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VALUE PROPOSITION FOR DIGITAL TECHNOLOGY INNOVATIONS OF UNCERTAIN MARKET POTENTIAL

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Abstract

In this paper we explore the notion of value proposition in relation to the features of digital technology innovations of uncertain market potential. Drawing on an empirical study of 'serious games' development we focus on the interplay between the design features as they are being incorporated into the serious game and how these can be addressed through an emergent articulation of the value proposition that sheds light on the establishment of a business model. We draw on 'pragmatics of justification' literature to develop an account of how the values, with not only economic/finance but also non-monetary notion, manifested in digital technologies, are justified in order to arrive at a value proposition. We argue that through mutual adjustment and reconciliation of each value element with the emerging value proposition, clarity and stability are brought to its constitution which are vital in the drawing-up of a business model in situations of high uncertainty. The research contributions we make are (a) theorizing how a value proposition is constituted, (b) introducing a new analytical approach to the study of value proposition drawing from the pragmatics of justification in the context of digital technology innovations' development with social, economic and technical notions.

Keywords: Digital technology, Value proposition, Interpretive, Qualitative Research.

1   Introduction

The growing 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). Those participating in developing that digital technology innovation faced challenges in developing a business model – which they consciously avoided doing, as in the case of Twitter, which did not have a clear business model for the first four years but focused on building "a service that many people use, then figuring out how to make money"[1]. They need to reconfigure the social and technical environment around the digital technology during the development process, 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 and Rosenbloom 2002)or an upfront business model. As such, they are engaged in a strenuous attempt to manage the uncertainty of a technology development process (Lyytinen 2001, Tuomi 2002, Hanseth and Lyytinen 2010), discern relations between, likely model components (Hedman and Kalling 2003, Chesbrough 2012) and achieve a longitudinal assessment of a continuously and often rapidly changing market potential. In this paper we focus on the challenges of developing business models for digital technology innovations, which have uncertain, or difficult to assess, market potential. More specifically, we seek to develop better insights into how the values, manifested in digital technologies, are justified in order to arrive at a value proposition, which becomes a crucial element for the eventual establishment of a business model.

In order to explore this, we expand our focus to the broader issue of how the value of a digital technology innovation is conceptualized during development. We do this by investigating the relevance to such an innovation setting of the concept of the value proposition, or offering (Ramírez 1999, Hedman and Kalling 2003, Rajala and Westerlund 2007), and which has risen to prominence as an element in the conceptualization of value in recent 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 (Ramírez 1999, Prahalad and Ramaswamy 2004, Kohli and Grover 2008, Vargo et al. 2008, Sarker et al. 2012). Our investigation focuses on the interplay between the features being built into a digital technology innovation and the unfolding articulation of its value proposition as it is being developed.

The empirical setting for our study is 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 and Chen 2006, Shute et al. 2009) in order to train, educate, investigate or advertise (Susi et al., 2005). 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. While the computer games industry is already well established, 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.

Based on our study of the development of a serious game, our research sets out to make a number of contributions. First, we seek illustrate and theorize how a value proposition is arrived at (Carton at al., 2012). Second, we introduce a new analytical approach to the study of value propositions drawing from the pragmatics of justification and the establishment of 'orders' or 'regimes' of worth (Boltanski and Thévenot 2006, Stark 2009) in the context of digital technology innovations development and the role of business models in it. Lastly, we seek to develop new insights around the importance and role

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[1] http://www.nytimes.com/2010/04/13/technology/internet/13twitter.html?_r=0

of the value proposition in the development of digital technology innovations and the dynamic constitution of business models for them (Hedman and Kalling 2003, Al-Debei and Avison 2010).

The paper is organized as follows. The next section presents a literature review and our theoretical foundations based on the pragmatics of justification and 'regimes of worth' proposed by Boltanski and Thévenot (2006). In the subsequent section we discuss the methodological approach we have adopted in order to realize the aims of the study. This is then followed by a presentation and analysis of the empirical setting studied and the material collected. Finally, in the discussion section of the paper, we attempt to build on our findings to offer new insights regarding how digital technologies relate to the justification of value proposition and the construction of a business model.

