was offering compatibility with Adobe Photoshop 2D images. “Baked shadows [were incorporated] to give a more realistic feel to the game without compromising the rendering speed explained Josh, the graphic designer and artist of Orora. “Although virtual environments could successfully support training for proper fire evacuations within 3D virtual buildings, developing the required virtual environments is often difficult, time consuming, and can be expensive”, he continued.

The aforementioned decision created ramifications concerning other features intertwined with the use of 3D assets. For instance, their existing agreement on features was creating considerations about the plug-ins and the scripts they had to accommodate. As Peter, the company’s programmer noted “we decided if we have to buy a small plug-in or buy a server and do all the work on setting up” which was creating issues about the compatibility between the features as well as the cost. “Real-time shadows provide a more realistic feel to the game. […] Also, embeddable scripts are a highly effective means of promoting interactivity and active learning […]”, he continued. However, the members of QueGames decided to incorporate baked-in shadows because these would give a more realistic feel to the game without compromising rendering speed. They added more realism with real-time shadows to several objects such as

the player's hand or objects like the cup of water, or the box of baking soda. Nick, the software engineer also explained that Adobe Photoshop and Unity Pro's particle systems were appropriate tools for the creation of effects such as smoke, fire, water, and the fire extinguisher's smothering material. Consequently, 'Fire' would employ various particle systems for the animation and behaviour. Moreover, Josh, QueGames' graphic designer and artist, explained that later during the development they were trying to decide whether they should employ sensors and mapping tools. They ended up using maps on objects such as the player's hand because "they would be created with Autodesk Mudbox and not with ZBrush because it could bring in base meshes from Maya" claimed Nick, the software engineer in QueGames. At the same time he highlighted that Mudbox and the other Autodesk applications could be easily integrated.

In the meantime, the members of the QueGames were negotiating around other features related to the use of the game. For instance, they were trying to specify whether the game should be PC-based, on a console, or online; or whether one or more players should play it at the same time. Each feature was interrelated with other technological features to support this way of development. For example: the use of one or more avatars was creating new negotiations around whether the avatar(s) would take a 3D or 2D form; if they would be driven by artificial intelligence or real life representation (human); and how they could save considerable development time, cost, and resources for this asset. It was difficult for them to reach an agreement and as Andy, the company's project manager, noticed, "everyone was coming from another angle for the development" making it hard to come to decisions. In the end, they decided to employ 3D avatars as human representation of hands to ensure higher user involvement and greater retention of learning concepts. Peter, the programmer in QueGames, claimed "our motivation for doing so was the fact that although virtual environments can successfully support training for proper fire evacuations within 3D virtual buildings, developing the required virtual environments is difficult, time consuming, and can be expensive. Using the developed prototyping system over a three week period, a single developer constructed a

realistic model of a real-world building and conducted an experiment with human participants to evaluate its use in a fire drill evacuation scenario. Participants found the simulation realistic but their performance was dependent on prior gaming experience.". Meanwhile, at the time the development process was evolving the developers of QueGames also presented the first demo of the game to executives from the local fire services and the offering was accompanied with their perceptions about the effectiveness *of* 'Fire'. The developers were attempting to obtain feedback regarding the user's interface, including the colours, sounds, and to gauge the potential changes they could make. Consequently, they decided to make changes to increase the effectiveness of the game and they decided that the incorporation of a custom fire spreading system would be the most appropriate change. Peter, the programmer in QueGames explained how they operationalised this change; "Blocks placed around each level and each block has a material with certain temperature value. The fire spreads by heating up adjacent blocks. If the heat associated with the fire reaches a threshold, the fire will spread. The material of the block determines the threshold. For example, granite has a very high threshold while for wood is much lower". Furthermore, the changes in relation to the artistic elements, were also forcing the members of the team to review their decisions concerning the technological features while they were constantly challenging previous agreements for the objectives. Josh, the graphic designer and artist provided an insightful example: "All of the models were created "in-house" using Autodesk Maya and we also created all the objects used by the player, the player's hand, and the kitchen itself using Autodesk Maya. So all the models were cheap, all textured using textures made with Adobe Photoshop and some shader effects like the fridge, which uses a cube map for reflection on a simple grey texture. Later, we applied a refraction shader to the water glass and the cupboards, details that were adding value."

New issues regarding the content, the gameplay and the instructional design were surfacing and consequently, this was conditioning reviews of the existing features and new justificatory arrangements related to the engagement of the user and the interactivity. Nick, the software engineer of Orora explained: "With this really new way which is informed by both

pedagogical and game-like, fun elements we aim to engage kids and why not their parents so they can actually learn more with very high retention rate, the gameplay is deemed to change people's mind-sets. The game utilizes computer graphic techniques to simulate physiological responses to stress, heat, and toxic fume inhalation to create an engaging and stimulating alternative to the traditional and mundane incident response training techniques". However, the members of QueGames had to evaluate their decision to pursue changes because "adding a lot of new content does take a lot of time, but it is certainly something that we can do and even smaller changes when it is good idea. For example, arranging buttons along the side of the screen so they are visible on laptops are marked on the main map in a way that gets noticed. In general, usability is a critical concern for game-based learning interventions. We should be aware that textual content more used to characters in games being voiced, is often overlooked or ignored by children".

The following table shows a sample of my analysis of the empirical material from QueGames. The table demonstrates the development choices and the sub-choices of features of the game together with, the justifications associated with them. Moreover, the table shows the different notions of value which emerge from the justificatory arrangements pertaining reconciliations of value elements.

Design Choices	Design Sub choices	QueGames Justification of design choices	Value elements
3D or 2D		"So from my experience you can make a game with lot of information but if it is not entertaining it is going to fail and if we add mechanics to a certain successful product to commercialize it to another market then it can be less entertaining, so we should be careful" "There is always a conflict between the instructional designers and the game designers because we have to flash out all that knowledge which will be part of the game and keep the users actively engaged with something that's fun and entertaining." "Although virtual environments can successfully support training for proper fire evacuations within 3D virtual buildings, developing the required virtual environments is difficult, time consuming, and can be expensive" "The lack of awareness about common household fire safety practices and procedures and the ineffectiveness of the public education programs" "Virtual reality has been noted as a highly effective means of promoting interactivity and active learning"	Realism, visualisation, intuitive interface, fidelity, easy to create and manage art assets, cost, entertaining, fun, learning environment, interactivity, active learning, social impact, users' engagement, enhancing knowledge, proper training, awareness practices, effective education
	Game engine	"Baked-in shadows (were incorporated) to give a more realistic feel to the game without compromising rendering speed" "Real-time shadows to provide a more realistic feel to the game. Real-	Realistic settings, compatibility with platforms, less cost and effort, increased performance and processing capacity and video memory, realistic

	time shadows are accomplished using the Unity Pro game engine"	and attractive effects, commercial or freeware game engine
Models, textures and animations	"All of the models and animations in the game were created "in-house" using Autodesk Maya." "If the game runs too slowly, we reduce the number of objects to improve performance, which in turn has affects the realistic settings."	Visualisation, realism, fidelity, compatibility supported by the game engine (pc-based, console, tablet, mobile phones), user engagement, quality action, low memory requirements, easy integration of characters, fun, enhance transfer of knowledge and skills, gain experience, efficacy and effectiveness, visual effects, rich details
Plug-ins	"If we have to buy a small plug-in or buy a server and do all the work on setting up" "The way to integrate the subject matter and the knowledge within the game that is actually entertaining and people want to go back is a big challenge and there are changes all the time, for the x (name of the game) there were not questions and explicit content but we decided to add specific questions (use of plug-in) later and we changed the design a lot in the middle of the project because we could gain some benefit from that, a more specific aspect based on what we wanted to achieve." "we estimated the "number of users were going to buy it, the number of previous serious games have sold within the market […] and again	Intuitive interface, assessment (for the user), feedback, complex environments full of detail, transfer of knowledge and skills, art, powerful and fast plug in, cost, explicit content, integration with code

		how role mechanics play, if it's something new or more established, if we had to buy a plug in or a server" "plug-ins support to integrate with existing game code"	
	Scripts and algorithms	"The algorithms were developed in C++ to communicate with the game engine and the scripts for the objects and sound […] to make possible the loading of the scripts. The algorithms were embedded into the game engine to enable 3D graphics" "We focus on the integration of these different tools (scripts of game components' behaviors) in the game so that personalized feedback can be given during game play." "Embeddable scripts are a highly effective means of promoting interactivity and active learning."	Immersive knowledge, assessment (for the user), feedback, personalization, scripts to create high-quality reflective settings, interesting, transfer of knowledge and skills, dynamic game, compatibility and integration of tools
Sensors/ Sensor interface or without Sensors/ Sensor interface		"[…] games which offer an "experiential" educational experience offer immersive knowledge." "To enhance transfer of knowledge and skills to real life situations management we also incorporate explicit methods of learning in the form of a "game within a game" "[…] sensors […] keep users actively engaged and create differentiated gaming experiences." "[…] If they spend x amount, it should have an obvious impact or social impact"	Interaction between game and user, adaptive environment, personalized user experience, connect players to the game in deeper, more meaningful way, cost, actively control the sensor to enhance features and mechanics of the game, safety and security, enhance transfer of knowledge and skills, reflexive

	Bio-sensors	"Powerful input devices, imagine your entire body being immersed, the user is accustomed to manipulating the real world." "[…] what this game is going to teach people and get content experts on our team to help us basically to flash out all that knowledge which will be part of the game, actions effects for the establishment of user states"	Attention levels, master instincts, user engagement and interaction, cost, immersive knowledge, educational, interaction, monitoring and immediate feedback
	Brainwave sensor technology **or** gloves	"Designed to be used with the Neurosky MindWave, a brainwave sensor technology that accurately measures mental states such as meditation and attention levels." "[…] less encumbering than full body suits or gloves"	Measure mental states (such as meditation and stress), cost, Immersive knowledge, efficient and effective, control fear to harness, hands on experience, interaction between game and user, personalization, interaction levels, exciting
Mapping tools or without Mapping tools		"It is ideal for those struggling to understand complex issues, make important decisions or even learn something new" "A decision that can lead to another decision that do better making decisions and they are faster on making decisions and really make some those good decisions in real life" "[…] information turns it into valuable, actionable knowledge to enable […] insight to occur"	Visual user experience, knowledge rich canvas, rich data sources, compatibility, cost, make decisions, manage their knowledge, increase level of awareness, enhance transfer of knowledge and skills, real life decisions, motivating, valuable and actionable knowledge, visual experience, intuitive and collaborative

Table 5.1: The justifications of value of design choices and the reconciliations of value elements at QueGames.

5.3 Orora: The interplay between the features of 'Virtual Tour Guide' (VTG) and the justifications of the design choices

As described in the previous chapter Orora focused on designing novel "bespoke" solutions to new customers, and modifying exiting products targeting at customers in different industrial sectors. For example, 'Virtual Tour Guide' the game developed by Orora offers a virtual 'human' representation (avatar) of an interactive tourist guide. The game was initially designed for tourism industry to promote and enhance a visitor's experience in tourist attractions. The avatar has capabilities to interact with the users through their mobile phones or tablets while the game incorporates augmented reality in order to offer the user a virtual tour guide by scanning the QR codes located in various areas around the attractions.

Despite all the aforementioned contrasts as for the setup of the companies and the games developed, in Orora the members were facing challenges to assess the market potential for their products, at the same time, the usage of their games was not fully known and the use and business values were constantly contested. Moreover, similar to QueGames, development at Orora was characterized by a series of design choices concerning the game's features that were more appropriate to include. Eddy, the business development director at Orora claimed that the product started as a 'hobby product', without committing much new resources, but later the idea of becoming 'serious product' started evolving due to the constant interaction of the members of the senior team and their views concerning the possibilities to commercialize it. Since the original idea of the project started with a very generic concept, without a clear idea of the market or a request from customers, the product development was based on their effort in probing and visioning possible usages and market opportunities through the launching of an innovative serious game within the existing tight budget and technological capabilities.

At the early stages of the development process the members of Orora were aware of the key issues with serious games. These issues were obvious for 'VTG' and they were challenging the successful commercialization of the game since their idea could create misconceptions

regarding the use and effectiveness of this serious game. In other words, the aim of the game had direct impact on the elements of the game. Chris, the project manager at Orora was describing the difficulties they were facing to create a common rationale at the beginning and while the idea was very vague. He also highlighted that with a blurred outlook of the objectives of the game and the instructional design, they were struggling to identify the appropriate technological features to flash out all that knowledge which would be part of the game and this was leading to their concerns about the perceived usefulness and effectiveness by the potential customers. For this reason, a trajectory was triggered with constant evaluations of the members of Orora who were attempting to decide which technological features were more appropriate. Every time the members of Orora were making decisions, they were keeping notes in the 'concept document' and their agreements were accompanied with the 'green light', which was the approval for the evolution of the project.

One of the important decisions the members of Orora made at the early stages of the development process was for the creation of an avatar and the agreement over the option to incorporate only the voice of a virtual tour guide within a virtual environment or an alter ego character. They decided to use an avatar because were considering that people can relate to that and it is an interactive way of engaging the users. Alf, the studio's graphic designer and artist, explained that an avatar "it is actually them [users]. It's kind of representation of them. So it kind of engages you [as a user] more and that's why we used an avatar and that's what a lot of people find very engaging". To elaborate, Alf the studio's graphic designer and artist also explained that they decided to incorporate an avatar because this would offer an "interactive way of engaging with key stakeholders and encourage visitors to spend within the area increasing the revenues [for the attractions foundation] and contributing to the local economy". However, their decision to incorporate an avatar was creating complications related to the game engine. They needed an appropriate game engine given to their decision to 'write' a 3D avatar and their justification for a serious game for multiple platforms, iOS and Android for both phones and tablets. Allan, the software engineer in Orora offered a very insightful description

related to their decision for the game engine and the dynamics between this and the sub choices: “it depends on the requirements. So it depends on the message we're trying to send, so in the case of Virtual Tour Guide, a mobile app. Some engines that maybe, a company uses to make PlayStation or Xbox games, would be relevant to that. Those engines are not available for games on mobile platforms. And it would be difficult to get them, even if they were, there're costs behind using those game engines, so often we have to pay across to the license to engines to use it. Unity is a very good engine because for us it's cross-platform. It is available on a lot of platforms. If you want you can license it for PlayStation 3 or for Xbox 360 but more generally people just use it for PC games and for iOS and android so it's for phone games. And it's very affordable, but even though it's affordable it's also particularly good. It has got a very good interface. It makes it very easy for us to develop with it. And that means we can do things very quickly. It's very quick for us to get something working using this engine. There are a lot of positive points with Unity. It's a great popular engine now.”

Peter, Orora’s programmer, highlighted the complications and the importance of the aforementioned decisions for the continuation of the project “we have to decide how many, polygons, how many objects, 3D objects you can show on the screen. If we are to do a 3d game for your iPhone, we would have to say, it's probably limited, and maybe we can show 5,000 polygons. So we design a person and we have a female character in the game and you've [user has] got to control the female character, she would have to be quite low poly, quite low polygon for her to work on the iPhone. And we would choose a very simple method of what we call texturing which is putting on the images on to the model and then we would use small programs called shade-up programs. So that's where a lot of the cost comes from.”.

Thereafter, they examined the incorporation of a headset but they decided that it would exceed their budget. Because of its high cost but also because the technology they could use would render the speed of the game, then the game would not be attractive and engaging for the users. Leo, studio’s designer, explained “someone would say it's like the matrix and you could be

in it and you can have anything you want in there. And this is great but the reality is actually its quite heavy to wear, a little bit heavy to wear and it strains your eyes. It makes you very tired from using it." . However, the actors involved at that time in the development of VTG, decided to use QR codes that could be easily scanned by the users. Hence, this would be useful to increase the interactivity and encompass the benefits of GPS functionality that would create awareness of visitors' destination and would increase the footfall.

Moreover, they agreed that the use of such features could attract the interest of the visitors by differentiating at the same time the game from the ordinary technological artefacts that are already provided in tourist attractions. The members of Orora decided that the visualization would be flexible across multi-platforms like mobile and tablet devices and through the intranet or a web browser making it suitable for a wide range of applications. Nevertheless, the incorporation of a dialogue system created additional complications. The strong dependencies on the previous decisions and the requirements for compatibility with the other features without compromising the functionality of the game were contesting the existing justifications.

During the development process, they were considering different features they could embody to the game so as to "to put value to this, to move this [Virtual Tour Guide] from being anecdotal evidence to something that we can put numbers to." claimed Eddy, the business development director. They agreed that innovative techniques could be combined with panoramic photography, 3D modelling and video sequences to produce a very high quality end result. They developed as well 3D representation of the environment because it would add realism and their potential customers would be more interested for very real life representation of the heritage and Alf, the graphic designer and artist in Orora explained "this cutting edge 3d technology could offer memorable tour enhancing their [visitors'] experience, to capture all the useful information that would otherwise require much time and the representation of buildings that do not exist anymore would require money and time". According to Allan, Orora's software

engineer “3D technology could offer memorable tour enhancing their [visitors’] experience, to capture all the useful information that would otherwise require much time. And the representation of buildings that do not exist anymore would require money and time”. Furthermore, Alf, the graphic designer and artist at Orora, claimed that “If you put an avatar in there, that’s going to make people want to repeat the process, learn more. And we all know, the more you do something, it becomes a muscle memory”.

Later, they also decided to incorporate features that would enable users to take their own “selfies” with the avatar through augmented photography and print them to the bookstore of the tourist attraction offering as such promising returns of investment since the users would find it fun and they would like to have a personalized souvenir. The members of Orora also decided that this function would add value to the game because such a function would be of heritages’ interest because it could increase their returns of investment.

The following table shows a sample of our analysis of the empirical material from Orora. Similar to the Table 5.1 the following table demonstrates the development choices and the sub-choices of features for the ‘Virtual Tour Guide’ together with, the justifications associated with them and the different notions of value which emerge from the justificatory arrangements pertaining reconciliations of value elements.

