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Abstract

Purpose – This paper aims to identify, analyze and discuss a potential new business opportunity that arises from the intersection of the digital music and game industries across borders throughout network-based innovation approach.

Design/methodology/approach – The research draws on review of industry and academic literature, two online surveys and interviews, overall encompassed by a interpretative exploratory research methodology strategy.

Findings – The study supports the interest and potential for developing new products that combine digital music and casual digital games and that draw on firms from more than one region, while potentially involving a wide set of social network key stakeholders.

Research limitations/implications – This is an exploratory study in which findings should be challenged by confirmatory studies, including new product design and development of modeling techniques and network-based innovation approaches. This research contributes for the generation of new insights over technological and social driving forces, as well as emerging trends that shed light on the global competitiveness and on convergence of mobile gaming and digital music industries at regional innovation systems view. It also discusses spillover mechanisms based on new knowledge creation, knowledge diffusion and knowledge appropriation throughout the key stakeholders. The customer-centric innovation and network value autocorrelation hypothesis was validated, and both technology convergence and social factors are enhancement factors for innovation. Limitations and

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further research with larger sampling, specialization techniques and empirical modeling to in-depth analysis is suggested.

Practical implications – The study provides a framework for managers to develop new products that merges boundaries of related industries and encourages network-based innovation and cooperation between industry players, involving different regions. Ultimately, it shows opportunities of diversification, by introducing new products into new markets, as result of interdependence, soft factors, knowledge spillover and absorptive capacity mechanisms over a network of key stakeholders across different regions throughout customer-centric innovation, while impacting also new discussion on entrepreneurship and knowledge spillover theory and policy making.

Social implications – Social capital network is key for innovation and knowledge spillover among industry players. Content creation regarding products and services show high dependence on spatial external cultural influences, tastes and habits for customer-centric innovation, while impacting on social and learning customer experience, as well.

Originality/value – The paper has value for product development and innovation managers, researchers and practitioners. It discusses the value of innovation systems that are purposively developed beyond traditional geographic and industry boundaries.

Keywords New product development, Regional innovation systems, Casual gaming, Customer focused design, Digital music, Network-based innovation

Paper type Research paper

1. Introduction

Open innovation models have been widely studied in innovation management, competitive strategy and policy making fields in the past decade (Chesbrough, 2006; Koberg *et al.*, 2003; Gassmann and Enkel, 2004; Prahalad and Ramaswary, 2004; Dallander and Gann, 2010; Eckhardt and Shane, 2011), but without conclusive results regarding ideal models. One stream of research focused on a broad range of medium and high technology industries, identified sources of competitive advantages for open innovation models, namely, leveraging external knowledge inputs and transference to accelerate internal innovations, and expanded the markets for external use of innovation, as well as some potential positives externalities as fast economic growth and agglomeration economies. Other empirical studies found that returns from open innovation tend to decrease at the margin, as the costs of openness exceed the benefits (Laursen and Salter, 2006), namely, when factors of specialization and technological change are considered. Moreover, studies show that companies vary considerably in their capabilities and skills to master the challenges and take advantages from open innovation opportunities (Tappeiner *et al.*, 2008; Salge *et al.*, 2012). In summary, the heterogeneity of open innovation models has made difficult to understand the effect of intercompany heterogeneity performance, competitiveness and economic growth. This research analyses the hypothesis that customer-centric innovation models and network value autocorrelation emerges through technology convergence and *soft factors* encompassed in cross-regional social capital. The hypothesis was tested in one open innovation model applied to the mobile gaming and digital music industries. This research suggests that valuable business concepts and product designs are likely to emerge from the technological convergence and value network of the gaming and streaming music industries.

The study describes a quasi-experiment in what concerns to open innovation modeling and was analyzed and discussed for validation by considering a potential venture between Rovio (a video games multinational company) and NMusic (a digital

music company based in Portugal) that might approach an innovative and blue ocean[1] market flaw. The results are pioneering and innovatively designed products, which merge from gaming and streaming concepts. Such collaborative arrangement and open innovation partnership model has not been developed and tested before. Since the setup of Angry Birds product, Rovio has experienced strong growth[2], launching numerous products related to the theme Angry Birds, including games, merchandise, books and animation. Being Rovio's desire and vision to continue exploring the successful brand (Forbes, 2012), and music streaming being a growing trend in the digital music industry[3], both companies can benefit from this global opportunity. This open innovation model and the launch of a product and service such as "AB Music" will also drive major transformations for the entire gaming and music streaming industries, namely, innovation value and economies of scale and scope, gained by technology merging and suppliers' network integration, at both forward and backward levels (Mateos-Garcia *et al.*, 2008, pp. 19, 60). Ultimately, the extension of the hypothesis validation can lead to the possibility that these industries may no longer evolve separately, but connection points between both will gradually increase instead (Hong, 2010).