2 Literature Review and Theoretical Foundations

Digital technologies "embody the uncertain and distributed nature of innovation" (Doganova and Eyquem-Renault 2009). The increasing embedendess of digital technologies in products and services (Orlikowski 2009, Bharadwaj et al. 2013) points at 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 and Rosenbloom 2002, Hedman and Kalling 2003, Tripsas 2009, Al-Debei and Avison 2010, Yoo et al. 2010, Chesbrough 2012). Due to this rapid, on-going, and reflexive transformation of production and use contexts, the value of such innovations can often be obscured until their actual commercialization (Chesbrough and Rosenbloom 2002, Chesbrough 2012). With both developers and users struggling to make sense of the value and use of the innovations (Hanseth and Lyytinen 2010, Chesbrough 2012), there is a need for emergent ways of assessing market potential as the development of the innovation takes place (Hedman and Kalling 2003, Al-Debei and Avison 2010, Chesbrough 2012).

2.1 Business models

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 (Hedman and Kalling 2003, Doganova and Eyquem-Renault 2009) Al-Debei and Avison 2010) and how a business model relates to the creation of value and firm performance in the context of e-business (Petrovic et al. 2001, Dubosson-Torbay et al. 2002, Rappa 2004, Shafer et al. 2005, Malone et al. 2006, Zott et al. 2011). Other studies in marketing and strategy have focused on the role of the business model and its components in relation to competitive advantage (Amit and Zott 2001, Chesbrough and Rosenbloom 2002, Teece 2010). One alternative view comes from Doganova and Eyquem-Renault (2009), who draw attention to how the business model helps to explain what value is created and shared, providing a "synthetic explanation of complex processes" and conveying a "coherent portrait to an audience". In this context the business model as well as its "building blocks" are articulated longitudinally.

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 and Kalling 2003, Al-Debei and Avison 2010, Zott et al. 2011). This has primed a research interest in how a greater conceptual coherence regarding what constitutes a business model can be brought about (Hedman and Kalling 2003), and how diverse insights resulting from recent research and studies might be integrated (Al-Debei and Avison 2010).We aim to build on such efforts by focusing on the value proposition, one of the key components of business models, encountered in the context of digital technology development.

2.2 Value Proposition

Within this context, the notion of the value proposition is discussed primarily as a component for the constitution of a business model (Pateli and Giaglis 2004, Hedman and Kalling 2003, Shafer et al.

2005, Doganova and Eyquem-Renault 2009). Information systems scholars have also explained and analyzed the value proposition as a key element of the business model (Afuah and Tucci 2000, Osterwalder and Pigneur 2002, Hedman and Kalling 2003, Shafer et al. 2005, Al-Debei and Avison 2010, Zott et al. 2011), associating it with the measure of performance of the "stakeholders, market share, brand, reputation and finance" (Hedman and Kalling 2003).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.

The value proposition has been broadly referred to as an element to leverage the economic value of a firm (Kallio et al. 2006, Keen and Qureshi 2006) or as one of the "decision variables to create competitive advantage" (Morris et al. 2005) and being shaped as part of a "profit oriented" business logic (Shafer et al. 2005) on the way to creating value and challenging a firm to gain profits through implementing its future plans (Hitt and Brynjolfsson 1996, Kallio et al. 2006). Other scholars, however, describe the value proposition as the value received by the customers (Stähler 2002) and a core component of the business model as the "proposition, which is accepted, rejected or unnoticed by the customers" (Stähler 2002 , Mahadevan 2000, Shafer et al. 2005, Vargo et al. 2008), conceptualized in terms of the price that the customer is willing to pay for a product or service (Dubosson-Torbay et al. 2002). In the same direction, Dogaova and Eyquem-Renault (2009) delineate value proposition as the "passing test" that indicates the reconciliation between the vendor and the potential customer.

These latter views tend to see the value proposition as intertwined with the social or use value of an innovation or system. A number of complications occur regarding a twofold view of the notion of value as the value manifested in the development of a digital innovation is explained and analyzed, not only in economic/financial terms, but also in non-monetary terms. It also has ramifications regarding the views of value associated with an innovation by its producers/developers and users/customers and how they can be reconciled.

In the existing literature little attention has been given to presenting a view regarding how such social and use values are negotiated versus economic/financial values in order to deliver a value proposition. Gordijn et al. (2000) describe the "tangible" and "intangible assets/resources" that are needed to deliver a value proposition, and Bonaccorsi et al. (2006) argue that in an attempt to bridge the values of entrepreneurs and those of an open source community, non-monetary "motivational factors should be taken into consideration".