Design Choices	Design Sub choices	Orora Justification of design choices	Value elements
Avatar or voice-based interaction		"An avatar is very helpful to people, they can relate to that." "It [avatar] gives you somewhat more of a personalization approach… They [users] relate to the actual product. They [users] actually think that, 'Okay, I can customize this.' Or 'I can kind of imagine this being me.' " "They will see that, 'Okay, the avatar is doing this. This is going to be the process.' So, it's actually them. It's kind of a representation of them. So, it kind of engages you more and that's why we use avatars and that's what a lot of people find very engaging." "People need to lower your barriers, accept this new way of learning and then repeat it over and over and over again in a fun and engaging manner. So that's why we use avatars" "If you put an avatar in there, that's going to make people want to repeat the process, learn more. And we all know, the more you do something, it becomes a muscle memory" "So, you'll probably recognize this, Confucius, I mean, he's sort of the smartest man and he said, 'I hear, I forget. I see, I remember. I do, and I understand.' So that's basically why we like to use the more engaging, selecting the avatar. You're actually doing something like an interactive tour"	Engage the user, attains skills proficiencies, confidence to the user, retention, user expresses his personality, personalization, active learning, immersive knowledge, knowledge retention, valuable knowledge

	"They [potential customers] gain 50% more knowledge retention for their employees and better skilled and the money that they invested into training, they're actually getting that back."	
3D or 2D	"So, even if you spend a bit more money (for 3D), you gain a lot more value from your cost. You get a little ROI but also, you have your human capital. Your employees or whoever they might be. Their [users'] skills are increased. So that you up-skill them and that's going to provide a lot longer benefit to you in terms of your business and what they provide - their output within your business. So I think that really does offset the costs quite easily and quite dramatically for companies" "It' hard to make changes like you know, just add a feature. Because if you just add a feature maybe it breaks the way the game works and some kind of times it can, it can cause lots of technical problems to make that change because you don't have the artwork. So if you certainly have to add guns you don't have the artwork to show how the characters when they are shot respond. And with 3d takes time to make changes" "So obviously render takes time – to render something up in 3D. So would they [potential customers] prefer to spend that money on making something look good or would they want to spend that money on more of the game play elements? […] Whereas in this case there's no point doing 3D environments because when that person has to then go and physically do something around the area, it's not going to look the same. So there's no real point developing that whole 3D model. You're better off focusing on the actual content."	Higher the retention rate, realism, real-life, detail, enthusiasm, level of experience, fun, quality, attract interest, knowledge retention, cost, ROI, time consuming
Headset or QR codes	"It [headset] puts you inside the virtual world […], it's very impressive and when you move your head it accurately reflects why you're looking	Interactive, enhances the experience, link real and virtual,

	in the virtual world it's actually like you're there. […] Someone would say it's like the matrix and you could be in it and you can have anything you want in there. And this is great but the reality is actually its quite heavy to wear, a little bit heavy to wear and it strains your eyes. It makes you very tired from using it." "This headset though, it's very low resolution so the display, it's like, you know when you get very close to the old television, the old TVs and you get very, very close and you can see the red, the green, the blue, the pixels." " It's [QR codes] a small tag it looks like a clothing tag something you know, very small. And they're quite cheap and you can place these anywhere." "That's nice … if we can get someone to pay us for a project to use it"	cost, engage the users, simple usage, user friendly, increase level of awareness, enhance transfer of knowledge
Game engine	"We can use Unity to provide that [make sure that you can play the game on your phone] but it depends on the [potential customer] audience." "We spent about 6 months making these simulations" "[…] is 2d on top of the 3d. So we can mix and match the two depending on what's needed with Unity" "it is a very good engine because for us [developers] it's cross-platform and it's very affordable, but even though it's affordable it's also particularly good. It's got a very good interface. It makes it very easy for	Compatibility with platforms, supports both 2d and 3d, supports 3d applications, compatibility, advanced graphical capabilities, cost, realistic physics, intuitive design

	us to develop with it and that means we can do things very quickly. There are a lot of positive points with, so you can do 2d or 3d but very sexy 3d."	
Textures and animations	"We've made a version of this game using this leap motion and we tried this but it's very, very difficult." " […] it is done very cheaply. And for this we just use textures. So we use textures with baked, baked shadows. […] but it works quite well. It's realistic, it looks good because the image is a high quality image that has been used." "[…] a very simple method of what we call texturing which is putting on the images on to the model and then we would use small programs called shade-up programs. So that's where a lot of the cost comes from."	Photorealistic graphics, better simulation, realistic, specialized texture, rich information, interactivity, art, cost, motivating, visual experience, intuitive

Table 5.2: The justifications of value of design choices and the reconciliations of value elements at Orora.

Having analysed the empirical material from the perspective of the interplay between the features of the game and justifications of the design choices, I will now precede the analysis with a focus on the multiple value elements which emerge during the development process and condition value configurations.

5.4 The emergence of value elements and the value configurations in QueGames

During the early stages of the development process and while their idea was very fuzzy the members of QueGames were trying to justify the potential usefulness of the game and to create rationales of whether the game can create, deliver or capture value. At the same time there was not a clear idea of the game and the market potential. Within this complex and uncertain context they were constantly attempting to evaluate the game in terms of productivity and effectiveness by comparing the game with other similar. Aiming to make the idea of the project more precise, they brought forth the issue of the high annual expenses for the fire services department in order to raise the fire safety awareness of the citizens. At the same time they pointed out the implementation of the serious game as a means to reduce the repetitive annual expenses for public education programs and to increase the engagement and awareness of the players so as to develop their skills. This is illustrated by the following quote from Nick, the responsible for software engineering in QueGames: "The Emergency & Fire Services department maintains an active public education program aimed at raising fire safety awareness and educating the public on basic fire safety and prevention skills. Although these educational efforts can be effective, the cost for the Emergency & Fire Services is high but the effectiveness limited since they do not involve "hands-on" skill development and first-hand experience" (software engineer in QueGames).

At the stage of development, the consistency of the prior agreement regarding the different forms of value emerging from the decisions of the members of QueGames was contested. New decisions were made and the new justificatory arrangements related to the

design choices were bringing light on new value elements. One of the interviewees stated "at this stage, we had a better understanding why the game was beneficial" (Andy, the project manager in QueGames). In that, the need to increase the creativity, entertainment was gaining importance and their decision as for the features of the game were in line with this need. While the developers in QueGames were attempting to make a decision as for the most appropriate features to enhance creativity and entertainment, more value elements surfaced changing again the configuration of the value elements. Meanwhile, this was a complex stage because the perceptions of the developers associated with the educational aspects that surrounded the game ware creating new trials of justifications of design choices leading to new value elements with direct impact to the value configurations.

In parallel, the decision concerning the main purpose of the game as well as the means to achieve it was interrelated with the evaluation of the game. The importance of the effectiveness of the game and the increase of the players' productivity and the employment of game mechanics in the workplace were specifying the value of the game. Andy, QueGames' project manager in his interview claimed "We had to be certain concerning the target of the serious game and at the same time to frame our ideas in order to develop a serious game and not just a game. […] The game design should focus on the users' experiences, the effective game story and the human – computer interaction but there was a lot of potential to be encountered and several opportunities to be explored".

The decision concerning the features of game had an immediate impact on the monetary sacrifice for Orora for the continuation of the development of the project. On the other hand, the commercialisation was not always leading factor for their decisions and for the articulation of the value proposition. Moreover, while the developers in QueGames were struggling to provide a holistic understanding for their offering, they involved some trials that would report whether the game could meet the purpose for which it was developed. The results from the trials were used to support their proposition.

The following table describes a few examples, at QueGames, of how the abstracted reconciliations led to emergent value elements that can be categorized under 'set of values' associated with the mutual adjustment and reconciliation between value elements, orders of worth, and value proposition. Analysing the empirical account in the way illustrated in Figure 3.2, I looked the value elements and I sought to cluster similar notions of value under groups that induced from the sensitising concepts and the value elements.

QueGames			
Design Choices	**Value elements**	**Clustering of value elements**	**Clusters**
3D or 2D	Realism, visualisation, intuitive interface, fidelity, easy to create and manage art assets, cost(3d), entertaining, fun, learning environment, interactivity, active learning, social impact, users' engagement, enhancing knowledge, proper training, awareness practices, effective education	Entertaining, fun, interactivity	Functionality
		Learning environment, active learning, enhancing knowledge, proper training, awareness practices, effective education	Industrial
		Realism, visualisation, intuitive interface, entertaining fidelity	Quality
		Social impact, users' engagement	Civic
		Easy to create and manage art assets	Performance
		Cost(3d)	Market
Game engine	Realistic settings, compatibility with platforms, less cost and effort, increased performance and processing capacity and video memory, realistic and attractive effects, commercial or freeware game engine	-	Functionality
		-	Industrial
		Realistic and attractive effects, realistic settings	Quality
		-	Civic
		Compatibility with platforms, increased performance and processing capacity and video memory	Performance

		Less cost and effort, commercial or freeware game engine	Market
Models, textures and animations	Visualisation, realism, fidelity, compatibility supported by the game engine (pc-based, console, tablet, mobile phones), user engagement, quality action, low memory requirements, easy integration of characters, fun, enhance transfer of knowledge and skills, gain experience, efficacy and effectiveness, visual effects, rich details, engagement	Enhance transfer of knowledge and skills, engagement	Functionality
		Quality action, gain experience, efficacy and effectiveness	Industrial
		Visualisation, realism, fidelity, fun, visual effects, rich details	Quality
		User engagement	Civic
		Compatibility supported by the game engine (pc-based, console, tablet, mobile phones), low memory requirements, easy integration of characters	Performance
		Cost (time consuming)	Market
Plug-ins	Intuitive interface, assessment (for the user), feedback, complex environments full of detail, transfer of knowledge and skills, art, powerful plug-in, fast plug in, cost, explicit content, integration with c	Transfer of knowledge and skills	Functionality
		Assessment (for the user), feedback	Industrial
		Intuitive interface, complex environments full of detail, art, explicit content	Quality
		-	Civic
		Powerful plug-in, fast plug in, integration with C	Performance
		Cost(plug-in)	Market
Scripts and algorithms	Immersive knowledge, assessment (for the user), feedback, personalization, high-quality & reflective settings, users' feedback, interesting, transfer of knowledge and skills, dynamic game, compatibility and integration of tools	Immersive knowledge, personalization, interesting, transfer of knowledge and skills	Functionality
		Assessment (for the user), feedback	Industrial
		High-quality & reflective settings, dynamic game	Quality
		Users' feedback	Civic
		Compatibility and integration of tools	Performance
			Market
Sensors/ Sensor interface or without Sensors/ Sensor interface	Interaction between game and user, adaptive environment, personalized user experience, connect players to the game in deeper & more meaningful way, cost, actively control the sensor to enhance features and mechanics of the game, safety and security, enhance transfer of knowledge and skills, reflexive, connects one player, connectivity	Interaction between game and user, personalized user experience, enhance transfer of knowledge and skills	Functionality
		Safety and security	Industrial
		Adaptive environment, connect players to the game in deeper & more meaningful way, actively control the sensor to enhance features and mechanics of the game, reflexive	Quality
		Connects one player	Civic
		Connectivity	Performance
		Cost (sensors)	Market
Bio-sensors	Attention levels, master instincts, user engagement and interaction, cost, immersive knowledge, educational, interaction, monitoring and immediate feedback, single user	Attention levels, user engagement and interaction, immersive knowledge, educational, interaction	Functionality
		Master instincts, monitoring and immediate feedback	Industrial

		-	Quality
		Single user	Civic
		-	Performance
		Cost (biosensors)	Market
Brainwave sensor technology **or** gloves	Measure mental states (such as meditation and stress), cost, immersive knowledge, efficient and effective staff, control fear to harness, hands on experience, interaction between game and user, personalization, interaction levels, exciting	Measure mental states (such as meditation and stress), immersive knowledge, interaction between game and user personalization, interaction levels, exciting	Functionality
		Efficient and effective staff, control fear to harness, hands on experience	Industrial
		-	Quality
		-	Civic
		-	Performance
		Cost (sensors vs gloves)	Market
Mapping tools or without Mapping tools	Visual user experience, knowledge rich canvas, rich data sources, compatibility, cost, make decisions, manage their knowledge, increase level of awareness, enhance transfer of knowledge and skills, real life decisions, motivating, valuable and actionable knowledge, visual experience, intuitive and collaborative environment, display and organize	Rich data sources, make decisions, manage their knowledge, motivating, intuitive and collaborative environment	Functionality
		Visual experience, knowledge rich canvas, increase level of awareness, enhance transfer of knowledge and skills, real life decisions, valuable and actionable knowledge, visual experience, display and organize thoughts, connections between units of knowledge	Industrial
	thoughts, connections between units of knowledge	-	Quality
		Visual user experience	Civic
		Compatibility	Performance
		Cost mapping tools)	Market
Semantic algorithm	Provide relevant content intuitive and collaborative environment, semantic intelligence and context-aware capabilities, data sources and social networks, rich data sources, compatibility, cost, training, learning environment, increase level of awareness, collective knowledge	Semantic intelligence and context-aware capabilities	Functionality
		Training & learning environment, increase level of awareness, collective knowledge	Industrial
		Provide relevant content, intuitive and collaborative environment, rich data sources	Quality
		-	Civic
		Data sources and social networks, compatibility	Performance
		Cost (semantic algorithm)	Market
Knowledge mapping tool	Display and organize thoughts, knowledge-rich canvas, real word scenarios, insight, compatibility, educate, manage their knowledge, enhance transfer of knowledge and skills, representation, cost	Insight	Functionality
		Display and organize thoughts, knowledge-rich canvas, educate, manage their knowledge, enhance transfer of knowledge and skills	Industrial
		Real word scenarios, representation	Quality
		-	Civic
		Compatibility	Performance
		Cost (knowledge mapping tools)	Market

Table 5.3: The mutual adjustment and reconciliation between value elements, orders of worth for the articulation of a value proposition at QueGames.

5.5 The emergence of value elements and the value configurations in Orora

Similar to QueGames, at Orora there was lack of a clear idea either for the usage of the game or the market potential and the lack of an up-front business model was reinforcing the uncertainty. Whenever the members of Orora had a novel idea for a game they were challenged to assess the market potential and because this was exceeding high degrees of difficulty. In order to face these challenges and reduce their risk, during the development process the members of Orora were trying to find potential customers. They were aiming to involve their potential customers as early as possible in the conversation to understand what their problems precisely and capture what they are trying to solve and their existing practices.

In Orora in the beginning the concept was very general and that was pushing them to articulate the value of the game. Andy, the CEO at Orora, claimed that they did not have a pre-specified way to evaluate their games and he explained "at the beginning most of our conversations are based on what we are doing, although we can't prove the value of what we are doing". When the members of Orora were at the stage of research they were trying to gauge the positive points of a Virtual Tour Guide. As a result they agreed over an innovative communication technique to engage with any audience in a truly memorable way (doc8). This justificatory arrangement was followed with a dynamic interplay of design features and multiple value elements were emerging (Table 5.2). This constant interplay of the features was constantly creating tension to the value elements and this had a direct impact to the weight given to the value elements with different notion. For example, early during the development process the developers focused more on the features related to the avatar and the values related to the interactivity and engagement while later during the same stage the members of Orora prioritized values related to the realism, visualization. Moreover, decisions like the game engine that they would use were crucial and as Leo the designer at Orora explained "the emergence of an appropriate game engine opens up new opportunities because we can decrease considerably the development cycles and our cost. The technology or platforms create business opportunities

but also business challenges and we have to overcome all of them to gain competitive advantage".

Throughout the stage of development the members of Orora were making decisions related to the technical infrastructure needed for the game and the features, the storyline, the characters but also the key requirements, the budget constraints and timeframe. The aforementioned decisions were interrelated with the articulation of the value configurations that were transforming longitudinally. Helen, the technical software developer at Orora, elaborated on this with an illustrative example: "Yes, we can do 2d or 3d [graphics] there's often a temptation to make things 3d because it's, sexy, because it's fun. You can make cool 3d games with lots of graphics. But a lot of the customers they're not really interested in that. They don't need that for what they want. And I think we have to be careful sometimes so that we're not doing too much. Sometimes just a simple 2d game is enough. And there are lower costs of all of these on this for us because if we make a simple 2d game, the artwork isn't as complicated. We don't need to do as much and we can make these games easier more quickly. When it's a 3d world there's a lot more things for us to simulate. We have to be a lot more careful about character interactions. For example, when you knock against something in the world, it's much more complex. With a 2d game it's a lot simpler. [...] These have a significant repercussion on the business opportunities".

Last, when the members of Orora focused much more explicitly on the evaluation of the product the value configuration was reviewed given the transformation of the ordering between the value elements. Value elements related to financial values became prominent. Tony the CEO at Orora claimed "So at the end we come along with something fresh and new and we should defend our proposition, but there is only one consideration whether there is understanding of the technical aspects from the customers side as to what we present and the cost of the game". The members of Orora at the final stages of the development process were trying to bring together the value element related to the aim of the game and the economic aspects.

Consequently, the ordering of the value elements that constitute the value configurations have been combined and recombined to articulate the value proposition.

Similar to the previous section the following table (table5.4) describes a few examples, at Orora, of how the abstracted reconciliations led to emergent value elements that can be categorized under 'set of values' associated with the mutual adjustment and reconciliation between value elements, orders of worth, and value proposition.