The scope of the present research is the discussion on how open innovation models and network value autocorrelation is caused by technology convergence and "soft factors". Of particular interest is the identification of external driving forces and emerging trends that shed light on the global competitiveness of these industries and on the intensity of diversification and knowledge integration that players can develop by potentiating interdependence, spillover mechanisms and absorption capacity among the relevant key stakeholders across different regions.

The main research purpose is then to examine the processes embedded in the network-based innovation model based in the mobile gaming and music industry. What are the market or consumers needs in mobile gaming and in music streaming? How complex are the product and service design and the technical features to address that needs, in result of the open innovation process? What consumer features can be created in a sustained and competitive way? How to aggregate those features to generate innovative product concepts and impact in industry competitiveness?

2. Literature review

Casual video games are defined as "games developed for a mass audience, which are easy to learn, fun, quick to access and require no previous special game skills, expertise or regular time commitment to play" (Casual Games Association, 2007, p. 3). Besides, several casual games can also be mobile games, that is, games designed to be played in mobile devices such as smartphones, personal digital assistant's (PDA's), portable media players and tablets (Casual Games Association, 2007). In accordance with various studies and research, the main characteristics that should be taken into account regarding casual game design include fiction, usability, interruptibility, right level of difficulty and juiciness[4] (Juul, 2010). The gaming literature identifies five models of game innovation and design development (Dempsey *et al.*, 1996): models aimed at fulfilling motivations and needs[5], models aiming at technology and media adoption, models focused on game usage and customer experience, models geared to different types of gamers (taxonomies) and models enhancing the role of music in digital games.

Focusing on massively multiplayer online role-playing games (MMORPG), Yee (2007) pointed out that from a social interaction perspective players use games for different purposes to satisfy different motivations. Yee highlights nine player's motivations that can be organized in three main components: achievement, immersion and social. Drawing on the self-determination theory, Ryan *et al.* (2006) concluded that video games satisfy three psychological needs – competence, autonomy and relatedness – that in turn increase the intrinsic motivation to play the game[6].

Perceptions also influence the adoption of technology and media products by customers, more specifically, perceived usefulness[7], perceived ease of use[8] and perceived enjoyment[9] (Ha *et al.*, 2007; Park *et al.*, 2013). Hsu and Lu (2007) have also pointed out that communities and loyalty among members play a significant role in adoption processes of online games, which ultimately results in an expanded network of gamers. Sociability, usability and perceived enjoyment are the main drivers of these communities[10] (Hsu and Lu, 2007).

Choi and Jinwoo (2004) identified customer loyalty to the game as a consequence of the quality of the customer experience, which, in turn, depends on personal interaction with the game system and social interactions with other people[11]. Besides, personalized gaming increases players' satisfaction because it enables a better fit between the player's personality and the game environment (Bakkes *et al.*, 2012), contributing to make the game experience a commercial success and player loyalty[12].

Moreover, of particular interest is Bartle's (1996) explanation of how game designers make decisions at early development stages to attract and influence the various kinds of gamers[13]. Inspired in Bartle's work gamification[14], several innovation models have emerged in this field. The taxonomy of gamification user types[15] divides players in eight types: four types driven by an intrinsic motivation and another four types moved by an external motivation[16]. The taxonomy of gamification player types[17] distinguishes players according to what they look for in the gamified environment, specifying what type of mechanics, aesthetics and story these players want and how they can be translated to in-game features[18]. One of the most accepted models to adapt gaming literature to social and casual games is the taxonomy of social engagement verbs[19], also inspired in Bartle's work: compete, explore, express and collaborate[20].