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. A key exception comes from Doganova and Eyquem-Renault (2009) who discuss 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" in a dynamic relation that creates a trajectory of justifications and transformations. A key purpose of the value proposition in this study 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 and Eyquem-Renault 2009).

We aim to address the lack of a combined usage and monetary approach to the theorizing of value in relation to business models to develop an alternative perspective that is better able to take into account the many and heterogeneous aspects of value found in digital technology innovation, by investigating in more detail the role of the value proposition along the lines discussed by Doganova and Eyquem-Renault (2009). In particular, we seek to better understand how the value proposition, or offering, enables the enrolment of key partners and entities, providing a better understanding of how the components of a business model and the relations between them are defined (Hedman and Kalling 2003).

2.3   Regimes of worth and new perspectives on value

Examining the approaches to business models and the value proposition found in the existing literature and how these are challenged by the particular transformative and re-configurative characteristics of digital technology, it can be seen how the concepts of value that underpin existing views of business models are no longer as relevant (Ramírez 1999). In this section we present the theoretical approach of Boltanski and Thévenot (2006) regarding how humans justify their actions through recourse to a multiplicity of values and which we adapt to develop an alternative way to understand how the many different values that come to bare on and are transformed within the development process are reconciled in order to arrive at a common agreement regarding the justification of value for a digital technology innovation and the articulation of a value proposition for it.

Boltanski and Thévenot (2006) argue that "there is not just one way of making value but that modern economies compromise multiple regimes of worth". At the same time, they also acknowledge that economic value is a basic part of the "construction of value" out of multiple regimes of worth that are used to measure value and can be thought of as principles through which a general concord is arrived at. Patriotta et al.(2011), state that "orders of worth are legitimate forms of common good, which provide universal principles of logical coherence as well as justice". They are principles that 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 adaption to new phenomena" (Bergquist et al. 2012).

Thevenot and Boltanski (2006) identify six worlds, namely, "Inspired", "Domestic", "Fame", "Civic", "Industrial", "Market" (Boltanski and Thévenot 2006), representing a particular regime of worth where individuals can recognize the link between these regimes and their perceptions of worth. Boltanski and Thevenot (2006) argue that a person can refer to any or all the different regimes as explained above. Moreover, justification takes place through the combination of different values as well as spheres of justice with different requirements of justification from which are constituted the different environments/systems (worlds) (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 that rely on the "willingness to pay" (Dubosson-Torbay et al. 2002, Buellingen and Woerter, 2004, Von Hippel, 2009) assume the existence of a market and, as a result, they do not illuminate 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 implemented for 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 a challenging issue since it is influenced by many factors. The concept of regimes can be a useful tool to analyze the fuzzy values that appear at the beginning of an innovation process when there is an idea for the development of a digital technological innovation and the developers start to struggle with finding a way of 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 should be managed, creating the need to reshape any initial business model.

3   Research approach and Empirical Setting

The study adopts an interpretive case study approach (Walsham, 1995, Orlikowski and Baroudi, 1991), which involved the collection of qualitative data to explore the justification of value in the development of the game and the trajectory of justifications of values involved in the construction of a value proposition. This empirical focus encountered at two different serious games studios based in Canada (QueGame – a pseudonym) and U.K (Orora – a pseudonym). Further, the 'serious games' as

the area of enquiry exhibits the characteristics of digital technology with not well-understood usage and implications. Our analytical approach involved focusing both at local development practices relating to interactions, conflicts, agreements, and justifications of each design choices and development, and the articulation of the value proposition at macro level. We adopted the approach proposed by Nicolini, 2009 (based on Latour, 1987 pp 77–79) which involved metaphorically "zooming in" on practices and "zooming out". This approach is used to "re-positioning in the field" that is necessary so that "certain aspects of the practice are foregrounded while others are bracketed" (Nicolini, 2009: p1391).

3.1   Data collection

Data collection involved conduction of semi-structured interviews and observations (only at Orora), between October 2012 and August 2013, in order to obtain significant amounts of information that could potentially disclose new information and meanings (Nandhakumar and Jones, 1997). We conducted 26 semi-structured interviews with 16 individuals including, founders, designers, programmers, software engineers, software artists, project leaders, non-academic content experts and academic experts. The interviews were voice recorded and transcribed whereas the observations were recorded in handwritten notes during or soon after the conduct with members of the studio. In addition to the interviews, we have also collected studio's documents such as research reports, conference papers and presentation, commercial reports, financial statements published material such as articles on press release concerning the studio, their games and their business strategy and vision and other documents such as customers' feedback and blog-posts.