Orora			
Design Choices	**Design Choices**	**Clustering of value elements**	**Clusters**
Avatar with voice-based interaction	Engage the user, attains skills proficiencies, confidence to the user, retention, user expresses his personality, personalization, active learning, immersive knowledge, speed,knowledge retention, valuable knowledge	Immersive knowledge, knowledge retention, valuable knowledge	Functionality
		Confidence to the user, retention, user expresses his personality, active learning	Industrial
		Engage the user, attains skills proficiencies, personalization	Quality
		-	Civic
		Speed	Performance
		-	Market
3D or 2D	Higher the retention rate, realism, real-life, detail, enthusiasm, level of experience, fun, quality, attract interest,	Higher the retention rate, enthusiasm, fun, quality, attract interest	Functionality
		Level of experience, knowledge retention	Industrial

	knowledge retention, cost, ROI, time consuming	Realism, real-life, detail	Quality
		-	Civic
		-	Performance
		Cost (3D), ROI, cost (3d_time consuming)	Market
Headset or QR codes	Interactive, enhances the experience, link real and virtual, cost, engage the users, simple usage, user friendly, engagement, increase level of awareness, enhance transfer of knowledge	Interactive, engagement, enhance transfer of knowledge	Functionality
		Enhances the experience	Industrial
		Link real and virtual	Quality
		Engage the users	Civic
		Simple usage, user friendly	Performance
		Cost (HvQR - headset vs QRcodes)	Market
Game engine	Compatibility with platforms, supports both 2d and 3d, supports 3d applications, compatibility, advanced graphical capabilities, cost, realistic physics, intuitive design	-	Functionality
		-	Industrial
		Realistic physics, intuitive design	Quality
		-	Civic
		Compatibility with platforms, supports both 2d and 3d, supports 3d applications, compatibility, advanced graphical capabilities	Performance
		Cost (game engine)	Market
Textures and animations	Photorealistic graphics, better simulation, realistic, specialized texture, rich information, interactivity, art, cost, motivating, visual experience, intuitive	Better simulation, realistic, interactivity, motivating, intuitive	Functionality
		Visual experience	Industrial
		Rich information, art	Quality
		-	Civic
		Photorealistic graphics, specialized texture	Performance
		Cost (textures/animations)	Market

Table 5.4: The mutual adjustment and reconciliation between value elements, orders of worth for the articulation of a value proposition at Orora.

In this section I described the emergence of value elements out of the justificatory arrangements concerning the design choices. I provided an analysis of how the value elements condition value configurations and how the prioritization between the value elements is reshaped due to the given importance of the design choices. I will now continue the analysis

with a focus on the articulation of the value proposition which is being informed by the value configurations.

5.6 The articulation of the value proposition in QueGames

During the early stages of the development process the members of QueGames did not have an up-front business model and there was a high level of uncertainty surrounding the idea and continuation of the project. This lack of a business model had resonance to the articulation of the value proposition. Andy, the project manager in QueGames highlighted that "rather than doing a full business plan that is 50 pages we do a 2 pages one that has a couple of assumptions and we switch the account. We try to keep it short and sweet and very flexible because we are going to new spaces [referring to market opportunities] or trying to do a new product for a new space… you do not always know all the answers. […] We need to clearly define the objectives otherwise it will fail. We have to put in every ounce of effort and take every opportunity in order to have the best chance at being successful".

During the development process and while the members of QueGames were at the stage of research they had to make a decision whether they would proceed the development. They were surrounded with uncertainty and they focused around traditional methods to develop a business plan and marketing plan. Andy, the project manager in QueGames explained the process and methods they were using to make a common agreement "we try to demonstrate whatever we can, the scope and objectives of the game, the value proposition, the returns on investment, the pricing alternatives. We mainly use SWOT analysis". During this stage the developers, at QueGames, were trying to provide a stronger hold in their perceptions concerning their offering. The following quote from Nick, the software engineer, highlight their norms and practices. "We are trying to give the customer seriously an offering that will work for them and we constantly work on this to react on customer needs but so far we have seen that the technical decisions drive real change and open up serious possibilities". I identified that the

members of QueGames were constantly mentioning that although there was neither a clearly identified gap in the market nor an enquiry from a specific interested costumer they had agreed that they were seeing these challenges surrounding their idea as opportunities to provide solution to problems with immediate impact and velocity.

The members of QueGames were trying to find customers for the early stages of the development process and even before the actual development. For this reason the articulation of a value proposition was highly prioritized although it was constantly under review. Josh, the graphic designer and artist puts it as follows: "we tried to find potential customers before we actually developed anything, so for making our own idea, we want to go out there and talk to as many people as possible, just to make sure that it is something that has a need, so if, if, if we want to develop a game for fire, we want to talk to a whole bunch of fire departments and get their ideas about whether this would be something that is necessary, whether it would be something that they would need, or and whether it would be something that they would pay for. So we need to have something to say, we need a proposition and then derive insight, shape interaction and unlock innovation. Then they [fire fighters] would be able to help us with getting the game out there, we would be able to use their channels to market and promote the game. This causes a proactive assessment of our business model and shows possible opportunities"

When the development of 'Fire' was initiated, the members who were involved at the time were interacting and negotiating the design choices constantly. Even though they were focused on the technical characteristics, I clearly identified that there was interdependency with the articulation of their offering. This is illustrated by the following quote from Andy, QueGames' project manager. "During this process we were forced to evaluate our business and hone our value proposition to better resonate with clients". While he also explained that they were refining the game to become a more 'turn-key' offering while he pointed out that the evolution was fast, especially in the early stages while they were reconsidering and adjusting

their product. There were taking place strong interactions between the actors who were involved because of the interplay of their perceptions related to the design choices. As mentioned to the previous section this was putting forward the emergence of value configurations from different value elements which were transformed, both in terms of the weight given to the value with different notions but also through the introduction of new ones. The iterative transformations of the value transformations were informing the value proposition as the developers were in a constant attempt to bring close all the 'types' of value that could support a sound proposition.

As the development process was evolving the value elements were progressively less contested and the social but also economic usefulness of 'Fire' was gradually clarified. Consequently, the value configurations were taking a more consistent shape. The value proposition was reflecting the value configurations and the value elements that have cumulatively emerged throughout the process. During the last stages of the development process the members of QueGames focused much more explicitly and consciously on the articulation of a value proposition. They demonstrated the usefulness of 'Fire' they shaped their diffusion strategy with the use of traditional approaches and as Nick, the software engineer stated they "use very traditional strategies to assess the value of the product. We depend on the type of the game, the quantity of the content, the desired quality and the used technology. But still there are threats related to the development time, the lack of analytical tools that help to bring the appropriate evidence for the effectiveness of the game. Also we think if alternatively we can make a game and adopt it to other situations to increase the value propositions but the problem is if we are going to create additional outcome from that we have to make sure that the mechanics in the game play are actually reinforcing it so again we have to validate it again".

Finally, as I described earlier the member of QueGames attempted to carry out some trials in order to measure the degree to which their serious game is consistent with the existing

needs and the perceptions of the potential users and the results were used to support their offering in an attempt to provide a holistic understanding.

5.7 The articulation of the value proposition in Orora

In Orora, at the beginning of the development process the concept of the Virtual Tour Guide was very general and that was pushing them to demonstrate whether there was an offering and to justify some initial aspects of the deliverable. However, there was one important challenge throughout the process and they were struggling even internally to face it said Sandy the sales director at Orora and she explained "when we are introducing a game that is for business, we start introducing elements that are very video game like, we can see their [potential clients'] recalls so we are trying in our way to pull the bate more into using the games technology. So when it is time to sell it we struggle with the words game and serious game and we have to take into account that you 've got people that like games and they wonder how a game can be serious and people that would like something serious so they would like a game and vice versa. Sometimes we even avoid the word game so we talk about simulation or fidelity of graphics we are just trying to avoid these hot subjects when we are talking to our customers". As the idea was taking shape, the members of Orora had to move forward and start refining their offering. As such the actors involved at this stage at Orora were attempting to answer in more detail what they were trying to achieve and as Ian, the technical designer explained that often he was listening the following quote during their meetings: "Yeah, we'll create this Virtual Tour Guide. Fantastic. It'll look great and so on. It is good but why are we doing this?", Ian.

As I mentioned in a previous section (section 4.5) while the members of Orora were at the stage of research they tried to gauge the serious games market and they involved in a research about the market segmentation in an attempt to deconstruct the market. According to Eddy, the company's business development director, they identified the following markets that could accommodate a virtual human representation: corporate training, tourism and heritage,

health, defence, police / fire services, environmental institutions and retail. Later, different perceptions for a virtual human representation were put forward and they had to decide to what problematic practices they could contribute to. For example, a virtual human representation would add significant value in recruitment, marketing, business processes or training or in the sector of corporate for 3D archives, location based tours or showcases.

When the concept of the project became more precise and they agreed to develop a virtual tour guide and shaped a generic value proposition for a virtual tour guide that would work as the voice and would act as the 'face' of the company. At this stage according to Tony, the CEO at Orora, the offering was basically including three aspects "First, affordable 24/7 support. Second, innovative method to engage the visitors in a memorable way and third, consistent and high quality transfer of knowledge".

When the members of Orora started the actual development of the game then the value proposition was constantly reshaped and it was informed by the value elements related to the design features. Richard, the lead game designer at Orora pointed out that due to the existence of different perspectives; they had a lot of discussions to discern what their goal was and how to achieve it but also the members of the company had to make conclusions about their offering. "It's about something you want, to communicate to user, some lesson, some objective, some goal and then finding an interesting way to communicate that. For an application like Virtual Tour Guide, if there's an app on the phone, the children can take it off to parents. They can point the app and the environment and they can see characters come to life. So we're making it in an interesting way rather just, having a brochure or a book with pages of information. It's not suitable for kids and I think that's probably one of the common things throughout our games. ". Along this process an ongoing interplay between the features of the game the offering was taking place and all the more different forms of value were emerging.

Our analysis showed that as the process was evolving the members of Orora were trying to become all the more precise about their offering because they were also trying to figure out

the best practices to commercialize the game and maximize their profits. They were trying to reflect the usefulness of the game and the value related to the features of the game on the offering. As such their value proposition was informed by the value configurations. These were including value elements in tandem with the relative advantage, the economic profitability, the cost reduction but also the return on investment from the use and they were highly prioritized. This is illustrated by the following quote from Chris the project manager at Orora. "The product is young, so we are now starting to become a little more refined in what we do. So now the idea is far more precise, we know the cost involved, we estimate the revenue potential from the project, whether that's fixed fee or whether that's some kind of licensing model where we get so much per use or a combination of the two. We know the cost structure; we estimate the revenue opportunity to run a profit and loss statement (P&L). However we can guarantee that we are tracking profitable projects. We then we work on the customer end trying to shape propositions based on what we do we try to prove a return on investment. But again that's something that involves uncertainty and we are now starting to consider more".

During the last stages of the development process, the members of Orora were trying to provide a consistent value proposition to approach their potential customers with an attractive offering. They thought that customer satisfaction is really important and they were using examples of successful serious games from their portfolio or even other companies. Tony, the CEO at Orora, explained, "So the first thing we have to do is to project the returns on investment (ROI). Before you get the job we have to do quit detailed return of investment and value proposition. This is 'what' we did, this is 'what' you can use in this serious games and there was a cost benefit because there was so much ROI and the real benefits for training were x...y...z. But still our offering is in development for quite some time until it works. […] we can't build a game without revenue but we can't focus on revenues without an attractive product".

Having presented an analysis of the empirical material with focus on the three emergent analytical themes, I now proceed with an analytical overview of my findings which illustrate a

mechanism of mutual adjustment and reconciliation between value elements, value configurations and the value proposition.

5.8 Analytical Overview

The above account outlined the three emergent analytical themes, in this section I will outline at a company level the trajectory of design choices concerning the games' features and their interplay, and how the multiple fragmented forms of value are reconciled through justifications. I will also outline how value elements are abstracted from the justifications and then I will illustrate the way the value elements articulate an emergent value proposition which is reshaped as the worth of different value elements is reordered.

5.8.1 The interplay between the features of the game and justifications of their value

Although, the objectives of the games were different, in both cases I could see that there was an evolving idea within a constantly transforming environment. Several design features were interrelated and the developers had to justify the value of the design choices that were critical for the continuation of the game development (Figure 5.1 – arrow a). Even though the choices were not the same for both companies, the practices the developers followed were similar. The evolution of the idea as well as the involvement of content experts and instructional designers brought the need for more features, challenging the existing justifications and driving to a review of the features (Figure 5.1 – arrow b) and demanding new justifications by drawing on a new set of value elements. Figure 5.1 demonstrates the aforementioned process which was repeating over time within the development process. This figure highlights the multiple technological choices that were available for the development of the aforementioned artefacts along with the starting point for the trajectory of evaluation. The interactions among the members of the actors involved in the development process brought into play different value

perceptions. The justifications were leading to value elements so as to evidence common rationales as for the value related to developers and developers' view of usage of the actual games.

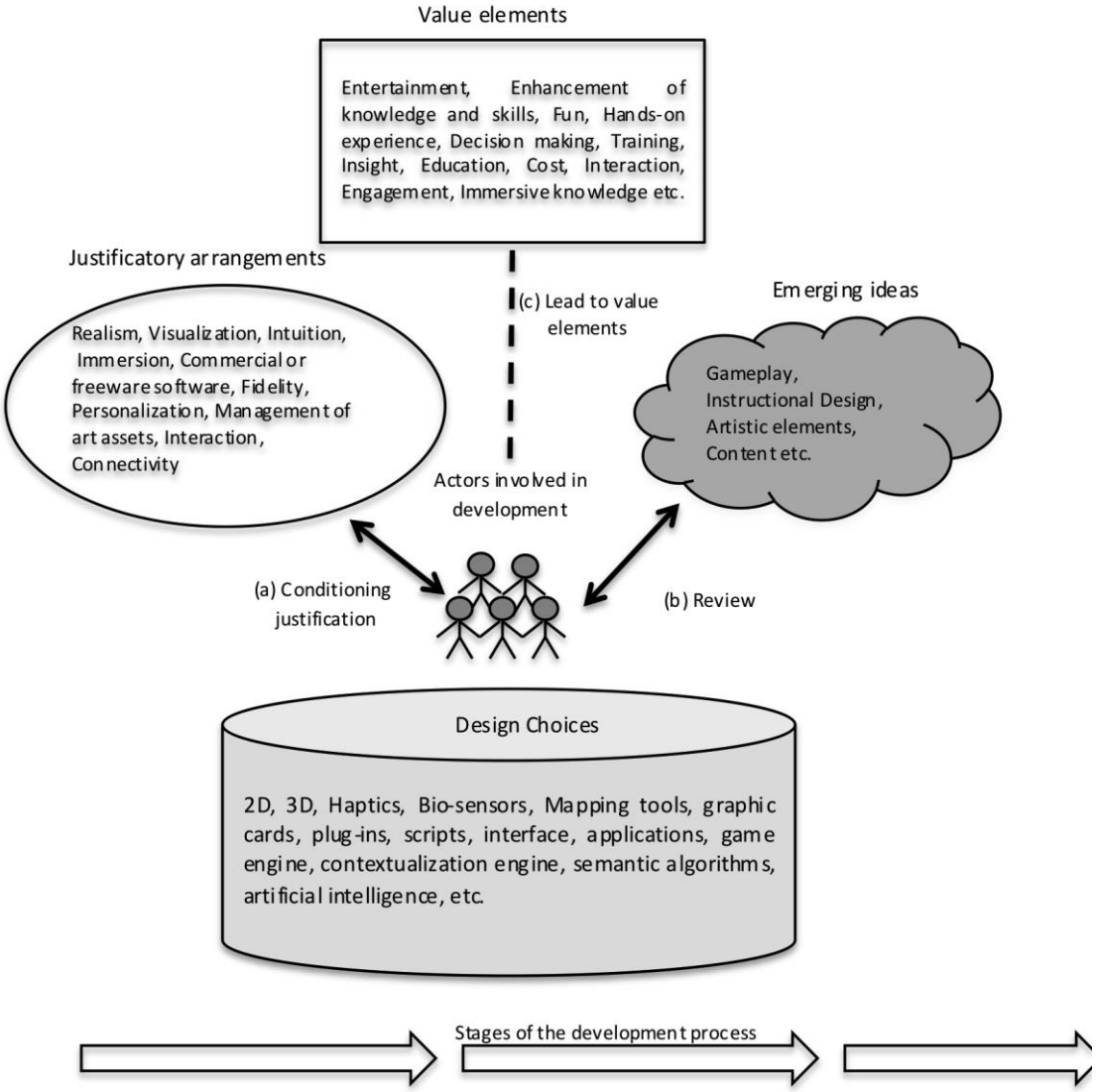


Figure 5.1: The trajectory of justifications and the constant reconciliation of value elements

The choice in both companies between various features, such as 3D or 2D models, Avatar or voice-based interaction and animations were linked to the value of each of the features for the users in a sense that, for example, making the game fun would offer immersive

transfer of knowledge to the user. "From my experience you can make a game with lot of information, but if it is not entertaining it is going to fail and if we add mechanics to a certain successful product to commercialize it to another market then it can be less entertaining, so we should be careful", said Andy, the project manager at QueGames. This was reinforced by Josh, the QueGames' graphic designer and artist, who said: "[…] we have to flesh out all that knowledge which will be part of the game and keep the users actively engaged with something that's fun and entertaining". Similarly, at Orora, Alf, the company's graphic designer and artist claimed "3D technology could offer memorable tour enhancing their [visitors'] experience, to capture all the useful information that would otherwise require much time and the representation of buildings that do not exist anymore would require money and time". Further Alf, also graphic designer and artist at Orora, claimed that "If you put an avatar in there, that's going to make people want to repeat the process, learn more. And we all know, the more you do something, it becomes a muscle memory".

Throughout the process the developers were also taking into consideration in terms of the justifications deployed, the cost of the technological assets, as they should not exceed their budget and the implications this might have on a future price for the game. For instance, the decision regarding the use of sensors and the investment in mapping tools would result in a higher price for the game. As Andy, the project manager from QueGames, noted "[…] if they spend x amount, it should have an obvious impact; there is no point developing something very expensive and hope that someone is going to buy it". The developers were aware of the need to highlight the efficiency and effectiveness of the game against traditional procedures for similar learning outcomes as Sue pointed out: "We should look into [comparative] evaluation […]. We have been looking at other areas but we should focus more on such evaluation".