On the other hand, Zehnder and Lipscomb (2004) showed music can perform different roles in video games, such as enhance a sense of immersion, contribute to the video game narrative, act as an emotional signifier and cultivate the thematic unity of a video game[21], [22] (Zehnder and Lipscomb, 2004, p. 11), as well as predicted an "evolving relationship between the video game and music industries" as broadband Internet access and online gaming services expand. Huiberts (2010) studied the role of audio for immersion[23] in computer games, while having identified two functionalities that audio has in gameplay: optimization, as it provides useful information to the player, making the game more understandable[24], and dynamization, as it makes the experience more intense and thrilling[25].

Hence, although gaming literature explores motivations and behaviors that are common to all players, the translation of those guidelines into product features is still unclear. Ultimately, it is the feedback of consumers that will allow innovation progress (Trott, 1998), as well as in analyzing motivations to play casual games in terms of autonomy, mastery/competence and relatedness[26]. Second, the role of music needs to be analyzed in the context of casual games, which are far less complex than traditional

video games. Finally, degree of simplicity should be considered as well because casual game players become move increasingly away from simplicity (Juul, 2010).

The above literature suggests two important trends in regard to open innovation models and network value autocorrelation. First, technology convergence results in the creation of new knowledge that through filtering processes (Acs *et al.*, 2003) is converted into economic knowledge or commercialized knowledge (Arrow, 1962). Knowledge is non-excludable and non-exaustive (Audretsch and Lehmann, 2005) and follows spillover mechanisms that involve greater degree of uncertainty, higher extent of asymmetries and greater cost of transacting new ideas:

H1. Customer-centric innovation models and network value autocorrelation is likely to be enhanced through technology convergence.

Moreover, open innovation models and network value autocorrelation draw into "soft factors", embedded in social capital available through regions and spatial agglomeration (Tappeiner *et al.*, 2008). In fact, social capital has an economic impact on the innovation of a sector or a region. Spatial patterns of innovation are shaped not only by the spatial distribution of production factors including concentration of R&D and human capital (Tappeiner *et al.*, 2008), particularly in regarding to network-based innovation models, promoting value added, differentiation, competitiveness and economic growth:

H2. Customer-centric innovation models and network value autocorrelation is likely to be enhanced by soft factors encompassed in cross-regional social capital.

3. Methodology

We used an interpretive approach and a combination of literature review, secondary data about gaming and music industries, two online surveys and two interviews. The combined research methodology, by using collaboration case, literature review, two online surveys and interviews follows the mixed methods research sampling techniques, associating well-established qualitative and quantitative techniques in complementary and creative ways to answer research questions at both network-based innovation model, market and consumer needs and products and services features implications in the mobile gaming and streaming music industry processes level.

The review of the literature focused in understanding the industries of digital music and mobile casual games, trends and customer needs. We proposed that the intersection of these two industries is an attractive space for innovation and new business opportunities throughout networked-based innovation approach. To illustrate this proposition, we discussed a potential collaborative arrangement between the two major organizations using the network models, namely, Rovio and NMusic. To further analyze this scenario, we gathered secondary data about market potential and trends for both mobile-casual games and digital music industries.

Additionally, two online surveys were designed and conducted. One general public survey[27] was to assess general perceptions of the general public and of the game players regarding characteristics of a possible new game and respective market potential, so it included questions about innovation, generic design and adoption curve. Then, a second survey was developed and targeted to game experts asking specific questions about the game[28] to assess potential games specific features, gaming specifics behavior about collaboration and competition; gaming motivation and buying

decision specifics, e.g. affordability, ease to install and ease of use, sense of challenge, customization and sociability, which reflects the prioritization of several game elements[29] and hierarchy of product features.

Finally, in-depth interviews were conducted with the CEO and staff of NMusic[30] to learn about the core activities and products of the companies, dimensions of social capital and innovation strategic options.

In summary, the methodological approach adopted an interpretive perspective based on the use of multiple methods and tools, both quantitative and qualitative to understand what people think about something new, and define real limitations and assumptions that might be relevant for future research.