3.2   Data analysis

For the data analysis we coded the transcripts, observation notes and the other material to identify and highlight extracts relating to interaction, conflict, agreements, discords and justifications of each design choices. Using spreadsheets we displayed all the extracts of text relating to design choices and justifications of their values through out the development sequence. During this process we "zoomed in" on data on local development practices to trace the trajectory of design choices and justifications of value elements combined and recombined longitudinally to represent the reconciliation of values added to the digital technology at each phase of the process. We grouped the text under the justification of values of each feature, and we categorised the value elements that emerged into 'user value' and 'developer value' for each justification. By "trailing, the connections between practices" (Nicolini, 2009), we then "zoomed out" from these local practices to wider context where value elements at each studio are transformed to articulate a value proposition. This analysis led to the integration of first order categories (value elements) into higher order themes. We draw on Boltanski and Thevenot (2006) justificatory regimes as sensitizing concepts (Nicolini, 2009; Walshm, 1995) to develop the common rational of the value elements emerged from the first order categories to identify second order themes. We were able to identify and describe six groupings, industrial, functional, quality, civic, performance and market in order to theorize and develop a mechanism of mutual adjustment and reconciliation between *value elements*, *orders of worth*, and *value proposition*.

4   Empirical findings and Analysis

In this section we present and analyze our empirical findings from our study of serious games. We provide an overview of the development process for the game at each games studio (QueGames and Orora) and then we "zooming in" on the QueGames case to investigate the interplay of features and the justification of their value from which a range of value elements are abstracted. Then we "zooming out" to illustrate common practices about the way the value elements constitute the value proposition and how this is reshaped as the worth of different value elements is reordered.

The main aim of the serious game we studied at QueGame is to educate in fire safety. Different scenarios 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.

At Orora, a range of new digital technologies and cutting edge expertise were used to develop an interactive serious game to promote and enhance a visitor's experience to tourist attractions. Computer generated graphics are placed in the vision of the user through their mobile phones or tablets and they incorporated augmented reality in order to offer the user a virtual tour guide by scanning the QR codes located in various areas around the attractions.

Both studios presented similarities in terms not only of their corporate but also organizational structure and practices. Although they were different especially in their size as well as the number of games they have already commercialized, both studios were facing the same difficulties to assess the market potential and develop a business model with a sound value proposition to shift people's attitude and face the suspicion of the market around the serious objective of such games.

The development of a serious game at both studios commenced with a generic idea. The concept was fuzzy and the developers were trying to figure out what it was they wanted to achieve and how to develop it. Both studios had a specific budget tied to the technological infrastructure of the studios for the development of the game. Moreover, often the stakeholders 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 challenging to be pre-specified clearly for the project. Moreover, as Sue (producer and project manager of QueGame) explained, they were uncertain whether they "had something to get across" and how and what value they could deliver for their potential customers. Since the original idea of the project often started with a very generic concept, with lack of identified gap in the market and no enquiries from customers, they started doing their own research to articulate the market potential and make the concept more specific to test to find out if their idea was realistic with the existing budget and technological capabilities.

As such, at this stage, as described by Josh (graphic designer and artist of QueGames) they decided to develop the game for a "public organization such as fire service or municipality", based in their market research findings. The developers talked to experts in fire service and protection, as such they could focus on a more specific needs, according to Sue (producer and project manager), "what we do is to try to understand what they need, find under the skin what their pressure points are by trying to understand what the problem is and how we can address that, how we can add value with something very clever". By this way they found "a lack of awareness about common household fire safety practices and procedures and the ineffectiveness of the public education programs" (Sue, producer and project manager in QueGames).

4.1 "Zooming in QueGame": The interplay between the features of the game and justifications of their value

First we "zoom in" on the case of QueGames to understand the design choices within the context-transforming development process of the aforementioned serious game. We thus focus our attention on the trajectory of design choices concerning the features which interplay and need to be reconciled to condition justification of features' valuations. As such we aim to show how a common agreement regarding the justification of features' valuation articulate the range of value elements.