The emerging features of the artefact as it moves through the innovation process act as a motor for the generation of new justifications through which existing value principles incorporated in the value proposition are reconfigured and new ones brought in. These trials of

features' evaluation were taking place longitudinally within the development process and as Alex (designer, artist and animator at QueGames) mentioned, "the ideas do change continuously even before the development starts". He continued by saying: "the most difficult for us is to establish a clear picture of the thing that we are doing through this idea". According to Josh, a graphic designer and artist at QueGames, that is why they had to go out and discuss the game with senior executives of fire services departments to "position themselves effectively". "The core for the development model is the fact that we know it is something [the potential customers] want", he continued, but acknowledged that "despite all research […] it's difficult to predict if it's going to succeed.[…] Lots of organizations still see it as video game, they think that is all about fun and it is difficult to change their minds. […] We need to reinvent the value proposition and support it with research material and show how we add value to business".

I now elaborate on the role design choices for the features of the game played in developing an ordering and connection between value elements and value configurations. As shown in the table 5.1 and table 5.2 different set of value elements emerge from the justifications of design choices. The value configurations are induced from the value elements pertaining each design choice. As shown in the figure 5.1 the initial design choices created ramifications and implications during the development process. Concrete choices were made by the developers out of a wide selection of possible features that took effort, time and funds to incorporate into an innovation for which both the usage and value were uncertain and as such their value was constantly contested. In order to reconcile these tensions implicit in these choices, the developers were forced to articulate the value of the features more explicitly and establish and articulate explicit linkages with the financial aspects of the project, which also became more clearly delineated in the process.

As the broad inspiration for the development of a game becomes more precise, the developers gained deeper insights concerning the usefulness and objectives of the game. At the same time, previously agreed design choices were also likely to be challenged, creating a

constant consideration about the features needed. Justificatory contestations took place continuously during the development process, but gave rise to new agreements regarding the value that each feature added to the game between the actors involved. More specifically, at the beginning, the value elements we identified exhibited a variety of dispersed but also interdependent values as the value elements related to one feature (e.g. 3D environments) had value (but in different regimes) for the developers, the potential customer, and the user (when the latter differs from the buyer). For instance, 3D environments were "difficult, time consuming, and can be expensive" for the developers, "can successfully support training" to benefit customers by making the users more "actively engaged". Furthermore, what is of value is not only economic but also social and technological We show this by grouping these value elements under the core categories that emerged from my analysis, situating the value elements under the same 'order' based on the relative ranking of the purpose each value element serves. The analysis shows the value elements of each design choice condition value configurations when all the separate categorizations are integrated into an aggregative value configuration which is reviewed throughout the development process.

The next sub-section, I will proceed the presentation of my findings with focus on the articulation of the value proposition and how this reshapes throughout the development process.

5.8.2 The articulation of the value proposition in relation to the design features

By relating the above to articulation of value proposition at the company level, I trace over time, how the trajectory of justifications in both companies helped to identify value elements, which were interrelated to articulate a value proposition but also how these value elements are constantly transformed, reshaping at the same time the articulation of the value proposition. There was a common trajectory for the justifications of features' valuations, even if the justifications vary in each situation and context.

In order to come up with a profitable business model the developers focused much more explicitly and consciously on articulating clearly the value proposition. At the very beginning when they had the inspiration for the game, the set of objectives, the design, the artefact and what this can offer. As the sales and sales director (Sandy) in Orora pointed out for the early phases of the development process: "We always start with a proposal, a discussion paper, quite often the customers do not know what they want but if we suggest something to them they either like it or not like it and all of the sudden we have the basis for the proposition". The proposition was constituted by different value elements and it was changing longitudinally since the articulation of the value elements was changing as the design choices were adding new values to the artefact or certain values were transformed into valuable use values. More specifically, when the development started aligning because of the incorporation of additional design features which were conditioning a set of new or supplementary value elements, the developers "imported the production values in their offering". As Eddy, business development director in Orora noted, they were "struggling even internally" and they were "making presentations of the elements that are very video games-like so as to explain the reason they fit the purpose". The articulation of the value elements was altered along the process not only because new value elements were added but also because of the importance these value elements were adding to the game. The developers, during the early phases, were more concerned about the value elements which were adding value on the objectives of the game and their effectiveness on the product in tandem with the optimal exploitation of their technological assets and budget.

At the last phase of the process, the developers drew their attention to the marketization and commercialization with primary concern being the effectiveness of the serious game and the methods of pricing it. They were attempting to change their potential customers' mind-sets and explain how with this kind of digital innovation and with these specific design features the users would have more use-engagement in the long term, adding further value to the organisation. Tony (the CEO in Orora) explained: "We demonstrate

whatever we can…. Return of investment, which is the thing we want to cover. All right if you want to spend £50,000 on that so what are the benefits? There is learning outcomes, but quite often it is about minimizing downsides so that people are not wasting time going to external training venues and that kind of staff; so there is a return of investment in time, a return of investment on cash or both...". At this stage, the developers sought to extract the values related to the game features to achieve certain objectives and to add value to the potential customers.

Having outlined the trajectory of design choices concerning the games' features and their interplay, and how their multiple values were reconciled through justifications at both companies, I turn my attention to how the recurring over time, the articulation of value elements is conditioning value configurations leading to distinct value proposition articulations. Moreover the aggregation of the design choices throughout the development process illustrates an ongoing mutual adjustment and reconciliation elucidating aggregative value configurations leading to value propositions.

My analysis shows different value elements and orders combined and recombined to represent an ongoing collective agreement. The 'set' of value throughout each phase of the development process are articulated and ordered in different ways because new value elements are brought into play, transforming the existing configuration by adding importance to other orders and modifying the hierarchy of relative importance between the value elements. For instance, I show that for 'Fire' at QueGames at the beginning the 'functional order' was dominant since the developers were elaborating on their generic idea by examining the technological feasibility of the features they could use to achieve the desirable usefulness as they saw it at that point in time. As the process was unfolding, however, new justificatory arrangements took shape, with not only the 'functional order' dominating but also the 'industrial order' became prominent as the developers prioritized their decisions in relation to their effect on business objectives. For example, with 3D animations and graphics they sought to develop an intuitive interface (functional order) and as result the game would increase the level

of awareness among users of the training aims of the game (industrial order), and offer effective education (industrial order). This trajectory evolved during development, and as the phase of the commercialization approached, I noticed that 'market order' gained importance as the developers where attempting to find ways to price the product and estimate the potential revenues and costs. The 'industrial order', however, continued to be crucial because they were still attempting to prove and promote the effectiveness of the game. Figure 5.2 demonstrates the relative dominance of particular value elements and their reshaping for the articulation of the value proposition for 'Fire', as this emerged from the empirical setting. Each value element refers to a particular category with the same sense and all the categories condition value configurations which are constantly contested.

Figure 5.2: The articulation and reconciliation of the value elements along the phases of development process at QueGames.

Despite the fact that both of the companies in order to support the offering were employing views of value associated with the set of the objectives of the game and the improvement of the efficiency of their potential customers due to their digital game, at Orora, they were focusing less on economic value, the value related to the performance of features and that associated with the actors who would be influenced by the artefact. During the next phases of the development process new justification contestations were generated, new justificatory arrangements took shape and the 'industrial order' became prominent in an attempt to clarify the effect of the game on the business objectives. It is also important to mention that my analysis shows that at the final phase when the developers had a clearer idea of their game, both were focused on the economic evaluation and the values in tandem with the objectives of the game while they gave equal importance to the actors who would be benefiting from the game. For example, they considered the impact of the game to the local economy, the organization who would be interested to buy the game, and the tourists who would use the game, all of which they anticipated would benefit and they related these different manifestations of value to the economic value of the game. As a result, the value elements related to the impact and the degree to which they serve a community and the value elements that have as a mode of evaluation the price, or cost, but also other economic and monetary rationales became prominent.

Figure 5.3: The articulation and reconciliation of the value elements along the phases of development process at Orora.

The interplay between these orders serves as a way of understanding the mechanism through which different value elements and their rankings can be combined and recombined to articulate an emergent but converging value proposition within an uncertain social, economic, and technological environment.

5.9 Summary

Drawing on the empirical account, in this chapter, I put forward my analysis of the research setting based on the way the value elements emerge from different design choices throughout the development process and how these value elements condition value configurations. In this way, I sought to show how a common agreement regarding the justifications of value of the design choices articulates a 'set' of value elements. Later, the analysis of the empirical material provided insights into the role design feature choices play in developing a dynamic ordering and connection between value elements and the articulation of value configurations. Finally, the analysis illustrated how the value configurations inform an emerging value proposition. In order convey this with detail I focused on demonstrating the dynamic transformation of the value proposition in terms of the weight given to the value elements in relation value configurations. The following chapter features a discussion of my analysis and findings along with the implications of my research.

Chapter 6: Discussion and Implications

6.1 Introduction

In the previous chapter I presented an analysis of the development process featuring three analytical themes: (a) the interplay between the features and the justificatory arrangements, (b) the emerging value elements which condition value configurations, and (c) the articulation of an adaptive value proposition which evolves along the development process. In this chapter, I bring together the insights from the analysis and the empirical findings with the relevant literature. I aim to answer in detail the research questions that motivated my study and to develop a conceptualisation which will offer an understanding of the complex phenomenon under investigation. I build on my findings to offer new insights regarding how the stakeholders involved in the development of digital innovations justify the value of their innovation, how a value proposition is established emergently through processes of justification and how this generally contributes to the construction of a business model. Briefly, my findings indicate that within the technological and market uncertainty areas within which such innovation takes place, it is possible to trace the manifestation of value elements associated with the design features. Then, I propose the configurations of value elements as a way of understanding the mechanism through which it is possible to integrate value principles from diverse regimes of worth in an emergent value proposition. In particular, I will describe and theorise how a value proposition for digital technology innovations is arrived at (Carton et al. 2010), and I will build on this theorisation to provide insights into the importance and role of the value proposition in the development of digital technology innovations and the implications this has for the dynamic constitution of business models on them (Al-Debei & Avison 2010, Hedman & Kalling 2003).

6.2 Justifications of value of digital innovations

In response to how the actors involved in the development of digital innovations justify the value of their innovation, my empirical analysis shows that the innovation process is an environment within which there is a plurality of perceptions concerning the value of a digital artefact, and along the lines of Vargo et al (2008), the value is co-created by the actors involved in such a process of development of a digital product or service. In particular, both companies were facing challenges discerning the usage of a product and they only had a fuzzy idea. Consequently, my empirical findings support the argument put forward by different scholars (e.g. Fischer 2000, Hanseth & Lyytinen 2010, Lyytinen & Damsgaard 2001, Tuomi 2002), and demonstrate that the development of digitalised artefacts is an innovation process that involves a complex system of interactions among stakeholders. For some of the games, there was involvement of external actors at different stages of the development process, as it took place. My analysis, in accordance with the existing literature, indicates that the existence of external actors (Chesbrough 2007, Miles et al. 2005, Ahmed & Shepherd 2010) who work collaboratively (Brown & Duguid 2001), offers additional perceptions concerning the value of the digital artefact, and requires justification to stabilise meaningful ideas that would add value to the project. However, the intention of involvement external to the company actors, depended mainly on the developers' fortunate stroke of serendipity (Austin et al. 2012).

Based on my study of the development of digital technology innovations, my empirical findings demonstrate that even within contextual uncertainty, when the usage of a digital innovation and it's market potential cannot be fully known up-front, it is possible to develop new insights around the value of such innovations, and also to describe and theorise how to create, deliver and capture value for such innovations. In Chapter 2 I provided details from the existing literature which demonstrate that the existing views cannot answer how the actors involved in the development of digital innovations justify the value of their innovation and in the previous chapter. I address this issue by studying the justifications of value during the development of digital innovations and their constant reviews and dynamic transformations. In

particular, my empirical findings and analysis indicate that the actors involved in the development process evaluate the design features through a constant negotiation that results in a relationship between “agreement and discard”. Thus, along the lines of Boltanski and Thévenot the actors develop "accounts for the confrontation with circumstances, with a specific reality, that accounts for the involvement of human beings and objects in a given action" (2006, p.128). Consequently, the value of the design features is constantly justified as they are being built into the artefact, and through this process different orders come together and interact through the justifications of value elements at different phases of the development process. Drawing on Vargo et al (2008) I demonstrate how the ‘value in use’ and ‘value in exchange’ embody both social/non-monetary and economic/financial notions related to the design choices made for the development of a digital artefact. So far, I argue that although the ‘value in use’ does not presuppose the existence of ‘value in exchange’, however, they are interrelated and interdependent, and they transform as both move through the development process and associate with the justifications of value made by the actors involved in this longitudinal process. This interaction describes a mechanism of mutual adjustment and reconciliation between value elements, orders of worth, and value configurations, and in this way an emergent view of the value can be reconciled with the need for plausible and stabilised rationales to emerge out of uncertainty.

To elaborate, during the process of innovation the developers are concerned with justifying the fragmented values by making sense of the equivocal nature of their digital artefact and the potential usages. The views of Yoo et al (2010) and Kallinikos et al (2013) have exemplified the vagueness in relation to digital technologies, and to the increasing ambiguity around the development of digital artefacts which adds to their incompleteness (Garud et al. 2008) and generativity, and offers the potential of adoption of these digital technologies for unexpected uses across multiple industrial contexts (Yoo et al. 2012, Austin et al. 2012, Avital & Te’eni 2009). My findings indicate that both companies focused on the interplay between the features of the game and the justifications of their value from which a range of value elements

are abstracted. Seen in this way, the emerging design choices for the artefact, as they move along the development process, act as a motor for the generation of new views of the worth of features relative to each other and through which the value configuration of the innovation as a whole takes shape. This provides an understanding of the view of a "coherent mediating framework that takes technological characteristics and potentials as inputs, and converts them through customers and markets into economic outputs" (Chesbrough & Rosenbloom 2002, p.532). However, my conceptualisation goes a step further by demonstrating a mechanism of mutual adjustment and reconciliation where the design choices and features of a digital product under development relate to different elements of value, with not only economic/financial but also non-monetary/social notion. For example, as shown in Figures 5.2 and 5.3, it is highlighted that different value elements are woven together leading to value configurations. In this way, the manifestation of value becomes interdependent with the actual characteristics of the digital artefact, leading to plausible and stabilised rationales emerging out of uncertainty.

In addition, at this point it is important to clearly describe and theorise the concept of value. Drawing on my empirical findings and analysis I develop a conceptualisation that considers the value elements as different forms of value that emerge during the development process, and these value elements are combined and recombined to articulate an emergent value configuration. My findings revealed six orders, and a 'set' of value elements which are combined and recombined to represent an ongoing collective agreement. The aforementioned 'sets of elements' are: *Quality, Functional, Market, Industrial, Civic* and *Performance.* Under "Quality" I grouped the value elements in relation to the conformance of the design choices, under "Functional" are those associated with the set of objectives for which the actual artefact is developed and under "Market" are the value elements that encompass economic/ monetary value. In addition, under "Industrial" I clustered the value elements which emerged in relation to the added productivity or efficiency the product is to offer, whereas under "Civic" appear all the value elements in terms of social influence, and under "Performance" are the value elements associated with the pre-existing architecture or connectivity. The 'set' of values throughout each

phase of the development process are articulated and ordered in different ways because new value elements are brought into play, transforming the existing configuration by adding importance to other orders and modifying the hierarchy of relative importance between the value elements. Moreover, the actors involved in the development process can refer to any and all the value elements. My conceptualisation does not propose a rigid model with certain values, on the contrary, I suggest that all, some, or even new elements can occur in relation to the manifestation of multiple values, and I view this as a mechanism through which different values and rankings of values can be combined and recombined at any given point in time within an uncertain social, economic, and technological environment.

A key theoretical point here is that social/use value and monetary/economic value are not seen as antithetical (Friedman et al. 2013, Gordijn & Akkermans 2003, Bonaccorsi et al. 2006, Baden-Fuller & Morgan 2010), but as in constant interaction and can be reconciled, or made more explicit and visible, through the materialisation of the innovation and the design choices associated with this materialisation (Antero et al. 2013, Reuver et al. 2011, Chesbrough & Rosenbloom 2002). Moreover, within the discussion of the literature, it is argued that most of the studies have restricted their focus on either economic or social values. On the one hand, economists study the value and claim the economy while on the other hand, economic sociologists study values and focus on the social relations in which the values are embedded (Stark 2000). My findings propose social/non-monetary value elements are negotiated and reconciled with economic/financial value elements shaping, at the same time, value configurations. I sought to focus more consistently on 'value elements' in my analysis of the empirical setting to shed light on the notion of value. I draw inspiration from Vargo et al (2008) who have combined different forms of value related to service systems, and these perspectives focus on processes of value emergence and co-creation. I argue that my findings offer novel insights into the process through which different value elements are combined and recombined to represent the manifestation of socioeconomic value configurations for digital technology innovation. Although the existing views place emphasis on the unnoticed values of technology

as a way to create value when its market potential is not fully known (Chesbrough & Rosenbloom 2002), my empirical findings demonstrate that the value configurations exhibit multiple forms of value that are in constant interaction. This raises the issue of the multiple dimension of value that emerges from the actors involved in the development process, as well as the potential customers. I am able to show, therefore, not only how different forms of value are manifested and reconciled, but also how they constantly reshape. To this extent, compared to existing views that consider the individual and aggregated values as incompatible (Schwartz 1999, Callon 2009), my study demonstrates that through the justification of value mutual agreement is established between the individual values, and reconciliation also exists between individual and aggregated values. Seen in this way, this approach also makes it possible to show how business and use values should not be seen as separate or antithetical but linked, even if within this linking –and resultant order or ranking –there is, nonetheless, a resulting hierarchy.