4. Analysis and results

4.1 Business description

4.1.1 Business opportunity. The emergence of new business concepts that will merge games and music arose as a consequence of three key factors. First, the evolution[31] of the games and music industries as constituents of the same sector, influenced by common trends and facing similar challenges, has gradually shortened the distance between these industries[32]. Second, digital engagement and hardware adoption is fuelling the role of digital music as a driver of innovation[33]. After continuous investments in building its knowledge base, NMusic recognized the potential of the digital music segment. As a central role of the mobile experience, music is expected to add value to mobile game play, answering to the constant search for innovation that is necessary to deliver or continue sustaining a successful game. Then, the success of Angry Birds positions Rovio as a distinct innovation-based company and recommends the development of new products. According to Johnson and Jones (1957), new product development strategies are dependent on the degree of technological change and the degree of market change. "Angry Birds Music", despite heavily relying on content innovation, is positioned as a new technology. This demands to acquire scientific knowledge and production skills new to the company(ies) to reach a strengthened market, while designing at broadening the line of products offered to present consumers through new technology (Trott, 1998, p. 394) which was network based[34].

4.1.2 NMusic and Rovio collaboration. NMusic is a successful online music streaming innovative startup[35], based in Portugal, and Rovio is an entertainment innovative company, based in Finland, known for the success of its digital game Angry Birds. The two companies studied the creation of a completely innovative business concept: "Angry Birds Music", while contributing with different capacities, know-how, technological, marketing and customer basis[36] to change both industries' current boundaries and create a blue ocean opportunity, mainly driven by "value innovation", in which the attractiveness of the market is closely related to the lack of direct competition[37] (Kim and Mauborgne, 2005).

4.1.3 Business environment

4.1.3.1 Sector overview. Technology is increasingly gaining more importance as a channel for individuals' socialization. The rising mobility of digital technology that allows for "anyone-anywhere-anytime" interaction has created a very important premise in the IT sector – connected consumers. Furthermore, digital convergence[38] has been expanding in the form of converged devices, applications and networks, creating significant consequences for the sector:

- technology-driven, instead of content-driven[39];
- with a larger number of consumers that perceive products and services with an increased value; and
- more competitive due to an integrative convergence[40],while leading to new innovative business opportunities and strategies rethinking because of the downturn of the economy, consumers' lower purchasing power, more competitive prices and value increasing in this sector (PWC, 2013).

Similarly to what has already happened in the gaming industry, where players started to vertically integrate[41], it is expected that the new business opportunity between NMusic and Rovio triggers a number of alliances and partnerships among players of the music and video games industries, as well as among numerous technological companies from different sectors throughout social capital, knowledge spillover mechanisms and network value creation (Mateos-Garcia *et al.*, 2008, p. 61).

4.1.3.2 Market trends. After responding to how the network-based innovation model addresses to the mobile gaming and music industry, we characterize the market trends and address the question about "what are the market or consumers needs in mobile gaming and in music-streaming?". First, the increasing availability of screens combined with the cloud technology and social networks create favorable conditions for the industry to attract more players, leading to more time spent on gaming and, consequently, more game revenues (Newzoo, 2013a, 2013b). Accordingly, mobility is critical for both casual gamers and music consumers (Siemer and Associates, 2013), as well as interactivity among several devices[42]. Besides, there is the trend of accessing to free games, so being able to continuously engage customers is vital to assure game monetization (Newzoo, 2013a, 2013b). Also, streaming music platforms that serve consumers with innovative players and features struggle to find how to extract value from that. The challenge is about adopting more creative and dynamic business models that allow them to extract value from the vast consumer base using their products/services[43] (Newzoo, 2013a, 2013b). Other industry trend derives from the fact that consumers are the ones deciding where they spend money within the game environment, thus pressuring publishers to continuously add new game content. Games and music are evolving globally from product to service, and, likewise, analytics and player understanding are crucial to serve consumers (Newzoo, 2013a, 2013b). Also, there is a global competition from the video games industry, and emerging markets will fuel growth in the future. (Newzoo, 2013a, 2013b).

4.2 Business idea

The business opportunity that justifies and supports the creation of Angry Birds Music leads to the development of business concepts and products design based on contribution of both companies and other industry players, e.g. developers, publishers and integrators, to capture the "network effect" at both technological and social levels. Angry Birds Music can take advantage from being highly innovative, thus promising that Angry Birds fans (263 million players active monthly)[44] are, ultimately, potential clients of this new version.

4.2.1 Market specifics – results

4.2.1.1 Statement of needs and market needs. The online research (I) about mobile-casual games suggested game features associated to specific customers' needs that, ultimately,

contribute to the success of a game. The online survey (II) was performed to test the relevance of those features, so to each customer statement corresponds at least one characteristic of AB Music that satisfies that need, further associated with a specific game element (Table I)[46], which validated and tested the existent gaming literature[47], while collecting new insights for the features of the new game.