As the project team of QueGames began the development, it set in motion a trajectory of evaluation 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. 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 studio and accruing to Nick, the artist and animator of QueGame, they were also considered as more "effective means of promoting interactivity and active learning". Real-time shadows were possible using the Unity Pro game engine, which, was an existing game technology in the studio, but also offered compatibility with Adobe Photoshop 2D images. "Baked shadows [were incorporated] to give a more realistic feel to the game without compromising rendering speed explained Josh, the studio's graphic designer and artist. "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 that are intertwined with the use of 3D assets. For instance, their decision was creating considerations about the plug-ins and the scripts they had to accommodate. As Peter, the studio's programmer noticed "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 […]", Nick mentioned (artist and animator).

In the meantime, the members of the group were negotiating for other features related with the actual use of the game, such as: should it be PC-based or on a console or online, or whether it should be played by one or more players at the same time; or whether it should employ sensors and mapping tools. Each feature was interrelated with other technological features to support this style of development. During the development process, new issues regarding the content, the gameplay, the instructional design and the artistic elements, were constantly forcing the members of the team to review their decisions concerning the technological features, challenging previous agreements on the objectives. For example: the use of an avatar was creating new negotiations as for its nature; whether it would take a 3D or 2D form; if it would be driven by artificial intelligence (fantastic) or real life representations (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 Josh, the studio's graphic designer and artist, noticed "everyone was coming from another ankle for the development […] it is hard to come with decisions" In the end, they decided to employ 3D avatars to ensure high user involvement and greater retention of learning concepts. This led to new values gaining prominence, such as the engagement of the user and interactivity. The following table shows a part of our analysis of the empirical material assembled in relation to these development choices, the game features they relate to, the justifications associated with them by the developers and the different aspects of value these justifications are referencing.

Design Choices	Design Sub choices	Justification	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"(Sue). ----- "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." (Peter)" ---- "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"(Josh)----"[…]If they spend x amount, it should have an obvious impact or social impact" (Sue). ---- "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" (Sue).	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 (Josh) --- "real-time shadows to provide a more realistic feel to the game. Real-time shadows are accomplished using the Unity Pro game engine" (Josh).	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
	Models, textures and animations (avatar, role playing, number of objects in the game, single or multi-players, graphic cards with: processing capacity and video memory)	"All of the models and animations in the game were created "in-house" using Autodesk Maya." (Peter). ---- "If the game runs too slowly, we reduce the number of objects to improve performance, which in turn has affects the realistic settings." (Nick)	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." (Nick)--- "we estimated the "number of users were going to buy it, the number of previous serious games have sold within the market […] and again how role mechanics play, if it's something new or more established, if we had to buy a plug in or a server" (Sue). ---- "plug-ins support to integrate with existing game code"(Josh).	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
Sensors and Sensor interface or without Sensors and Sensor interface	"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" (Eric)	"Games which offer an "experiential" educational experience offer immersive knowledge." (Sue)---- "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" (Peter)---- "sensors [….] keep users actively engaged and create differentiated gaming experiences." (Josh)	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
	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. (Nick) ---- less encumbering than full body suits or gloves (Peter)	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,

Table 1.   The justifications of value of design choices and the different aspects of value these justifications are referencing.

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 for the use of sensors and the investment in mapping tools would result in higher price for the game, which meant that the product should offer obvious value. As Sue noted "[…] if they spend x amount, it should have an obvious impact or social impact. There is no point of 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 merely using traditional procedures for a similar learning outcome and according to Sue, producer and project manager, "[…] what the potential customer wants to deliver that expectations. We should look into evaluation because we are quite new and we have been looking other areas but we should focus more on the evaluation […] absolutely we need to do much more evaluation".

These trials of features' evaluation were taking place longitudinally within the development process and as Sue (producer and project manager) mentioned, "the ideas do change continuously even before the development starts". She 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, the graphic designer and artist, 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 they [the potential customers] want", he continued, but acknowledged that "despite all research […] it's difficult to predict if it's going to succeed. […] Starting to address this thing in terms of customers, lots of organisations still see it as video game, they think that is all about fun and it is difficult to change their minds. It's really important how we are addressing, we need to

reinvent the value proposition and support it with research material and show how we add value to business".

4.1 "Zooming out": articulation of the value proposition in relation to the design features

"Zooming out" from the case above, we are able to see longitudinally, how the trajectory of justifications that took place in both studios are conditioning value elements which are transformed to articulate a value proposition by the need to constitute the business model within an uncertain market environment. The cases of serious games studios illustrate a common trajectory for the justifications of features valuations.