The value assigned to value configurations is also constantly reshaped, creating transformation in the ranking of the value elements. To elaborate, the interplay between the different value elements exhibits a wealth of social, and also economic perceptions, which are parts of the different regimes of worth that, are brought together in each iteration of the value proposition. Through different episodes of justification, the relative importance of existing value elements is altered, existing value elements are articulated in different ways, and new values are brought into play, transforming the value configuration in the process (e.g. it was found to be time consuming to add 3D features but after the developers justified their decision to employ 3D features, the prioritisation of the market order was altered). In this way, the value elements associated with the features are combined and recombined and out of this process an emergent value configuration is gradually articulated. The articulation takes place as the value of each feature becomes interrelated and interdependent through an initially heuristic relative ranking (e.g. importance of the fidelity of the learning experience has a more prominent role than the cost involved). In this way, my findings explain and structure a dynamic theoretical background since I demonstrate that apart from technological artefacts, digital innovations are also social

artefacts that re-define economic value justifications. Moreover, as the development of the product unfolds, however, and the actual features are being built into the emerging digital artefact, this leads to plausible and stabilised rationales emerging out of the initial uncertainty. This also provides a detailed description of how the notion of 'value elements' (Faber et al, 2004) relates to such a process and also to the development and design of an innovation (Peffers et al. 2007, Verschuren and Hartog 2005). Faber, Haaker and Bouwman (2004) have argued that the value elements are manifested as soon as the developers have chosen a target group or a market segment, and they do so in order to formulate a compelling value proposition for that group/segment by aggregating elements of added value offered to them by the developers. Although this approach has described the interdependencies of critical design issues and critical success, my study provides insights on how the actual technological and design choices involved in the development of a digital artefact manifest different forms of value and how these have materialised in the artefact. Furthermore, while the process described in my study encompasses the key stages put forward in the design science literature - such as hunch, requirements and assumptions, structural specifications, prototype, implementation, and evaluation (Peffers et al. 2007, Verschuren & Hartog 2005), the evaluation is happening all the time and between and across stages and iterations of stages, and not in a particular discrete stage of a cycle. My study shows how the gap identified in the design science literature by Reuver et al (2011) regarding commercialisation might be addressed by showing how design choices rather than cycles can be "related to the way user and stakeholder requirements are made explicit" (Reuver et al. 2011).

In response to the first research question, I describe and theorise how the value is manifested, by drawing on my findings I show how the perceptions of value of the internal and external stakeholders are reconciled. The value sensitive design literature highlights the relation of value to what one or more people "consider important in life" (Friedman et al. 2013) and my findings demonstrate how the relations between business values and use values are associated with the design features. Seen in this way, my empirical findings and analysis

indicate how “under complex strategy horizons, where dislocations can be anticipated in general but are unpredictable in their specific contours, organisations must innovate in ways that allow them to flexibly deploy resources for further innovation” (Girard & Stark 2001, p.9). In this way, I provide an understanding of how the design choices and features of a product under development provide accountability to different value elements through justificatory arrangements of mutual agreement in respect to the design choices. Thus, I demonstrate how the prioritisation of such value elements might relate to the sensing and probing of market potential when the developers do not have an up-front clear target market and they are constantly facing difficulties in assessing the market potential during the development process. The following figure (Figure 6.1) provides an abstract demonstration of the aforementioned process.

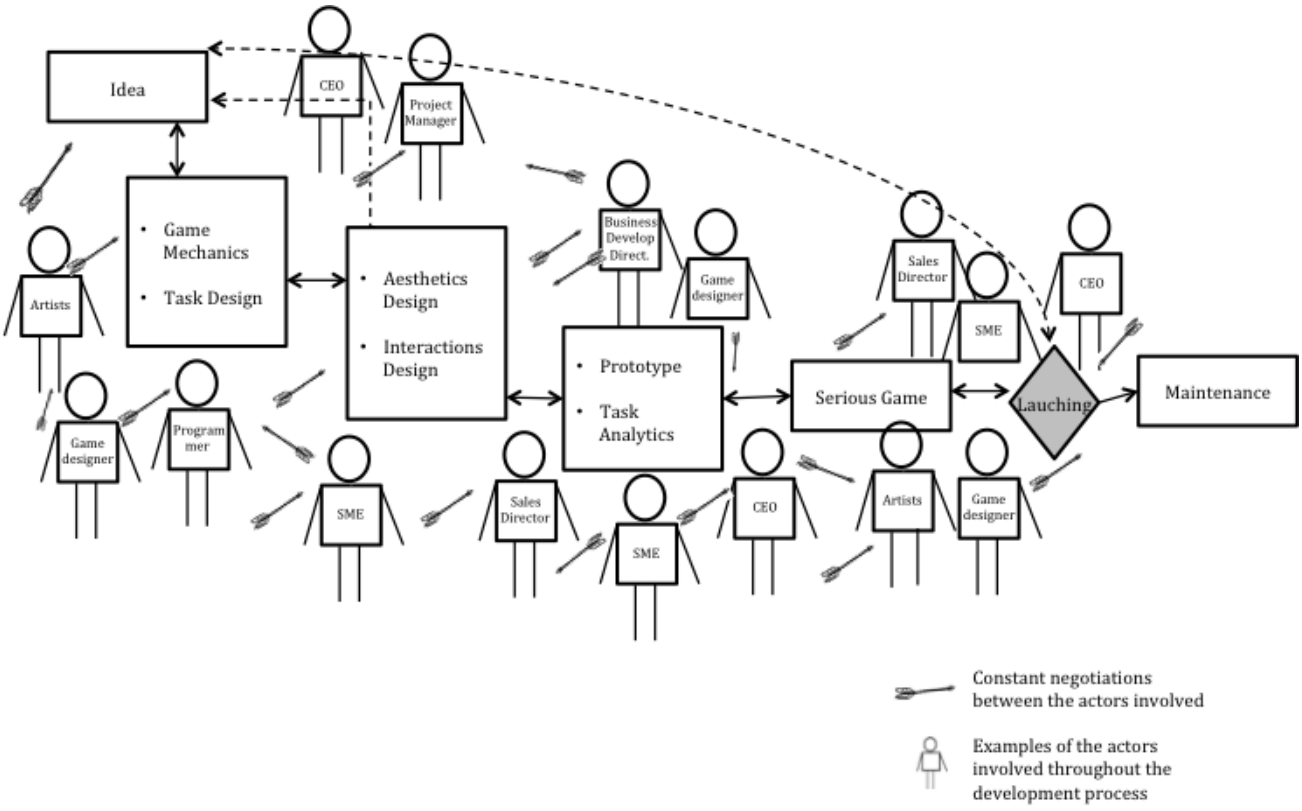


Figure 6.1: Emergence of value elements through justificatory arrangements in respect to the design choice.

So, to summarise, in response to my first research question is that my findings show that, even in the technological and market uncertainty within which such innovation takes place, it is possible to trace the manifestation of value elements associated with the design features. Value configurations emerge and take shape out of the dynamic prioritisation of the relative importance of each feature and the justifications of value that accompany it and which draw from particular established orders of worth. Therefore, although previous studies generally overlook the socioeconomic evaluation of digital innovations, in the present study I focus on the discursive aspects of economic/financial but also social/non-monetary values, and I show how the value is interrelated and interdependent with the actual features of the digital artefact, leading to plausible and stabilised rationales emerging out of uncertainty. This also involves a process of mutual adjustment and reconciliation of each value element within the emerging value configuration. Hence, clarity and stability are brought to the value configurations while it enables the enrolment of key partners and entities. Seen in this way the value co-evolves with the digital artefact throughout the development process, and both internal and external actors are involved in this process of mutual adjustment and reconciliation.

In the subsequent section I will draw on my empirical findings to discuss my second research question which is how the value proposition of digital technology innovations with indeterminate use and addressable market is achieved in the development of such innovations.

6.3 The value proposition of digital technology innovations with an indeterminate use and addressable market

As shown in the analysis the value of design features is constantly justified as they are being built into the artefact, and through this process different fragmented value elements come together and shape value configurations that constantly reshape at different phases of the development process. This interaction offers novel insights into the process through which different value elements are combined and recombined, and describes and theorises the

articulation of an emergent value proposition for digital technology innovation with an uncertain market potential and undetermined usage. This conceptualisation also shows an understanding of how the prioritisation of such value elements might relate to the sensing and probing of a value proposition. Based on my analysis of the development of serious games, I now seek to offer new insights regarding how a value proposition is arrived at emergently through processes of justification. I do this by proposing the justifications of value as a way of integrating value principles from diverse regimes of worth in an emergent value proposition. So, the previous discussion on my first research question will play an important role, since it enables me to point to ways of understanding the value of such innovations ahead of commercialisation (Chesbrough & Rosenbloom 2002, Chesbrough 2012) and to provide a description of a mechanism of mutual adjustment and reconciliation between *value configurations*, *orders of worth*, and *value proposition*.

In response to my second research question about how value propositions for digital technology innovations of uncertain use and market potential are attained, first, my empirical analysis shows how a value proposition co-evolved with the digital artefact throughout the development process, along the 'performative' lines suggested by Doganova and Eyquem-Renault (2009). In particular, the emerging design choices for the artefact, as they proceed along the development process, act as a motor for the generation of new views of the worth of features *relative to each other* and through which the value proposition of the innovation as a whole takes shape. For example, as shown in Figures 5.2 and 5.3, distinct value configurations are articulated at the different stages of the development leading to emergent value propositions. Unlike existing views of the value proposition in which it is often defined up-front and in a static way, in this theorisation I propose, from my study, that the innovation process is an environment within which the construction and reshaping of the value proposition takes place through this interplay and transformation of many and varied types of value. Seen in this way, the value proposition is an integral part of that process and not an antecedent of the development of the digital artefact or a separately evolving element that has a distinct

trajectory from the innovation process. The justifications of value and the interplay between values – or value elements – during that process shape the value proposition longitudinally during the innovation process. At the same time, the emerging value proposition also contributes back to this process. In this way, the value proposition becomes interrelated and interdependent with the actual features of the digital artefact leading to plausible and stabilised rationales emerging out of uncertainty. From this point of view the value proposition is discussed as dynamic rather than as a step by step approach and makes possible the evaluation of different courses of action. As the development of the product unfolds, however, and the actual features are built into the emerging digital artefact this leads to plausible and stabilised rationales emerging from the initial uncertainty.

The articulation of a value proposition from value configurations takes place constantly as the value of each feature becomes interrelated and interdependent through an initially heuristic relative ranking. Consequently, the value assigned to them is reshaped, creating a transformation in their ranking (e.g. it was found to be time consuming to add 3D features but after they justified their decision to employ 3D features the prioritisation of the market order was altered). In this way, the value elements associated with the features are combined and recombined and out of this process new value configurations emerge, leading to an emergent but converging value proposition which is gradually articulated. Thus, this dynamic prioritisation of the relative importance of each 'order', seen as a set of value elements, and of the value elements of which it comprises, and which are in a process of mutual reconciliation, bring clarity and stability to the constitution of an emerging value proposition. Seen in this way, there is a dynamic prioritising of the relative importance of each value regime in the shaping of the emerging value proposition and vice versa. Such a conceptualisation is seen as vital in the context of business model development, as I will discuss in detail in the next section, since the value proposition is considered by many scholars as a core element. Hence, it can provide useful insights in drawing-up a business model in situations of high uncertainty in which digital

innovation has to take place (Hedman & Kalling 2003, Chesbrough 2012, Chesbrough & Rosenbloom 2002).

Second, my empirical findings highlight that the value proposition is articulated by different value elements that are woven together and this shows how, even within the contextual uncertainty, that such innovation takes place when the definition of the value proposition is possible. In particular, my findings highlight the importance of understanding and managing the relationship between design choices and value proposition and the interplay between social/use value and monetary/economic value throughout the development process rather than through a pre-formed value proposition. The aggregation of the design choices throughout the development process illustrates an ongoing mutual adjustment and reconciliation elucidating aggregative value configurations leading to value propositions. Consequently, I argue that it is important to reconcile multiple value elements and 'orders of worth' of multiple actors as a step towards reaching a viable and stable value proposition which contributes to the performance of the innovation, rather than providing a snapshot description. Again, my empirical findings and analysis demonstrate a mechanism through which a value proposition is achieved in an emergent way, and also provide a detailed description of how the notion of 'value elements' (Faber et al, 2004) relates to such a process and to the development and design of an innovation or artefact (Peffers et al, 2007, Verschuren and Hartog, 2005). Moreover, this conceptualisation points to analyses of value co-creation, co-production (Sarker et al. 2012. Kohli & Grover 2008, Vargo et al. 2008, Prahalad & Ramaswamy 2004). In particular, the theorisation in relation to the articulation of value configurations and their dynamic transformation points towards the concept of the value proposition – or offering (Hedman & Kalling 2003, Ramirez 1999, Magretta 2002) – and has been central to analyses of value co-creation in situations in which the distinctions between the producer and the user of a product, system, or innovation have become increasingly blurred (Sarker et al. 2012. Kohli & Grover 2008, Vargo et al. 2008, Prahalad & Ramaswamy 2004). Hence, I show that the value proposition enables the enrolment of key partners and entities (Hedman & Kalling 2003) who

justify their actions through recourse to a multiplicity of values without the need to make distinctions between the producer and the user and by extension between developers' values and users' values. Thus, in turn, the value proposition demonstrates value "in terms of profit, for an investor, or in terms of advantages for a customer or a partner" (Doganova & Eyquem-Renault 2009, p.1566), while it can act as what Chesbrough and Rosenbloom (2002) refer to as a "focusing device".

While the value proposition is often acknowledged as a key element in the conceptualisation of value for an innovation and one that is seen as necessary in the context of business model development (Doganova & Eyquem – Renault 2009, Osterwalder & Pigneur 2003, Hedman & Kalling 2003), there is a lack of empirical studies on how the value proposition is articulated. Along these lines of literature, attempts have been made to develop formal descriptions of value propositions (Osterwalder & Pigneur 2003) through which more explicit links between the conceptualisation and other components of a business model can be established (Osterwalder & Pigneur 2003, Hedman & Kalling 2003, Carton et al. 2011). Nevertheless, the points regarding how the envisioning of the value of a future venture, and the value creation logic that it will entail are performed by entrepreneurs in practice, ahead of any formalisation, have received less attention. Made together, these observations from the literature in my study indicate that focusing on the discursive aspects of the value proposition and the way the value of a digital technology innovation is conceptualised during the development, provides a way to understand how it articulates and transforms during the development process. In particular, drawing on the empirical findings and analysis of the present study, I relate my understanding and contribute to the linking between the "narrative and calculative" aspects of a value proposition (Doganova & Eyquem-Renault 2009, Callon et al. 2007) and the features of digital technology innovation. To elaborate, it is important to focus on how, through this on-going ordering, justification, and reconciliation of features, the emerging value proposition takes shape. I build upon my analysis to base my argument on this study of the emergence and articulation of the value proposition, in relation to the design features of

digital technology innovation being developed through an investigation focusing on the interplay between the features being built into a digital technology innovation, and the unfolding articulation of the value proposition as it is being developed. I argue that multiple values that influence and are transformed within the innovation process and this shaping or stabilisation, result from the way the design choices are made, and how the 'orders of worth' they stem from are built into the artefact as the innovation is materialised (Hedman & Kalling 2003). Through these configurations of value general agreement is obtained, enabling the articulation of a value proposition, without assuming the existence of a clearly defined market. I argue that this mechanism of mutual adjustment and reconciliation between value configurations, orders of worth, and value proposition highlights cases in which the digital innovation has not yet been introduced to the market, or the market does not display the traditional characteristics of supply and demand that can be drawn on for the articulation of the value proposition.

Through the mutual adjustment and reconciliation described above, my empirical analysis and findings demonstrate that clarity and stability are brought to the constitution of the value proposition, as the set of features starts to become limited by growing dependencies among them, particularly those that have already materialised in the artefact. In response to my second research question, I demonstrate that as these choices become progressively more concrete and the trade-offs involved more explicit, they also shift from being primarily discursive to becoming calculative. So, for instance, as soon as the choice of using 3D graphics has been made, this has implications in terms of cost (software tools, developers' labour, buying expertise) but also in terms of assumptions made about the capabilities of users' game-playing devices (graphics cards, graphics accelerators, processing power). Once that choice starts to be built into the artefact and into actual expenditures, there is an explicit and calculable ordering where the importance of an immersive and engaging user experience is above the concerns of accessibility to users with technically inferior playing devices, and worth a certain proportion of the development budget. As a result, other features that are lower down in the ordering may

well be sacrificed, as the immersive user experience and its justification become a central part of the value proposition and of the game itself. Furthermore, more exact estimations of cost can be made and calculations entered into regarding implications for other features and whether they can be maintained or have to be sacrificed, or whether the budget can be increased if the justification for them is equally compelling. Along these lines I point out a "logic that connects technical potential with economic value" (Chesbrough & Rosenbloom 2002) and especially for digital innovations which embody distinct characteristics that create complications and a need for new business models (Tripsas 2009, Chesbrough & Rosenbloom 2002). Seen in this way, my conceptualisation proposes that the value proposition is an important discursive device that makes transitioning from a qualitative and imprecise definition of parameters of a value proposition possible, to a more clearly defined and calculable proposition. In other words, I argue that I propose an alternative perspective that is better able to take into account the many and heterogeneous and dynamically interacting aspects of value found in digital technology innovation. In particular, the value proposition in my research offers a coherent portrait with value configurations which elucidate a systematic combining of different forms of value at any stage of the development process. Thus it is also dynamic due to the dynamic relation it has with the value elements, and the interpretations of what is seen as valuable for the developers and the potential customers/users which are constantly justified. The following figure (Figure 6.2) demonstrates the aforementioned justifications of value of design choices and the abstracted reconciliations of value elements.

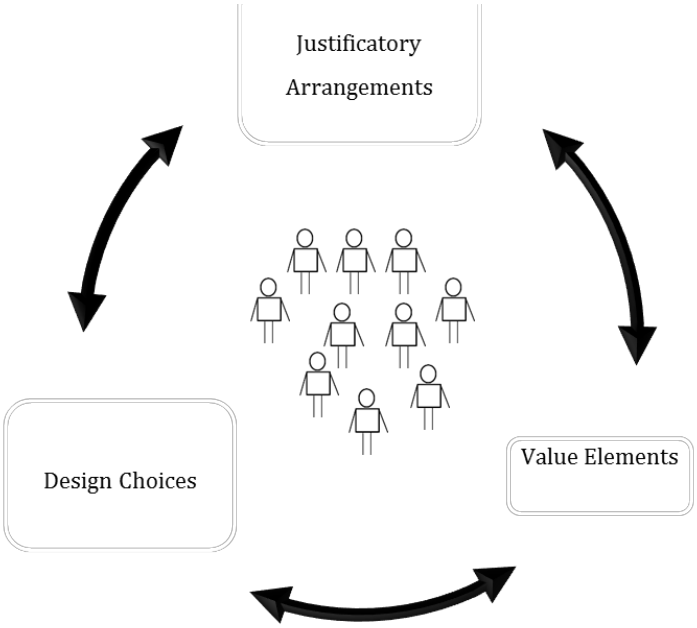


Figure 6.2: Justifications of value of design choices and the abstracted reconciliations of value elements.