4.2.1.2 Hierarchy of needs and business concepts – results. The market needs considered previously have different levels of importance for consumers, for it is necessary to prioritize them, which will consequentially allow for a better screening of product innovation ideas and innovative business concepts for creating AB Music. In what regards to consumer behavior and to consumption specifics, more than 75 per cent of mobile-casual gamers play at least once a week, from which 26 per cent play daily, while 83 per cent of the participants listen to music more than once a day. The key motives to play is "entertaining" and "fun" (which correspond to 65 per cent of the participants), followed by "competitive" (19.3 per cent). On the other hand, mobile gamers referred "entertaining" as the word most associated with music (31 per cent), followed by "immersive" (25 per cent), "good at providing escapism" (18 per cent) and creative (17 per cent). As for design features regarding mobile-casual games, 53 per cent of the participants chose graphics' quality as one of the most important feature, followed by ease of use (47 per cent), addictiveness (33 per cent) and story/narrative (32 per cent). About 56 per cent of the participants referred as highly valuable the possibility of selecting the soundtrack of a game, and from those, 77 per cent rated it as a very important/important feature, and 71 per cent of the participants valued disposing from an unlimited list of music. Consumers' adoption curve regarding new games is highly influenced by curiosity (76 per cent), addictiveness (16 per cent) and brand loyalty (8 per cent). Regarding end-equipments usage, smartphone is the preferred device for 46 per cent of the respondents to play this type of games, followed by PC's/Laptops (38 per cent) and tablets (34 per cent), whereas game apps are the most preferred platforms (64 per cent), followed by social platforms (32 per cent), and online players represent 47 per cent of the respondents.

The correlation analysis by considering the two online surveys and the SPSS analysis[48] shows the most important features, reflecting the hierarchy of needs, by combining both consumer-rooted and consumption-specifics, independently of the respondents' nationalities are, in resume, affordability, level of difficulty, autonomy[49], competence[50] (tutorials), role-playing, mastery of controls, ease of use, feedback and discovery, competition, rewards, escapism, collaboration and socializing[51]. Hence, the overall analysis supports the idea that to better respond to the hierarchy of needs, in alignment with customer-centric innovation and network value autocorrelation hypothesis, given the consumer-rooted and consumption-specifics for the segmentation basis, both technology convergence and social factors are enhancement factors.

5. Interpretation of results and discussion

The SPSS correlation analysis and interpretation of results by conducting the two online surveys and its relationship with the existing literature shows the following:

- From the customer-centricity point of view (Prahalad and Ramaswary, 2004), we found that innovative design features for music and gaming products like autonomy[52], role-play entertainment[53] and competitiveness[54] seem to be