Even though, the choices were not the same as the games had different objective, the practices of the developers followed were similar. The developers had a range of design features that were interplaying and the justificatory arrangements between the perceptions of the developers were conditioning value elements. The evolution of the idea and the involvement of content experts and instructional designers brought the need to embody more features which were challenging the existing justifications and driving to review of the features that were conditioning new justifications leading to new set of value elements. The following figure shows this common process which was repeating within the development process.

At the same time, in both cases there were clear difficulties to develop a business model and the key challenge in this was that serious games incorporate characteristics of art as well as entertainment that create misconceptions regarding their use and effectiveness. They were trying to develop a business plan from the early stages of the process and as Nick, the artist and animator in QueGames said on this: "A lot of the debate about value proposition does come from learning and entertainment […] 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 sort and sweet and very flexible because we are going to new spaces 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 (game) will fail".

In order to come up with business model the developers focused much more explicitly and consciously on articulating clearly the value proposition. The sales and marketing director (Mark) in Orora pointed out that at the beginning: "We always start with a proposal, a discussion paper, quite often the customers do not know what they want but if suggest something to them they either like it or not like it and all of the sudden we have the basis for the proposition". When the development started aligning because of the incorporation of design features which were conditioning a set of new value elements, the developers "imported the production values in their offering" and as Jonas, development director in Orora, noted they were "struggling even internally" and they were "making presentation 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 reshaping along the process not only because new value elements were added but also because of the importance these value elements were adding on the game. The developers, during this phase, were concerned more about the value elements, which were adding value on the objectives of the game and their effectiveness on the product.

At the last phase of the process, the developers drew their attention to the marketization and commercialization with primary object of concern the effectiveness of the serious game on the objectives and the methods of pricing it. They were attempting to change their potential customers' mindsets and explain how by this kind of digital artifacts with these specific design features the users would have more use engagement in the long term which adds value to the organisation. Mark (sales and marketing director in Orora) continued explaining, "We demonstrate whatever we can. Return of investments, that 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, quite often is about minimizing downsides, so, that

people are wasting time going to external training venues and that kind of staff so there is a return of investment time, a return of investment cash or both for example….". The following figure shows the phases of the development process and the articulation of the value elements as emerged from the empirical study, highlighting their dominance longitudinally. We discuss this more in the next section.
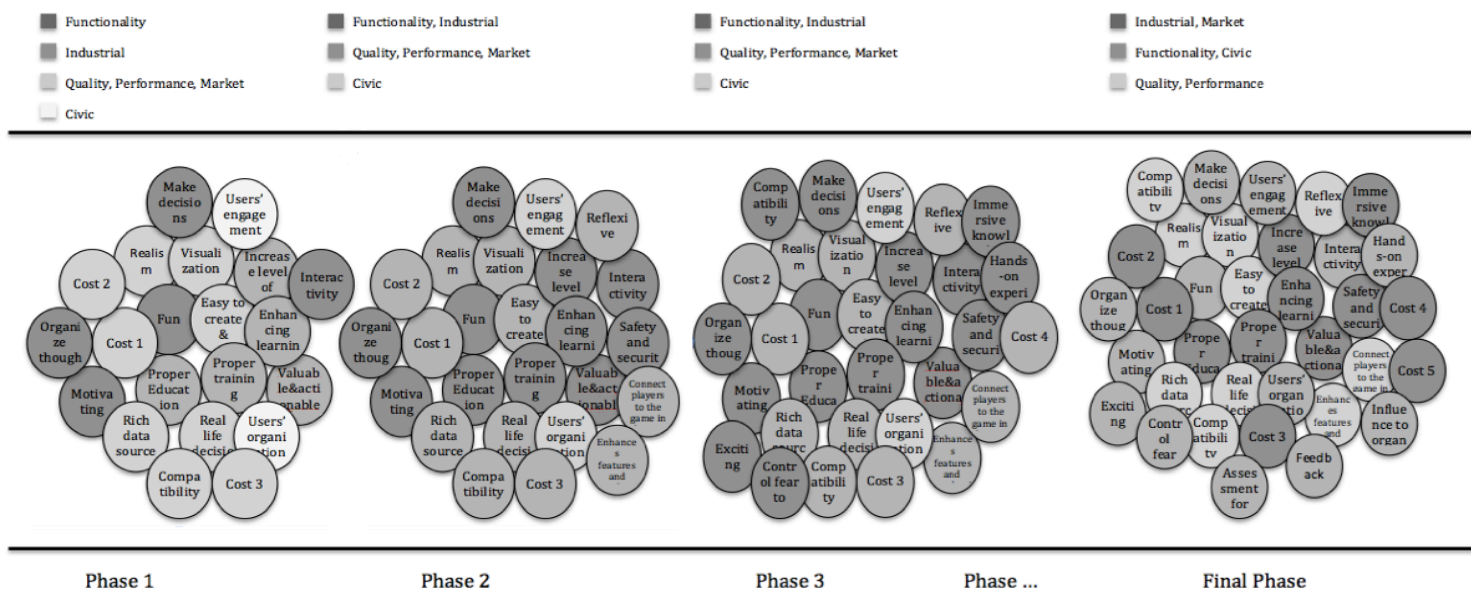