Further, in terms of value elements, value configurations and value proposition, my analytical approach to the study demonstrates how to draw on the pragmatics of justification and the "orders" or "regimes of worth" to investigate the emergence of multiple value elements throughout the development process of digital technology innovations and the role of these value elements in the articulation of a value proposition. In particular, I illustrate how the establishment of "orders of worth" provides an understanding on how the value elements that are associated with the features of such artefacts articulate an evolving value proposition and why this is important. I demonstrate how the value proposition of digital technology innovations with indeterminate use and addressable market are arrived at. In particular, I propose that links between a multiplicity of values are forged and a hierarchy of value elements is established through the development process. This enables a dynamic constitution of the value proposition (Hedman & Kalling 2003) and proposes convergence rather than separation between economic/finance and non-monetary views of value (Al-Debei & Avison 2010). This

approach also makes it possible to show how business and use values should not be seen as separate but linked, even if within this linking – and resultant order or ranking – there is, nonetheless, a resulting hierarchy. In particular, my findings show that certain values which are initially related only to the developers (e.g. the decision concerning the game engine as far as its licensing) can later be transformed into value(s) for the users (e.g. cost of the game, limited connectivity), while at the same time point towards situations in which the distinctions between producers, users and customers of an entrepreneurial venture have exceeded increasing vagueness. As such, the value configurations exhibit twofold transformation. Either the existing value elements are articulated in different ways, because new values are brought into play, changing the dynamics between the existing orders and reshaping the value configurations, or the existing value elements are transformed (e.g. values that were belonging to functional order they transform and become values that belong to market order), and consequently they increase the importance of other value elements, creating transformations of the value configuration during the development process.

So, to summarise, in response to my second research question my findings show that, even within the technological and market uncertainty in which such innovation takes place, an emergent constitution of a value proposition for digital technology innovation is possible. I describe a process of mutual adjustment and reconciliation of value elements (Faber et al. 2004) for an emerging value proposition, and how clarity and stability are brought into its constitution. I offer novel insights into the process through which different value elements are combined and recombined to represent an emergent value proposition for digital technology innovation with an uncertain market potential This involves empirically grounded insights as to how the value proposition can be of relevance to technology and systems development, particularly when that development takes place in settings where usage is uncertain and the market potential is still fluid and/or characterised by a high degree of complexity. Thus this shows that, even within the technological and market uncertainty within which such innovation

takes place, it is possible to trace the emerging value proposition in an emergent way without the need for a preformed business model.

This section leads to my last research question regarding how an emergent value proposition contributes more generally to the theorisation and development of business models, which I will discuss in detail in the subsequent section.

6.4 The implications of an emergent value proposition more generally on the theorisation and development of business models

In the previous sections I discussed in detail how the actors involved in the development of digital innovations justify the value of their innovation and how the value proposition of digital technology innovations with indeterminate use and addressable market arrived at the development of such innovations. In this section, taking into account the aforementioned discussion, I will reflect on how the value elements manifested during the development process and the articulation of an emergent value proposition provide more general insights into the theorisation and development of business models. In order to answer my third and last research question, it is important to reflect on how the conceptualisation of the present study contributes to more generally on the theorisation of a business model. A wide range of scholars have highlighted that digital technology innovations echo new understandings of the business model and business model components, and consideration of socioeconomic motives which can create trials for the development of new business models as the traditional are eroded (Berente et al. 2007, Tripsas 2009, Chesbrough & Rosenbloom 2002). As discussed in the previous sections, the notion of value is central to business models and business model design (e.g. Osterwalder & Pigneur 2003, Hedman & Kalling 2003, Chesbrough & Rosenbloom 2002) and within the existing literature the value proposition has been considered as a key element or component. The present study indicates how different forms of value are woven together to value configurations, which articulate the value proposition, and how these value configurations

reshape constantly as the development process evolves. It is important to focus on how, through this on-going ordering, justification, and reconciliation of features, the emerging value proposition takes shape.

Drawing on my empirical findings, I argue that the development process is an environment within which the construction and reshaping of the business model takes place. Seen in this way, different fragmented values become part of that process, and elucidate a way to measure the performance of a business model relative to these values as they emerge from the development process. I also argue that the emerging articulation of the value proposition and the value configurations do not leave the business model intact. Consequently, this also contributes back to the business model, offering the potential to create logical rationales informed by the multiple value elements which constitute the value configurations. In this way I show how the value proposition demonstrates a coherent portrait of value creation and value capture. So, the values in use and the values in exchange create a 'passing test' that indicates the reconciliation between the vendor and the potential customer. This way, the value position is a crucial step towards achieving a viable, stable, but at the same time, adaptive business model.

Existing views of the business model, which are often defined up-front with a static representation or a simplified description (e.g. Linder & Cantrell 2001, Ghaziani & Ventresca 2005) are often "an invitation for faulty thinking and self- delusion" due to their "loose conception of how a company does business and generates revenue" (Porter 2001, p.73). In my theorisation, I propose that the value proposition seen as an integral part of the business model reflects on the latter. In particular, I suggest that when there is high uncertainty due to the ambiguity about the usage and usefulness of a digital artefact, together with challenges to discern the market potential, then the business model changes and evolves over time along with the value proposition. The precedence of understanding and managing the relationship between design choices and value proposition in the development process before an up-front business model is a step towards a viable and stable business model. Hence, it is important to focus on

how, through this on-going ordering, justification, and reconciliation of features for the articulation of an emerging value proposition, it reflects on the business model and enables it to provide an adaptive rather than only a "synthetic explanation of complex processes and allows addressing a coherent portrait to an audience" (Doganova & Eyquem-Renault 2009, p.1567). This is because an up-front business model for digital technologies with indeterminate use and lack of market potential cannot answer questions such as: "who is the customer?", "what does the customer value" or "what is the underlying economic logic that explains how we can deliver value to customers at an appropriate cost?" (Magretta 2002, p.4).

Moreover, the development of digital technology innovations is surrounded with uncertainty around the definition of, and relationship between business model components (Hedman & Kalling 2003, Chesbrough 2012). I relate this to the stimulating research that has described the business model in terms of its components (e.g. Afuah & Tucci 2001, Amit & Zott 2001, Hedman & Kalling, Chesbrough 2012, Al-Debei & Avison 2010). I argue that these approaches cannot accommodate the uncertainty which is inherent to digital technology innovations, making the business model fuzzy and theoretical, thus in turn, they under-theorize the cases where some of the elements or components are missing. I argue that focusing on the value proposition and the value elements that articulate the value proposition can be a step towards a prospective constitution of the business model when there is not an ex-ante clear and understood market. Hence, my conceptualisation of the value proposition offers insights into how the different elements provide adaptability when key partners are enrolled, in order to demonstrate the value in terms of "profit, for an investor, or in terms of advantages, for a customer or a partner" (Doganova & Eyquem-Renault 2009, p.1566).

For some scholars the business model is considered as a narrative (Magretta 2002) and enables a lot of 'interpretive flexibility' (Pinch & Bijker1987). Hence, in those cases, the scholars provide a polysemantic description of the sequence of events while the main argument of how a business model enables the creation and capture of value remains vague. In addition to this, it is

unclear whether the scholars are looking for empirical evidence for the constitution of the business encounter holistic models, or representations, rather than rhetorical and ambiguous claims, because the developers have limited understanding of the multiplicity of values manifested in digital technology innovations. Consequently, I argue that the different "embedded values" that are woven together to provide understanding of the core element/component of the business model when the other components remain obscured. Therefore, this supports my argument that the emerging and dynamic articulation of a value proposition, as is proposed in my research, is a crucial step towards the establishment of a business model when there is uncertainty regarding the addressable market, but also lacks a clear upfront idea of the usage of that technology (Chesbrough & Rosenbloom 2002).

In this way, I argue that the value proposition considered as a key element of a business model becomes a vital component, acting as the bridge between narrative and calculative aspects of the business model. In particular, this 'bridging' between the narrative and calculative aspects of a business model that I describe provides a contribution both to the specific theorisation of business models as 'market devices' (Doganova & Eyquem-Renault 2009), and also to the wider concept of 'market devices'. In response to how an emergent value proposition contributes to the theorisation of a business model more generally, I suggest that the value proposition is an important discursive device that makes possible the transitioning from a qualitative and imprecise definition of the parameters of a business model to more clearly defined and calculable ones. In addition, I base my argument on the emergence and articulation of the value proposition in relation to the design features of digital technology innovation being developed through an investigation focusing on the interplay between the features being built into a digital technology innovation and the unfolding articulation of the value proposition as it is being developed. In particular, by drawing on my analysis I argue that this shaping or stabilisation results from the way the design choices are made and the 'orders of worth' they stem from are built into the artefact as the innovation materialises (Hedman & Kalling 2003). Through the mutual adjustment and reconciliation described above, clarity and

stability are brought to the constitution of the value proposition as the set of features starts to become limited by growing dependencies among them, particularly those already materialized in the artefact. As these choices become progressively more concrete and the trade-offs involved more explicit, they also shift from being primarily discursive to becoming calculative. For example, once the choice of using 3D graphics has been made, this has implications in terms of cost but also in terms of assumptions made about the offering. So once that choice starts to materialize into the artefact and into actual expenditure, there is an explicit and calculable ordering.

Viewed in this way, dynamics are being developed between the value creation and value capture logics which impact on the constitution of a "viable business model" (Morris et al. 2005). For example, when the importance of an immersive and engaging user experience is above the concerns of accessibility to users with technically inferior playing devices, and is worth a certain proportion of the development budget, then this needs to inform other elements such as the revenues. As a result, other features that are lower down in the ordering may well be sacrificed, as the immersive user experience and its justification become a central part of the value proposition and of the game itself. Furthermore, more exact estimations of cost can be made and calculations entered into regarding implications for other features, and whether they can be maintained or have to be sacrificed, or whether the budget can be increased if the justification for them is equally compelling. This points to the argument made by Morris et al (2005, p.732) who argue that "adaptability may require models with loosely fitting elements or introduction of new elements that change the dynamics among existing elements". Hence, I suggest that the value proposition can be seen as an adaptive relational tool which facilitates the management of the uncertainties and eventually arrives at a business model. In this way my empirical findings process enable me to point to ways of understanding the value of such innovations ahead of commercialisation (Chesbrough & Rosenbloom 2002, Chesbrough 2012) and probe the changing dynamics between value proposition and business model throughout the development process.

Moreover, I am able to show, therefore, not only how, even within the contextual uncertainty within which such innovation takes place, that the definition of the value proposition is possible, but also how it plays a crucial role in making visible and explicit the various components of a potential business model (Pateli & Giaglis, 2004, Shafer et al, 2005, Doganova & Eyquem-Renault, 2009, Hedman & Kalling 2003), since it incorporates different values which in a traditional business model approaches are related with several components. In my theorisation, notions such as the cost or the revenues are interrelated with the offering and I demonstrate their relative importance towards other value elements during the development process. I do this because the cost, for example, is an important factor for the design choices, and when there are budget constraints it has direct impact on the actual product, in other word business and use values are not seen as separate but linked, even if within this linking – and resultant order or ranking – there is nonetheless, a resulting hierarchy. Consequently, this points to my argument about perspicuity of these components when the uncertainly due to the lack of clarity about the market and the usage make the conceptualisation of these components fuzzy or even elusive.

Additionally, I must not omit in response to my final research question to elaborate on this bridging between the narrative and calculative aspects of a business model. This is vital because it provides a way of linking use and monetary value more explicitly in the eyes of the developers, but also, it facilitates the recruitment of users and developers who, while they may have very different understandings of the value of the innovation, can see how these different views are linked (Reuver et al. 2011). Our empirical analysis and findings demonstrate that the interplay between the value elements serves as a way to face the changes about "the decision variables in the areas of venture strategy, architecture and economics to create sustainable competitive advantage" (Morris et al. 2005, p.727) when there is uncertainty about market potential and the actual usage of the artefact. This is seen as a crucial step in resolving the uncertainty of the constitution of a business model in a way that accounts for both emergence and stability. Moreover, the interplay rather than the separation between economic and non-

monetary views of value attempts to decentralise the economic value which is hampering other omitted values elucidating ways to gain competitive advantage (Teece 2010, Amit & Zott 2001, Carton et al. 2010) Consequently, the present study demonstrates how the perceptions of value of the actors involved are reconciled and how multiple views of value manifested early in the development can become an "input" to the business model (Doganova & Eyquem-Renault 2009).

Moreover, drawing on my empirical analysis and findings, I indicate implications that a view of the value proposition, as part of the 'market device' of a business model, has for the theorisation and development of business models. I argue that my empirical analysis shows how the value proposition mediates the development of a business model by creating a "heuristic logic that connects technical potential with the realization of economic value" (Chesbrough & Rosenbloom 2002, p.529). In this way, it is an important part of how the business model establishes rather than describes the feasibility of the development of a digital technology innovation (Doganova & Eyquem-Renault 2009) and a dynamic demonstration of the social groups for which the digital artefacts has been developed. The 'bridging' between narrative/discursive and calculative is a crucial part of the business model as an adaptive relational tool (Doganova & Eyquem-Renault 2009) and "it can be expected that, due to the experiments in the role out phase, more information on market changes, the operations of technology, and user perception of ease of use and utility, are collected and therefore impact the business models" (Bouwman & MacInnes 2006, p.4). Seen in this way, my conceptualisation also contributes to a sensitisation of the perceptions of different actors who bring into play external and internal dynamics through the interplay of multiple forms of value and by coping with situations of high uncertainty as far the actual usage of the digital innovation and the market potential Consequently, I argue that my theorisation of the articulation value proposition can serve as a way to explain the relationship between the value proposition and business model, explaining why some digital innovations are thought of as more successful than others. At the

same time, I bring to the fore and give empirically grounded insights as to how to manage the relationship between the technology and the business model.

A key theoretical point here is that social/use value and monetary/economic value are not antithetical (Friedman et al. 2013, Gordijn & Akkermans 2003, Bonaccorsi et al. 2006) but in constant interaction and can be reconciled, or at least made more explicit and visible through the materialisation of the innovation and the design choices associated with this materialisation (Antero et al. 2013, Reuver et al. 2011). This can also provide useful insights for more formal design approaches such as Ballon's business model approach (2009) and the STOF and CANVAS models, by highlighting how it is possible to deal with multiple value dimensions that might flow from the actual artefact and how they are woven together, while allowing for them to still be contemporaneously transformed (cf. Figure 3 and 4). Within the technological and market uncertainty in which such innovation takes place, the worth of a digital technology innovation requires drawing on multiple dimensions of value, and the adaptability of a business model can be achieved through the articulation of these values in a way that accounts for both emergence and stability. The emerging features of the artefact as it moves through the innovation process act as a motor for the generation of new justifications, through which existing value principles incorporated in the value proposition are reconfigured and new ones brought in. Consequently, this points to a business model that "handles the tension between collective action and exploration, between framing and overflowing (Doganova & Eyquem-Renault 2009, p.1568). Thus, at the same time, it offers a better understanding of the cognitive and economic dimensionality (Baden-Fuller & Morgan 2010) of a business model.

So, to summarise, the answer to my final research question of how an emergent value proposition contributes more generally to the theorisation and development of business models, my findings show that, even within the technological and market uncertainty within which such innovation takes place, it is possible to trace an emerging value proposition through which the components of a potential business model can become visible and explicit (Pateli &

Giaglis 2004, Shafer et al. 2005, Hedman & Kalling 2003) in an emergent way and without the prerequisite of an up-front (preformed) business model. This also points to ways of understanding the value of such innovations ahead of commercialisation (Chesbrough & Rosenbloom 2002, Chesbrough 2012). By describing and theorising how a value proposition is reached, I bring clarity to some of the insights developed by Doganova and Eyquem-Renault (2009) on how the relations between external and internal components of the business model are associated with the value proposition, and I demonstrate how this 'bridging' between the narrative and the calculative aspects of value provide a more general contribution to the concept of 'market devices'. In this way I show how concerns about the construct validity due to the factitious existence of a business model can be faced. I explain how the different forms of value which are woven together and transform as the development process of a digital technology innovation evolves, provide adaptability to a business model so it can perform its function of demonstrating value in a way that accounts for both emergence and stability. Finally, I argue that the interplay of the value elements can serve as a way of bringing clarity to the business models components due to their dynamic relationship with them, elucidating 'expected', 'perceived', 'delivered' and 'intended' values which arise from an emerging but also coherent offering that exceed mutual adjustment and reconciliation between the actors involved. Consequently, I argue that this way the articulation of an emergent value proposition is a crucial step towards arriving at a viable, stable, but at the same time, adaptive business model.

6.5 Summary

In this chapter I conceptualise the insights from my analysis and empirical findings with the relevant literature. I provided a detailed discussion on my research questions: (a) how do the actors involved in the development of digital innovations justify the value of their innovation? (b) how is the value proposition of digital technology innovations with

indeterminate use and addressable market arrived at in the development of such innovations? and (c) how does an emergent value proposition contribute to more generally on the theorisation and development of business models? Thus, I did this with respect to the following analytical themes that I identified from my empirical material: (a) the interplay between the features and the justificatory arrangements, (b) the emerging value elements which condition value configurations, and (c) the articulation of an adaptive value proposition which evolves along the development process Last, drawing on my empirical findings I discussed the implications for the exiting literature on dealing with multiple value elements that emerge during the development of digital innovation with inherent uncertainties and with the challenges to articulate a value proposition that does not see economic and social forms of value as antithetical but in contrast demonstrates a coherent offering and a step towards the establishment of a business model in such a setting.