Customer statement	Need	Element	Supportive literature
"When I think of gaming, I think of winning"	AB Music defies you with attainable challenges. There are great and diversified chances of winning	Mechanics	Competence need (Rigby and Ryan, 2007) Mastery (Marczewski, 2013) Achievement (Manrique, 2013) Compete (Kim, 2012)
"Mobile-casual games are my 'killing-time' fun"	AB Music allows you to play in small breaks because it is designed for short engagement loops	Mechanics	Interruptibility (Juul, 2010)
"I want a game easy to master"	AB Music is user friendly	Mechanics	Usability (Juul, 2010) Ease of use (Zhou, 2012) Mastery of controls (Rigby and Ryan, 2007)
"I will only play a game that is visually attractive"	AB Music has juicy and fresh interfaces	Aesthetics	Juiciness (Juul, 2010) Positive emotions and pleasure (Manrique, 2013)
"Gaming is more than pure mechanics, I like to be involved in a story"	AB Music has a solid story sustaining gameplay	Story	Enjoyment (Ha *et al.*, 2007) Fiction (Juul, 2010)
"I would not like to be overwhelmed with information"	AB Music provides you limited HUDs[45]	Aesthetics	Positive emotions and pleasure (Manrique, 2013)
"I do not want to financially commit to a game before trying it"	AB Music can be accessed freely. The decision of having access to more content is made by the player, which in this case, should make a payment	Price	Newzoo (2013)
"I use more than one device to play and I would like they could synchronize"	AB Music can be played on your smartphone, computer or tablet	Technology	Ease of use (Zhou, 2012)
"Often, the sound of casual games is annoying and I turn it off"	AB Music allows you to select the game music according to your taste	Aesthetics	Personalization (Bakkes *et al.*, 2012) Playlist customization (Zehnder and Lipscomb, 2004)
"I fear that music disconnected from the gameplay can create non-contextualizing effects"	AB Music adjusts the game environment to the music genre you are listening to	Aesthetics	Music as the thematic unity of a game (Zehnder and Lipscomb, 2004) Role of music in games (Huiberts, 2010)
"Installation should not be a problem"	AB Music can be accessed through an application, Web sites or social networks	Technology	
"I do not want a game that it is too obvious"	AB Music will surprise you with new quests and challenges	Mechanics	Mastery (Marczewski, 2013) Achievement (Manrique, 2013) Compete (Kim, 2012)
"Repeating levels bores me"	AB Music lets you assess to the last level you achieved in the game	Mechanics	Competence (Rigby and Ryan, 2007) Mastery (Marczewski, 2013) Achievement (Manrique, 2013)
"I enjoy having a sense of progression"	AB Music is structured in levels, allowing you to have quick success and win prizes	Mechanics	Competence (Rigby and Ryan, 2007) Mastery (Marczewsk, 2013) Achievement (Manrique, 2013) Compete (Kim, 2012)
"I hate it when I don't understand why I failed in the game"	AB Music provides multi-level feedback, enabling you to improve your performance in the game	Mechanics	Competence (Rigby and Ryan, 2007) Goals (Choi and Kim, 2004) Mastery (Marczewski, 2013)

(*continued*)

Table I.
Customers' statements and interpretation of needs

Table I.

Customer statement	Need	Element	Supportive literature
"I get really annoyed when there is lockable content in the game that hinders my progress"	AB Music provides you with options to unlock protected content	Mechanics	Autonomy (Marczewski, 2013)
"When I start playing a game I like to understand the story background"	AB Music shows you short videos that quickly explain the game narrative	Story	Goals (Choi and Kim, 2004) Positive emotions & Pleasure (Manrique, 2013)
"I feel over-controlled with too extensive instructions"	AB Music has clear and simple tutorials that explains you how to play the game	Mechanics	Ease of use (Zhou, 2012) Positive emotions and pleasure (Manrique, 2013)
"I like to try out new roles and personalities with my characters"	AB Music lets you customize your characters	Aesthetics	Autonomy (Rigby and Ryan, 2007) Autonomy (Marczewski, 2013) Meaning (Manrique, 2013) Express (Kim, 2012)
"When I lose to someone, I immediately want to play again in an attempt to beat him/her"	AB Music compares your performance with your friends' performance and allows you to repeatedly try to beat them	Mechanics and aesthetics	Compete (Jo Kim, 2012) Relatedness (Rigby and Ryan, 2007) Mastery (Marczewski, 2013) Meaning and relatedness (Manrique, 2013)
"It's important to me to achieve goals with as little help from other people as possible"	In AB Music you have all the conditions to win without having to buy power-ups or ask other players' for help	Mechanics	Competence (Rigby and Ryan, 2007)
"I would like to have as much freedom as possible in music selection"	AB Music allows you to select the music you want through several filters	Mechanics	Autonomy (Rigby and Ryan, 2007) Personalization (Bakkes *et al.*, 2012) Playlist customization (Zehnder and Lipscomb, 2004)
"I want to be able to listen to the music of the game in other contexts"	AB Music has an offline mode, in which you can assess to the music saved during the game	Technology	Usefulness (Ha *et al.*, 2007) Achievement (Manrique, 2013)
"I would like to be notified about new tracks"	AB Music notifies you about new tracks, artists and albums available in the game	Mechanics and technology	Explore (Kim, 2012) Achievement (Manrique, 2013)
"I need a magic operator when I am not able to complete a certain task/level"	The Mighty Eagle helps you	Mechanics	Operator (Choi and Kim, 2004)
"It would be nice to socialize with other players through music"	AB Music allows you to see the music other players are listening and they can see what you are listening	Technology	Meaning and relatedness (Manrique 2013) Relatedness (Rigby and Ryan, 2007) Relatedness (Marczewski 2013)
"I think that music could be a very attractive reward for a game"	AB Music offers music as a reward and there is the possibility of selecting which track/album the player wants to win	Mechanics	Autonomy (Rigby and Ryan 2007) Usefulness (Ha *et al.*, 2007) Achievement (Manrique 2013) Explore (Kim, 2012) Role of music in games (Sander, 2010)

detached from specific regional and cultural factors as in result of globalization factors influence.