Figure 1.   *Articulation of the value elements along the phases of development process*

5   Analytical Overview

Our analysis of the empirical material demonstrates the role design choices play in developing an ordering and linking of value elements to the development of value proposition. As shown in table 1 the initial design choices create ramifications and implications during the development process. As concrete choices are made by the developers out of a wide reservoir of possible features that take effort, time and funds to incorporate into an innovation for which both the usage and value are uncertain, their value is contested. In order to reconcile these tensions implicit in these choices, the developers are forced to articulate the value of the features more explicitly and establish linkages with the financial aspects of the project, which also become more clearly delineated in the process. As the generic initial idea evolves, the developers gain deeper insight concerning the usefulness and the objectives of the digital artifact but at the same time, previously arrived at design choices are also likely to be challenged creating a constant consideration about the technological features needed in order to meet the evolving requirements, defining, in the process a more precise concept for the serious game.

What is shown is that justificatory contestation takes place continuously during the development process but through them the agreements between the perceptions of the developers regarding the value that each feature adds to the game are manifested. More specifically, at the beginning the value elements we identify empirically exhibit a variety of dispersed but also interdependent values. For instance, the value elements related to one feature (e.g. 3D) incorporate value for the developers, the potential customer, and the user (when the latter differs from the buyer). Furthermore, these values are not only economic but also social and technological values. As shown in the analysis we have grouped these value elements under core categories that emerged from our analysis, situating the value elements under the same 'order' based on the relative ranking purpose each value element serves. For example, we aggregate value elements related to the inspiration for the game objectives under 'functional order' because from the data emerged the need for a category that aggregates the values

based on their capacity to meet the objectives for the artifact's development. Another set of values gives an account of the conformance of features to the technological specifications and as such these elements are aggregated under the 'quality order'. We identified value elements that are related to the technological architecture that pre-exists and characteristics such as homogenization and re-programmability that are represented under 'performance order'. Some of the value elements correspond to the 'industrial order' which according to Boltanski and Thevenot (2006) is related to the efficiency and productivity and therefore we grouped in this category the value elements which refer to the effectiveness on the product's objectives. Moreover, we identified value elements relevant to the social aspects of the game. By this we mean whether the game is developed for one player or multiple players as well as if the game is addressed to an existing community with defined characteristics, such as a community within an organisation or a community of practice, or as a means of informing a large heterogeneous community such as the citizens of a town. For this purpose, we arranged into the 'civic order' (Boltanski and Thevenot, 2006) the value elements related to the impact and the degree values serve a community. Finally, we arranged under 'market order' (Boltanski and Thevenot, 2006) the value elements that had as mode of evaluation the price or cost but also other economic and monetary rationales.

The analysis showed different value elements and 'orders' combined and recombined to represent an ongoing collective agreement of an overall value proposition at different phases of the development process. As shown in figure 1 the trajectory of justifications during the phases of the development process contributed to the constitution of a 'set' of value elements and through each phase 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, we show that at the beginning the 'functional order' is 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 the development and as the phase of the commercialisation approached, we noticed that 'market order' gained overall 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. The interplay between these 'orders' serve as a way of understanding the mechanism through which different values and rankings of values can be combined and recombined to articulate an emergent but converging value proposition within an uncertain social, economic, and technological environment.

6 Discussion

In the theorization we propose from our study, different orders come together and interact through the justifications of features' value at different phases of the development process. This gives rise to a value proposition that is constituted and evolves over time. Seen in this way, a value proposition co-evolves with the digital artifact throughout the process. In particular, the emerging design choices for the artifact, as they move along the development process act as a motor for the generation of new configurations of the value elements through which the value proposition takes shape gradually. In this way, the value proposition becomes interrelated and interdependent with the actual features of the digital artifact leading to plausible and stabilized rationales emerging out of uncertainty. Along these lines there is a dynamic prioritizing of the relative importance of each 'order' and of the value

elements which comprise it and which are in a process of mutual reconciliation with the emerging value proposition. It is through this mutual adjustment and reconciliation that clarity and stability to its constitution are brought and which are vital to it as a core element in the drawing-up of a business model in such situations of high uncertainty in which digital innovation has to take place.