In the following chapter I will summarise the contributions this study makes and I will explicitly reflect on certain streams of theory. Finally, I will comprise the limitations and the future plans for continuing and expanding on the research presented in this thesis.

Chapter 7: Conclusion

7.1 Introduction

The previous chapter presented detailed discussion on the areas of interest of my research. In addition, I developed a thorough conceptualisation in response to my research questions and the complex phenomenon I sought to investigate. More specifically, I have drawn on my empirical findings and I explored how the actors involved in the development of digital innovations justify the value of their innovation (as per section 6.1), how a value proposition is arrived at emergently through processes of justification (as per section 6.2), and how this generally contributes to the construction of a business model (as per section 6.2).

Drawing on the empirical study of 'serious games' development, my study has offered an understanding of the justification of value in digital technology innovations by the different actors involved in the development process and has demonstrated a novel perspective of the emergent articulation of a value proposition for them. I have described how even within the technological and market uncertainty within which such innovation takes place, it is possible to trace the manifestation of value elements associated with the design features. This conditions a process of mutual adjustment and reconciliation of value elements for an emerging value proposition through which the components of a potential business model become visible and explicit in an emergent way. I have also described the implications of an emerging value proposition for the theorisation and development of a business model when the market potential is unclear and without the need for a pre-formed business model.

In this conclusive chapter, I provide an overview of the research and then I outline the contributions this study makes and more specifically, I summarise: (a) the implications for research, (b) the implications for practice. Then I present the limitations of this research and I provide a reflection on the adopted research paradigm along with the research design

limitations. I will conclude this chapter with a discussion on the future research that could build on and expand each viewpoint of this study.

7.2 Overview of the research

There is limited empirical material on how digital entrepreneurs and innovators assess the emerging value of a novel digital technology in practice in the early stages of its development. Moreover, digital entrepreneurs and innovators face challenges to articulate a value proposition and to constitute a business models and as a result, often, they are focused around serendipity. Therefore, the establishment of value propositions for digital technology innovations of uncertain market potential is challenging because of the difficulties in conceptualizing the value of such ventures. This thesis has investigated is how the actors involved in the development of digital innovations with under-determined uses and addressable market justify the value of such innovations in an emergent way during the design and development process and how they articulate an emergent value proposition for a business model.

From the extensive literature review as presented in Chapter 2 and the empirical data presented in Chapter 5, it has become clear that the development of digital technology innovations is surrounded with uncertainty despite the growth in the development and adoption of context reconfiguring innovations such as digital innovations and the implications they have in terms of the design and development of products and services (Yoo et al. 2010, Eaton et al. 2011, Tilson et al. 2010, Sørensen et al. 2005) there has been less discussion regarding the justification of value and especially in settings with uncertainty about the usage and the market potential. The developers have limited understanding of the multiplicity of values manifested in the new technologies and how to arrive at a value proposition as a crucial step towards the establishment of a business model. This is not only because of the uncertainty regarding the addressable market, but also the lack of a clear upfront idea of the usage of that

technology (Chesbrough & Rosenbloom 2002). As such, they are engaged in a strenuous attempt to manage the uncertainty of a technology during the development process (Hanseth & Lyytinen 2010, Lyytinen & Damsgaard 2001, Tuomi 2002) and a longitudinal assessment of a continuously and often rapidly changing market potential Within such a context, the articulation of a value proposition becomes a critical challenge for the developers in order to create and capture value from their innovation.

In order to investigate such a complex phenomenon I have drawn on an empirical study of serious games as a case of digital innovation and I have discussed the reasons they are distinguished from non-digital technological innovation (Yoo et al. 2010, Eaton et al. 2011, Sørensen et al. 2005, Tilson et al. 2010). I have taken an interpretive approach (Walsham 2006) in order to seek to understand the interplay of the perceived values between the actors involved in the development process. The study was conducted at two serious games companies which exhibited the characteristics which I sought to investigate namely: (a) not a well understood usage and usefulness of the novel digital artefacts they were developing and (b) challenges of commercializing and defining the market potential of their products. Although all the games were different and the companies displayed some differences in their development process but also in their set up, as I have also described in subsection 3.7.3 (Table3.3) they shared a number of important norms and practices.

One important aspect of the findings from the analyses has been that the development process of the games share common attributes with minor differences in the sequence of the events during the development process and the actors involved. Consequently in Chapter 5 I have chosen not to present the empirical material on a game by game basis but I have chosen to present the findings from my empirical study on an organization level using one example product for each case company. This has involved some abstraction; therefore, in order to address potential concerns that I have addressed in the previous chapter.

I have focused on the interplay between the design choices of the features being built into a digital innovation, the value of these choices and how these choices are justified in terms of appeals to what and why might be considered of value to the user, how feasible it may be to achieve it and what impact this might have. In this way I have described how different forms of value emerge and unfold the articulation of a value proposition during the development process with emergence of both economic/financial and non-monetary notions of value. I have drawn on the literature on the pragmatics of justification and the establishment of 'orders', or 'regimes', of worth through trials of justification (Boltanski & Thévenot 2006, Stark 2009). Empirically I have focused on the value elements that emerge from the complex system of value justifications, which construct the value proposition for an innovative digital technology and the actions and interpretations of the people who are involved in the development process through an in-depth research study of two serious games development studios. From the empirical material have emerged three analytical themes: (a) the interplay between the features and the justificatory arrangements, (b) the emerging value elements which condition value configurations, and (c) the articulation of an emerging and adaptive value proposition which evolves along the development process.

Moreover, drawing on the empirical account, in Chapter 5, I have sought to show how a common agreement regarding the justifications of value of the design choices articulates a 'set' of value elements. The value elements are associated not only with economic/ financial values but also with non-monetary values associated with the design choices for the features of the games. Later, the analysis of the empirical material has provided insight into the role design feature choices play in developing a dynamic ordering and connection between value elements and the articulation of value configurations. Finally, the analysis illustrated how the value configurations articulate an emerging value proposition and how the articulation of value position reshapes during the development process as a result of the change of the prioritization between the value elements due to the given importance of the design choices.

Later, in Chapter 6, I have brought together the understandings from my analysis and empirical findings with the relevant literature to revisit the research questions: (a) how do the actors involved in the development of digital innovations justify the value of their innovation, (b) how is the value proposition of digital technology innovations with indeterminate use and addressable market arrived at in the development of such innovations and (c) how does an emergent value proposition contribute to more generally on the theorisation and development of business models. I have built on my findings and outlined the insights that stem from my thesis together with the literature and I have presented how these questions have been addressed in this thesis.

Now I will summarise the contributions and implications of my study. The insights gained from this thesis have implications both the academic community who aim to provide answers regarding the value of digital innovations as they attempt to articulate a value proposition for a business model but also the practitioners who face the challenge of managing the development and commercialization of digital innovations in highly dynamic and complex conditions.

7.3 Summary of contributions

In this section I will reflect on the contributions I make on the digital innovations side. The contributions of my thesis are valuable for both researchers and practitioners who wish to understand digital innovations and their development and commercialization; meanwhile I hope to contribute to digital innovation literature. More specifically, my study is of interest for information systems research as it brings to the fore and gives some in-depth and empirically grounded insights into how the perceptions of the actors involved in the development process are justified as they attempt to substantiate the value of digital innovation of uncertain use and market potential and how the value proposition can be of relevance to technology and systems development, particularly where that development takes place in settings where usage is uncertain and elements or components of business models are still fluid and/or characterised

by a high degree of complexity**.** The contributions I make namely are: (a) fill the gap in the literature about the justification of value of digital innovations for which the market potential is difficult to assess, (b) describe and theorise how a value proposition is arrived at, (c) provide novel insights regarding the relationship between value proposition and business model, (d) introduce a new theoretical approach to the study of value and value proposition drawing from the pragmatics of justifications, and (e) outline implications for the practitioners who face the challenge of managing the development and commercialisation of digital innovations with inherent uncertainties about their indetermined usage and undetermined market potential.

7.3.1 Summary of implications for research

The first theoretical contribution lies in understanding the justification of value in digital innovations by the different actors involved in the development process. As I discussed in Chapter 2, the concept of value creation for digital innovations has become a complex area of consideration, and although scholars have scrutinised the concept across marketing, strategy and management literature, it still remains underdeveloped for digital innovations. Although several scholars have attempted to explain and describe how technology emerges and evolves and the process of value creation and co-creation, most of the debate does not provide answers on how to justify the value of digital innovations for which the market potential is difficult to assess, nor how the actors involved reshape their justification, since they struggle to understand the value of their innovation because they are reconfiguring the social and technical environment around them. The present thesis contributes to this area by describing a mechanism of mutual adjustment and reconciliation within which the value is manifested in association with the design feature and co-evolves with the digital artefact through the development process while both internal and external actors are involved in this process.

A key point here is that the existing literature that has been critically reviewed demonstrates that the notion of value has been an area of constant consideration, however,

there has been a lack of discussion on a uniquely socioeconomic justification (Stark 2000). In addition to the problem of assessing the value of a novel digital artefact, which is further complicated by the twofold nature of the value, the concept of value for digital innovations is itself contested due to their particular transformative and re-configurative characteristics. As I discussed in Chapter 2, the challenge addressed by the present study has been to seek to highlight how a justification of value involves both dynamic and static meaning and is the result of an evolving process rather than an explanation of a static phenomenon. In this context, the exploration of economic and social values was deemed necessary since it places emphasis on the unnoticed value of a digital technology as a way to create value when the market potential is not fully known, and it also raises the issue of the multiple perceptions of value that emerge from the actors involved in the development process as well as the potential customers (Chesbrough & Rosenbloom 2002). Based on these observations my thesis has attempted to fill the gap in the literature regarding the justification of value of digital innovations for which the market potential is difficult to assess and the usage is under-determined. I offer novel insights to the academic audience who are interested by providing a synthetic explanation to the value of such digital innovations. Hence, although previous studies generally overlook the socioeconomic evaluation of digital innovations, in the present study I have focused on the discursive aspects of economic/financial but also social/non-monetary values, while I have shown how the value is interrelated and interdependent with the actual features of the digital artefact, leading to plausible and stabilised rationales emerging out of uncertainty. In this way I hope that such an understanding offers new ways of moving the feasibility of development and the commercialisation of a novel digital technology away from purely budget and monetary driven views.

Moreover, the study presented has shown how the gap identified in the design science literature by Reuver et al (2011) regarding commercialisation might be addressed by showing how design choices rather than cycles can be "related to the way user and stakeholder requirements are made explicit" (Reuver et al. 2011). The contribution here is not only to

propose a process through which a value and by extension a value proposition is arrived at in an emergent way, but to also provide a detailed description of how the notion of 'value elements' (Faber et al, 2004) relates to such a process for the development and design of an innovation or artefact (Peffers et al. 2007, Verschuren & Hartog 2005). Furthermore, while the process described in my study encompasses the key stages put forward in the design science literature - such as hunch, requirements and assumptions, structural specifications, prototype, implementation, evaluation (Peffers et al. 2007, Verschuren & Hartog 2005), the evaluation is happening all the time, and between and across stages and iterations of stages and not in a particular discrete stage of a cycle. From this viewpoint, a dynamic evaluation provides stability and offers a view of a dynamic environment within which both the articulation of the value proposition as well as the development of a digital artefact take place. Therefore the value proposition is an integral part of that process and not an antecedent of the development or a separately evolving element for a business model with a distinct trajectory.

Second, the present study also contributes to the theorisation of how a value proposition is arrived at and may offer insights to the scholars who investigate the constitution of value proposition. In detail, my findings have implications for the theorising of the value proposition for digital technologies that are characterised by limited visibility of the multiplicity of use value they enable, lack of clearly defined ideas of their usage, and uncertainty regarding their market potential. I am able to show, not only how, even in view of the contextual uncertainty within which such innovation takes place, that the definition of the value proposition is possible. To elaborate, I have provided an understanding of how a value proposition co-evolves with the digital artefact throughout the development process, along the lines suggested by Doganova and Eyquem-Renault (2009). The contribution here is not only to propose a process through which a value proposition is arrived at in an emergent way, but also how it re-shapes due to the dynamic prioritisation of the relative importance of each feature and the value elements associated with it. Along these lines, the present study contributes to the linking between the "narrative and calculative" aspects of a value proposition (Doganova &

Eyquem-Renault 2009, Callon et al. 2007) and the features of digital technology innovation. Through a mutual adjustment and reconciliation between value elements, value configurations, and value proposition, as I have described in Chapter 6, clarity and stability are brought to the constitution of the value proposition.

Third, another area this thesis aims to contribute to, is the more general area of business models literature where the idea of value proposition is central because it is seen primarily as a component for the constitution of a business model (Pateli & Giaglis 2004, Shafer et al. 2005, Doganova & Eyquem-Renault 2009, Osterwalder & Pigneur 2002, Osterwalder & Pigneur, 2003, Al-Debei & Avison 2010, Zott et al. 2011, Hedman & Kalling 2003, Afuah & Tucci 2000, Dubosson-Torbay et al. 2002, Morris et al. 2005). I aim to provide novel insights regarding the relationship between the value proposition and business model. In the discussion chapter of this thesis (Chapter 6), I have demonstrated how an emergent value proposition contributes more generally to the theorisation and development of a business model. In detail, the insights gained from my study also have implications for the development of a business model when the development of a novel digital artefact takes place in settings where usage is uncertain and the elements or components of a business model are still fluid and/or characterised by a high degree of complexity. Then the value proposition is a vital component for the constitution of a business model, acting as the bridge between narrative and calculative aspects of the business model (Doganova & Eyquem-Renault 2009). This 'bridging' is vital because it provides a way of linking use and monetary values more explicitly. From this viewpoint, my thesis suggests that the justification of value has a core role in the development of a business model because it adds not only monetary, but also social dimensions to the constitution of a business model and helps the constitution of coherent basis to inform the value creation and value capture rationales. Hence, this proposes an understanding of how multiple views of value manifested early in the development can become an "input" to the business model (Doganova & Eyquem-Renault 2009) and seen in this way it creates dynamics between the business model components which are associated with the articulation of the value proposition.

Following this point of view, my study offers insights into the adaptability of a business model and into the opinions of Morris et al (2005, p.732), who argue that the "adaptability may require models with loosely fitting elements or introduction of new elements that change the dynamics among existing elements". This study speaks for the benefit of scholars who aim to find ways to integrate an emergent value proposition, seen as a 'market device' (Callon 2009, Doganova & Eyquem-Renault 2009) or as a 'focusing device' (Chesbrough & Rosenbloom 2002). In this way an emerging value proposition can enhance understanding of how the multiple values that affect and are transformed can be integrated into the wider context of business model constitution, in a way that accounts for both emergence and stability by playing a crucial role in making visible and explicit the various components of a potential business model (Doganova & Eyquem-Renault 2009, Hedman & Kalling 2003, Bouwmnan et al. 2008).

Finally, with respect to another theoretical contribution of this study, I introduce a new theoretical approach to the study of value and value proposition drawing from the pragmatics of justifications. In particular, with the adaptation of the pragmatics of justification and the establishment of "orders of worth", I have attempted to offer a novel theoretical and empirical approach to studying how the links between multiple forms of value are forged and how a hierarchy of value elements is established through the development process. This makes it possible to reconcile the justifications of value of the design choices, and provides a sense making mechanism for the emergent constitution of the value proposition, and hence also for a business model (Hedman & Kalling 2003), with the attainment of a stable and well-defined entity where there is convergence rather than separation between economic/finance and non-monetary views of value (Al-Debei & Avison 2010). In this way business and use values are not separate but linked, even if within this linking – and resultant order or ranking – there is, nonetheless, a resulting hierarchy that is shaped out of the dynamic prioritisation of the relative importance of each feature and the value elements associated with it.

In the subsequent section I will outline the implications of my thesis for the practitioners who face the challenge of managing the development and commercialisation of digital innovations as they attempt to establish a business model for a market of uncertain market potential

7.3.2 Summary of implications for practice

The insights gained from my study have also implications for the practitioners who face the challenge of managing the development and commercialisation of digital technology innovations in highly dynamic and complex conditions. It is a common problem for the developers of novel digital technology to focus on serendipity for the development of digital products and services. The developers are surrounded with uncertainty around the definition of, the usage, and the usefulness of digital ventures. Moreover, the context-transforming characteristics inherent to their products make it difficult to assess their market potential and articulate a value proposition offering for a target market segment. Also, the establishment of an upfront business model is often illusive since it is surrounded with uncertainty around the definition of, and relations between, business model components.

My research offers implications for the managers, strategists and decision makers who face the aforementioned difficulties. They would benefit from my study through a deep understanding of the relationship between design choices and value and the interplay between social/use value and monetary/economic value. This implies a deeper understanding of a mechanism to articulate a coherent value proposition when they have limited understanding of the multiple forms of value manifested in their new digital technologies together with lack of clarity of their market potential My study also offers a mechanism that sheds light on the emergence of a coherent value proposition and how this relates to a potential dynamic view of a business model as it is a crucial step for the eventual constitution of a business model in a high uncertain development context.

The conceptual implications can contribute in similar concerns to those of the developers of Twitter. Jack Dorsey, co-founder and chief of Twitter has admitted on media that "Twitter's business model has been in development for quite some time, and it works.[…] We think of revenue as not a destination but as oxygen that feeds the model and vice versa. You can't build a product without revenue, but you can't focus on revenue without having a product either." [5]. Consequently, seen in this way, my findings highlight the importance of aggregating social/use value and monetary/economic value throughout the development process rather than attempting to focus on the constitution of a pre-formed business model. This is because it is important to reconcile multiple value elements and perceptions from internal and external actors as a step towards arriving at a viable, stable, but, at the same time, dynamic value proposition which contributes to the performance of the innovation rather than provide a snapshot description of a business model that lacks of clarity and can lead to misleading conclusions.