- All features that relates design and content, including graphics and music playlists (but not the content *per se*) accessible via streaming, demands technological convergence, which does not require spatial clustering because it refers to high technology intensity that delivers services over the internet and cloud computing.
- Music contents are influenced by spatial external influences, reflecting diversity of both local regional cultural habits and tastes, e.g. EU-28, India and China, where industry players' networks, e.g. content creators, content managers and publishers might have a significant impact on the innovation of music and gaming products; as well as social interaction[55] features (Hsu and Lu, 2007) (e.g. making visible status to others and inviting them to connect and share content), which reflects customer-centricity.
- We found that the present research contributes for the examination and comprehension of the processes embedded in the network-based innovation model based in the mobile gaming and music industry, while identifying and discussing what are the market or consumers needs, as well as the implications in how complex are the product and service design and the technical features to address. Finally, it allows the discussion and validation on ways how to aggregate features to generate innovative product concepts and impact in industry competitiveness on the future.
- There is high dependence of the network-based innovation on social capital among the different industry players that smoothly integrate externally acquired knowledge to take the business opportunity (Hansen and Nohria, 2004; Saebi and Foss, 2014). The results showed the importance of social capital among the industry players' networks that will support absorptive capacity and knowledge spillover mechanisms, while generating new competitive advantages, industry players' change roles and spatial agglomeration (Tappeiner *et al.*, 2008) to focus on network-based innovation products and services.
- Furthermore, the interpretation of the results lead to the prediction about ways the industry will potentially evolve in the future, namely, content creators and content managers to follow close collaborative arrangements, developers and publishers to follow modular design and vertical integration, developers to acquire publishing capabilities to work directly with manufacturers and stores, publishers to acquire capabilities to have hire control over the value chain, integrators to work close with developers and aggregators and manufacturers to start working close with original equipment manufacturers.
- The industry dynamics, ubiquity of bandwidth, low-cost computing decreasing, data and storage capacities increasing are creating a new breed of innovative network-based businesses (Saebi and Foss, 2014), which value stems from the technology convergence and the ability to connect customers,

providers with creators by delivering value propositions based on integrative concepts, design and customer focus.

- The literature review and the market research in this study allowed to prioritize customer needs, and more importantly, it demonstrates the potential to develop customer-centric innovation systems that cross-geographical and industrial boundaries, while involving network-based innovation approaches, influenced by external and internal driving forces. From a conceptual perspective, this study contributes to innovation research in cross-regional and cross-industry interstices, while impacting on knowledge spillover theory of entrepreneurship, by discussing potential entrepreneurial opportunities in result of the new knowledge creation, diffusion and appropriation throughout a set of key stakeholders. The economic knowledge (Arrow, 1962) that is exploited derives from the knowledge filter (Acs *et al.*, 2003), that is the gap between economic or commercialized knowledge and new knowledge due to "structural conditions", institutions, rules and regulations (Acs *et al.*, 2003). This research suggests the creation of flexible contextual conditions to merge boundaries of related industries, decrease regulatory and bureaucracy and ease technology market transfer mechanisms in favoring driving forces that propel network-based innovation among the industry's players. One possible consequence is the vertical integration and technological convergence, eventually in alignment with modular design, as a way of shaping information and communications technology (ICT) products and services of the entertainment and media industry and alike.
- The industry dynamics in result of combining music and virtual games on an innovative way has strong market potential: almost 100 per cent of the survey respondents would like to select music in the games, and approximately 50 per cent would appreciate to share the music experience with other players.
- Additionally, network value autocorrelation is caused by technology convergence and by "soft factors" which can be encompassed by the concept of social capital through regions and spatial agglomeration in relation to the mobile gaming and digital music industries' players (throughout network integration, at both forward and backward levels).
- Our research is exploratory as it aims at developing scenarios and unveiling new business concepts and opportunities rather than to validate market potential. The knowledge spillover and absorptive capacity mechanisms among the different key stakeholders of both industries will allow NMusic and Rovio or companies alike to capitalize on this digital business transformation opportunity, while reinforcing economic knowledge, social capital, organizational culture and values' communalities, which was validated by the qualitative research and in-depth interviews with NMusic and Rovio CEOs.
- Qualitative and quantitative methods in parallel with literature review provide insights that bridges theory and practice in terms of future innovative design for mobile gaming and digital music industries. At the same time, this approach generates societal, economic and commercial impact by providing new crossed forms of knowledge, cultural and entertainment's dissemination, as well as combining music, games and users interaction. Moreover, there is