Through the theorization we develop of the mechanism of mutual adjustment and reconciliation between *value elements*, *orders of worth*, and *value proposition* from our empirical studies and which we summarize above, we are able to show how, even within the contextual uncertainty that such innovation takes place in, the definition of value proposition is possible and how this plays a crucial role in making visible and explicit the components of a potential business model and the relations between them (Hedman and Kalling, 2003, Chesbrough, 2012) in a dynamic way and without the need for an upfront business model. This also enables us to point to ways of understanding the value of such innovations and which is increasingly obscured until deep into their development (Chesbrough and Rosenbloom 2002, Chesbrough 2012). By describing and theorize how a value proposition is arrived at we also bring clarity to some of the insights of developed by Doganova and Eyquem-Renault (2009) on how the perceptions of value of the internal and external stakeholders are reconciled and how the relations between them are associated with the value proposition as well how the adaptability of a business model can be achieved in a way that accounts for both emergence and stability. Furthermore, we also show the interplay rather than separation between economic and non-monetary views of value.

In terms of our analytical approach to the study of business model, we are also able to demonstrate the usefulness of drawing on the pragmatics of justification and the establishment of "orders" or "regimes of worth" in the context of digital technology innovations development and the role of business model in it. In particular, we illustrate how the establishment of "orders of worth" in the context of digital technology innovations provides an understanding on how the value elements that are conditioned by the features of such artifacts articulate an evolving value proposition. In this context "orders of worth" offer an interpretive approach to studying how the links between a multiplicity of values and orders of worth are forged and how a hierarchy of value elements is established through the development process, responding to calls for a dynamic rather than static understanding on the constitution the value proposition and as a result of a business model. This approach also makes it possible to show how business or economic and social or use value should not be seen as opposites but linked, even if within this linking and resultant order there is, nonetheless, a resulting hierarchy.

Finally, we seek to provide practical insight from this theorization to practitioners who face the challenge of managing the development and commercialization of digital technology innovations in highly dynamic and complex conditions. For practitioners engaged in this highly uncertain and fluid area of innovation, our analysis highlights the importance of understanding better and from there considering ways of how to manage the relationship between design choices and value proposition and how the latter can be used as a way of reconciling the multiple 'orders of worth' of different internal and external to the business or organization groups as a step towards arriving at a viable but at the same time dynamic business model.

Conclusion

Drawing on an empirical study of 'serious games' development, this paper explored how the design features interplay as they are being incorporated into the serious game and how these can be addressed through an emergent value proposition which becomes a crucial step toward the establishment of a business model. The analysis indicated how the wide range of design features interplay conditioning justificatory arrangement of features' values challenged constantly by the actions and the interpretations of the people involved in the development process. We found that the trajectory of justifications manifest a set of value elements combined and recombined longitudinally to represent the reconciliation of values added to the digital artifact at each phase of the process. The research contributions we make are (a) theorizing how a value proposition is constituted, (b) introducing a new analytical approach to the study of value proposition drawing from the pragmatics of justification and

the establishment of "orders of worth" as a sense making mechanism in the context of digital technology innovations' development which incorporate not only economic/finance but also non-monetary notions, (c) developing insight around the crucial role of value proposition in the development of digital technology innovation and the dynamic constitution of business model for them. Thus, our findings have wider implication for information systems research, and particularly the area of co-creation and co- production, in situations in which the distinctions between the vendor and the customer of a product, system, or innovation are complex (Ramírez 1999, Prahalad and Ramaswamy 2004, Kohli and Grover 2008, Vargo et al. 2008, Sarker et al. 2012). As for practitioners, our analysis contributes to a greater understanding of the interrelation of design choices to the value proposition and how in a challenging environment within which they attempt to assess the market potential and manage the development as well the commercialization of such innovations, the relation of design choices relates to an emergent value proposition. Finally, another implication for practice from our study is the highlighting of a need for a dynamic reconciliation of the perceptions of internal and external stakeholders to arrive at a value proposition that is conditioning stability and rise to the business model development.

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