As I described in Chapter 1, the developers are struggling to provide consistent rationales as far as the use and usefulness of their products and frequently they find it difficult to correlate the price of a product with their offering. In this direction, I had positive indications about my contributions to practitioners derived from the case study practitioners. The CEO from Orora found the mechanism of mutual adjustment and reconciliation, within which the value is manifested in association with the design feature, and co-evolves with the digital artefact through the development process, insightful. He implied that it can be a useful tool to manage the different perceptions of the actors involved in their development process and especially in cases where the market potential is unknown and the members of the company are pushing in divergent directions. For example, when the developers insist on adding features that would add certain values while the members of the finance team insist on developing lower cost products in a short period. He also admitted that this approach will contribute to improving the practices that are mainly focused around serendipity. Due to this, the CEO of Orora alluded

[5] http://techonomy.com/2012/08/video-jack-dorsey-on-twitters-business-model/

that they will be able to point to a coherent way of understanding the value of their innovations ahead of commercialization and they will able to use such an emerging offering to reach a viable and adaptable business model that could capture all the useful information which would serve as factors of their calculations involved in the constitution of their business model.

Having discussed the implications of my research, I now turn to the limitations in relation to the research paradigm and the research design, including those regarding the generalisation of the methodology and theory I examined.

7.4 Limitations of the research

My thesis has several contributions for research and practise in relation to the justification of the value of digital innovations for which the market potential is difficult to assess and there is lack of clear understanding about their use. These implications were described in detail in the previous sub-sections (Sub-section 7.3.1 and 7.3.2). Nevertheless, although the research has provided the aforementioned contributions and reached the aim and scope, there are some unavoidable limitations. In this section I aim to criticise these shortcomings and I will justify the trade-offs and choices I have made for this research.

7.4.1 Reflection on the adopted research paradigm

First, the phenomena of interest of this study presented 'exploratory nature' (Yin 2014) and required investigation within the context of real life, with focus on evolving events. I have used an interpretive approach to conduct the research, espousing the assumption that the social world is constructed and reality is constituted by the meanings the actors attach to their actions (Easterby-Smith et al. 2012), and in terms of the 'nature of being', ontology, I "consider reality as an inter-subjective construction, shared between individuals (Nandhakumar & Jones 1997). However, the interpretive research approach has some weaknesses that cannot be neglected.

In particular, the study has focused on tracing the different actors and their notions of value of digital innovation along the innovation process and their attempts to articulate a value proposition. However, value judgements and decisions can be made and are inter-subjectively assessed. Interpretivism is acknowledged to suffer from subjectivity while someone could make allusion for personal influence or neglect to explain 'structural contradictions' (Orlikowski & Baroudi 1991) that undermine the reliability and validity of the study. But, it is also argued that the researcher is responsible for identifying biases, and for this reason I was in a neutral position, gained deep knowledge of the phenomenon and the reasons behind the actions of the actors, which in turn result in their multiple interpretations (Walsham 2006). I had the type of access that allowed me to gain sufficient knowledge and understanding of the participants in terms of various actions and decisions, in order to develop their perceptions (Nandhakumar & Jones 1997). Hence, I gathered verbal descriptions of activities, behaviours and events and sought further explanations in cases where there is either lack of understanding or 'nods, silences, humour and naughty nuances' (Altheide & Johnson 1994, p.297) that could carry ambivalent meanings. Since I was aware of the weaknesses of an interpretive approach, I took into consideration aspects and recommendations from interpretive studies (e.g. Walsham 1995, Nandhakumar & Jones 1997, Brown et al. 2008), to develop a detailed research design model of how I would conduct this practical study and address the methodological aspects of the collection and processing of the empirical data necessary to address all the deficiencies in advance.

7.4.2 Research design limitations

An exploratory investigation also demands a trade-off between in-depth insights and generalisability. It is a fact that case study methodology suffers from critiques in terms of the generalisability of the results. According to Langley et al (2013, p.8) "making [this] inference to an insightful general case requires concrete and penetrating understanding of the particular"

and along the same lines Tsoukas (2009) has argued that qualitative case studies of an understanding of general phenomena take place through a process of "heuristic generalization". In particular, first I must answer "what is going on in QueGames and Orora" and then answer "What is this case of?" (Tsoukas 2009, p.298). As far as the first question is concerned, I have described how the actors involved in the development of serious games justify the value of their innovation when there is lack of clear understanding of the usage and the market potential and I have described how is the value proposition of digital technology innovations with indeterminate use and addressable market is reached, but also how this contributes more generally to the theorisation and development of business models. As for the second question 'what are these cases of?', the insights gained and the theorisation of the present study seem to highlight a number of other ventures. In particular, they are pertinent to entrepreneurial ventures that develop digital products and services, and they face uncertainty as to the usage of that digital technology, but there is also a lack of clear idea about an addressable market for their innovation. However, such insights "need to be appropriately theorized as scholars radially move toward less prototypical organisations" (Gehman et al. 2010, p.2013).

Moreover, the number of cases together with the number of interviewees implies limitations as far as generalisation and the representativeness of the findings. However, the epistemological stances, interpretive, and the "generalization from the setting to a population is not sought; rather, the intent is to understand the deeper structure of the phenomenon, which it is believed can then be used to inform other setting" (Orlikowski & Baroudi 1991, p.5). Moreover, the companies were small in terms of the number of employees, but I argue that they exhibited the central characteristics which I was seeking to investigate, and therefore they have provided good sites for exploring broadly similar challenges across different case contexts (Majchrzak et al. 2011). I have sought to follow key design choices made during the development of more than one game project in each studio in order to gain deep insights. Moreover, the small number of interviewees offered me the opportunity to establish a trusting relationship and the type of access that could provide me with rich data and the appropriate

methods that imply "observing individuals in practice and focusing on the objects they work with and the ends they pursue" (Carlile 2002, p.446). In this direction, the use only of qualitative data could be considered as a limitation. While the quantitative data could have allowed me to provide statistical comparison, I considered that qualitative data could provide me with in depth details for the phenomenon under investigation that I could not reach with quantitative data. For instance, I would not be able to reach thorough understanding of the non-monetary/social values that are not easily quantifiable. In addition, since I did not gather quantitative data I am neither able to test a hypothesis with quantitative methods nor to validate potential trends. However, I do not consider this as an important limitation since the selection of qualitative data was based on the aim and scope of this study.

Another limitation of my empirical account has been that it was less focused on the external actors involved in the development process. However, I gained insights into their interpretations through the feedback they provided to the companies and the meeting notes. Moreover, some of the external actors were involved in the process of providing their input/expertise concerning a specific issue, such as the best practices for extinguishing a household fire, but these insights were interpreted by the developers so as to find the best ways to adjoin this information to the game so as to 'write' it successfully. I argue that further investigation of the external actors was not needed since the developers are responsible for the final decisions and for the reconciliation of the different perspectives. Consequently, I focused on an in-depth investigation of the interpretation of the developers as to the perceptions of the external actors to trace the manifestation of value elements associated with the design features.

Along these lines, another limitation of my empirical account has been that it was less focused on hierarchy/status of actors, both internal and external, involved in the development process. This may be attributed to my analysis of design choices and their justifications in terms of common agreements and reconciliations of actors' perceptions of value rather than status or power. I argue though, that in such small companies the role of status or power was not an

important factor that impacted on the agreements of the actors, and for this reason I did not attempted to further investigation in this area.

Finally, another limitation of the study is on the actual articulation of a business model. Value proposition is a core element of the business model but the companies I studied did not have a model, although they were constantly attempting to develop one. As a result I have not yet seen empirically how the value proposition becomes integrated into a business model and how these values social/non-monetary and financial/economic values are being put into operation for the business model components.

Having discussed the limitations of this research, I now turn to discuss the future plans for continuing and expanding on the research presented in this thesis.

7.5 Further research

My study provides a conceptual and methodological platform for further research to explore the issues I have investigated. As I explained earlier the value proposition is conceived as an important integral element of the business model but I have not seen how it becomes integrated into a business model. As a result a future research could focus on how to integrate of an emerging value proposition into a business model and to investigate in practice the relation between the business model components (Zott et al. 2011) and the existence of design patterns (Gamma et al. 2002) or integration mechanisms. In this way, future research could investigate the business model for digital innovations more precisely and the list of components that are needed for its constitution with focus on what does not belong in the list and the dynamics between them.

Moreover, the aim and scope of this study was not to focus on the differences between the companies but this is a starting point for further research in order to map out potential particular practices which could sustain emerging patterns for the integration of the value

proposition in the wider context of the business model by enrolling different values into the business model components. Additionally, future research could include a further focus on the hierarchy/status of actors, both internal and external, involved in the development process and the distinctive practices of envisioning the value of a novel digital technology. Thus, another area to investigate could be the constitution of a business model as an 'activity system' (Zott et al. 2011) and contribute to the wider concept of 'market devices' (Muniesa et al. 2007, Doganova & Eyquem-Renault 2009). I aim to seek for insights into the performative role of the practices of the actors related to their hierarchy /status for the constitution of a business model and the implications of these performative practices to the activities of a business.

Last, further research could also be directed towards the area of information systems research and more specifically on how the value proposition can be of relevance to technology and systems development with in-depth and empirically grounded findings. Although the concept of business model has been extensively discussed in the IS literature there is still lack of discussion with empirical evidences how the value proposition can be of relevance to technology and systems development and how the justification of value practically mediates the development of a business model pointing to the issue of performativity and investigating the knowledge to provide stabilised rationales (Muniesa et al. 2007, Carton et al. 2011).

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Appendix 1: Guide used for semi-structured interviews

Points to remember during the interviews:

- Trace the development process
- Unpack terms and processes and actions
- Trace actions, interactions, agreements, conflicts, negotiations, discards

Points of discussion during the interviews:

Personal responsibilities in the process

Documentation and tools in the workplace

Process, checks, changes, approvals and progress, trajectories of meetings

Examples of case study Questions:

1. Imagine I am totally unaware of your products and services, tell me about (game)
2. Why (game) is considered as a serious game?
3. Why did you decide to develop (game)
    a. Explore the changes to the intended aim and outcome of the game throughout the process
    b. Effects of the decisions
4. Could you give me examples of a puzzling decision you came up with on the project of (game)
5. Could you tell me about the main topics of discussion during the meeting for the development of (game)
6. During the early stages did someone raise reservations?

7. How did you reach an agreement when there are disagreements?
8. Development team and finance team disagree on the way to create and capture value. How do you reach an agreement and how do you justify these forms of value?
9. Along with the agreements you made why did you have to review them and how radical were the changes you made?
    a. Explore the relation between the changes, the agreements of the value of the game, the value proposition and the business model
10. What were the challenges you faced?
    a. Explore uncertainties, ways to overcome problems
    b. Trace the transformations of their perceptions and reasons
11. How long did it take to develop (game)
12. When did you decide between the features you obtain? Criteria to make these decisions?
    a. Explore potential evaluation
13. Imagine I know nuts about the way you evaluate a project, tell me what it's like to evaluate an idea and then a project
    a. Explore different perceptions of value
    b. What is considered valuable?
14. How do you measure the added values?
15. What was the impact of this feature to the game? – what is the added value to the game if you add the "x" feature and not "z" feature? How do you measure the added values?
16. What was the sequence of tasks for this project?
17. So, when you were involved in the project, do you think that you reviewed any pre-existing decisions?
18. Did (game) succeed to attain the expected levels of success?
19. How do you explore the existing environments and the needs of your potential customers?
20. Who was involved at this stage?

21. It sounds puzzling to me to create value for potential customers with all the uncertainties you mentioned. Could you elaborate to this?
22. Do you have an up-front business model?
23. What constitutes your business model?
24. Let's assume that I know nuts about the concept of value proposition, tell me what its like?
25. How do you arrive at a value proposition?
26. What are the questions you ask to develop your value proposition?
27. When do you know that your value proposition work?
28. Can you describe any interactions with the market or potential customers?
29. Do you use any documentation when you attempt to approach a potential customer?
30. Can you tell me what are the major uncertainties you faced during the development process and how did you overcome them?
31. Are there any examples of the documentation you used throughout this process?

Appendix 2: Contact letter

The following is the letter I used to approach the companies for the fieldwork and provides the details I provided the companies with as far as the aim of the study and the confidentiality of the obtained information.

Dear XXXXX,

I am writing to you to express my interest and motivation in pursuing further my research in your company. Looking at the work and structure of your firm it is my strong belief that my presence in your enterprise will give great synergy between viable growth of your firm's initiatives and my expertise in the various areas including business plans, estimations of the market size, demand forecasts and analyses of good technological paths to achieve the opportunity. With my expertise, I am confident that I can make a valuable contribution to your firm's future projects and initiatives.

My research focuses on investigating ways of conceptualising the value of digital innovations such as serious games, for which the market potential is difficult to assess, and to explore the way that value can be used for the commercialisation of such innovations. I will try to understand the identified concepts of value into the stakeholders and their interactions longitudinally, as it is important to understand the economic and social concepts of digital innovations in order to understand how to communicate the value to the potential customers. The main contribution of my research is to elucidate ways to develop commercialisation strategy.

Looking at the work and structure of your firm it is my strong belief that I could trace the trajectory of the evaluations that have been made for one or more serious games. My starting point is the moment when the idea for the development of a serious game appeared until the moment of the first transaction with a customer. Thus, I expect to meet different stakeholders. I would like to interview these stakeholders in order to understand their interpretations

concerning the serious games. I plan informal and unstructured interviews in order to develop a keen understanding of the topic. The questions are planned to be unstructured and I intend to direct the discussion with questions such as:

- *How did you decide to develop a serious game?*
- *During the development of a serious game did your perceptions change for the value of the potential customers or your firm?*
- *Could you refer the people who were engaged on this stage?*

I would like to make clear that all the information will remain confidential and nothing will be published without approval.

In addition, my academic background demonstrates attributes that make me valuable for your firm. I have developed several business plans in tandem with new technologies such as a business plan for the implementation of m-ticketing in public transportations and a business plan for a provider of broadband services in a specific region of Greece. My dissertation was about Near Field Communications (NFC) with a Case Study in Mobile Banking in South Africa. I reviewed the critical success factors such as consumer behavior, costs, trust and security, usability, and lastly legislation governing mobile payments. I explored the various business models being proposed and applied during the implementation of NFC mobile payments.

For the aforementioned reasons I strongly believe that my presence in your team would be valuable for your firm and my research. I would like to thank you for taking the time to review my credentials. I hope you feel a personal meeting would be beneficial; I am available at your convenience to speak with you to evaluate your needs and share my ideas. I look forward to hearing your positive response.

Yours sincerely,

Katerina Antonopoulou

Appendix 3: Consent Form

One copy of this completed form was given to each participating interviewee at Orora and QueGames and the other retained by the interviewer

Title of Thesis/project:

"Digital innovations with inherent uncertainties:
From the justification of value to the articulation of a value proposition"

Name of Researcher:

Katerina Antonopoulou

Doctoral researcher at Warwick Business School

(to be completed by participating interviewees)

I agree to take part in the above study and am willing to (please tick those you agree to):

1. Be interviewed ☐
2. Have my interview audio recorded ☐

AND I understand that my information will be held by the researcher and I agree to its being used for the purposes of research in the proposed doctoral research project:

1. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my conditions of employment or legal rights being affected ☐
2. I understand that my responses will remain confidential ☐
3. I understand that my data will be stored in accordance with the Data Protection Act (1988). ☐

4. I understand that only anonymised quotes will be used and published in the final report and that if an individual is mentioned, a pseudonym will be provided to protect that individuals' identity. ☐
5. I agree to take part in the above study. ☐

_____	_____	_____
Name of Participant	Date	Signature
_____	_____	_____
Name(s) of Researcher(s)	Date	Signature

Appendix 4: Interview guide

QueGames

#	***Pseudonym***	***Job Title***	***Date***	***Duration***
1	Josh	Graphic designer and artist	10/10/2012 12/12/2012	00:52:00 00:68:00
2	Nick	Software engineer	19/10/2012 13/11/2012	00:67:52 00:45:32
3	Andy	Project manager	15/11/2012 11/12/2012	01:15:29 00:45:21
4	Alex	Designer, artist and animator	28/12/2012 09/01/2013	00:51:25 01:10:36
5	Peter	Programmer	07/01/2013 22/01/2013	00:59:17 00:58:23

Orora

#	***Pseudonym***	***Job Title***	***Date***	***Duration***
1	Alf	Graphic designer and artist	19/03/2013	00:52:00
2	Allan	Software engineer	27/03/2013	00:47:52
3	Chris	Project manager	04/04/2013	01:15:29
4	Eddy	Business Development Director	23/05/2013	00:51:25
5	Helen	Technical Software Developer	22/05/2013	00:29:17
6	Sven	Technical Software Developer	08/10/2013	00:55:25
7	Lu	Programmer	25/10/2013	00:52:00
8	Simon	Graphic designer and artist	22 /10/2013	01:13:29
9	Ian	Technical Designer	29/10/2013	00:47:52
10	Leo	Designer	02/12/2013	01:15:29

11	Liz	Style artist	17/12/2013	00:51:25
12	Mary	Artist	20/09/2013	00:29:17
13	Peter	Programmer	22/01/2014	01:11:29
14	Richard	Lead game designer	23/01/2014	00:51:25
15	Sandy	Sales director	03/02/2014	00:45:25
16	Tony	CEO	12/03/2013	01:15:29

Appendix 5: List of documents used

QueGames

Research report: Fire

Research report: Recycle

Research report: Diabetes

Conference presentation

Interview on TV

Guide for getting Fire

Guide for getting Recycle

Guide for getting Diabetes

Published material Q1

Published material Q2

Published material Q3

Published material Q4

Facebook posts_Q

Twitter posts_Q

LinkedIn posts_Q

Commercial report Q1

Commercial report Q2

Orora

Research report: VTG

Research report: Car Insight

Research report: Driver

Meeting documents

Whitepaper VTG

Market research

Commercial report

Concept document

Published material O1

Published material O2

Published material O3

Published material O4

Published material O5

Published material O6

Published material O7

Facebook posts_O

Twitter posts_O

LinkedIn posts_O

Commercial report O1

Commercial report O2

Commercial report O3

Commercial report O4