innovation and job creation in result of the value network generated by technology convergence and by absorptive capacity among the industry's players that will potentially revolutionize both industries. Finally, in terms of policy making, the research study focus on the reinforcement of convergent specialization policies regarding ICT sector, while catalyzing regional innovation systems.

6. Limitations and further research

There are limitations from the quantitative basis point of view, so larger sampling to in-depth research and specialization by conducting in-depth interviews, applying focus groups and products prototype market testing should be considered. Further research should address network-based innovation from a process focus, namely, throughout quality function deployment and design for engineering and manufacturing analysis. Finally, statistic analysis over data set of the industries with further empirical modeling would be interesting to validate regional innovation analysis.

7. Conclusion

The mapping and growth of mobile gaming and digital music industries show potential to increase the network value and customer focus that sustains the development of competitive value propositions throughout disruptive innovation. The growth of digital consumption, enabled by a wide access to technological devices and end equipments, supports the market potential and new business opportunities. Nevertheless, the key success factors are not focusing, exclusively, on the market flaws, but also on the necessary alignment regarding the strategy, team and resources for both companies, NMusic and Rovio within a network of key stakeholders. Despite social capital factor, innovation and risk-taking communalities between the two companies, they have different organizational cultures, so potential coordination and communication problems may arise, for it is important to prepare well the partnership model, avoiding any divergence points along the design and exploitation of the innovative business opportunity.

On the other hand, the selection of game features round the various business concepts and products design is closely related with the most important needs identified in literature review, namely, clear rules enabled by short tutorials, a division by levels, the scheme of rewards, extra challenges and online tournaments support the need for competence; the wide selection of songs, multiple research filters, the easiness of unlocking content and the possibility of creating playlists and avatars allow customers to experience a sense of autonomy and to customize several elements of the game according to their taste; a visible status, multiplayer interactions and shared activity enable players to relate with each other with a degree of personal exposure validated by respondents in the market research. As casual games' players value innovation and fun, and search for positive emotions and pleasure, this type of games resorts a lot on creative content, such as music, a highly characterized game environment and characters. To take advantage from the dynamic and immersing roles of music, this type of games brings close the music theme in several dimensions, including the integrative element. Finally, the elements that seem to increase the perceived usefulness of the these type of games and, consequently, increase the adoption process by players, as they are in alignment the hierarchy of needs, are:

- the access of a great variety of songs during gameplay;
- the existence of an offline mode that allows to have access to songs awarded in the game in other occasions; and
- real prizes, such as concert and Angry Birds adventure parks tickets, which allow transitioning from the game to the real world.

Last, but not least, given the mobile gaming and digital music industry driving forces and processes embedded in the network-based innovation model, there is an increasing intensity of innovation into global markets, knowledge integration and technological convergence of the players and intermediaries across different regions. The customer-centric innovation and network value autocorrelation hypothesis was validated, and both technology convergence and social factors are enhancement factors for innovation and knowledge spillover. Hence, design and content features within the mobile gaming and digital music demand technological convergence, social entertainment and learning customer experience, and are influenced either by spatial external cultural influences or by social interaction among industry networks. Finally, policy implications and recommendations are referred to merge boundaries of the industries, decrease regulatory and bureaucracy and ease technology market transfer mechanisms in favoring network-based innovation systems.

Notes

1. Blue Ocean is a terminology for all the industries that do not exist today, in which demand is created rather than fought over (Kim and Mauborgne, 2005).
2. In 2011, total revenue amounted to €75.4 million, and in 2012, after a 101 per cent growth, the company reached €152.2 million total revenues (Rovio – www.rovio.com/en/mobile-news/284/rovio-entertainment-reports-2012-financial-results).
3. Online music streaming revenues increased by 40 per cent in 2012 (Siemer Associates, 2013).
4. The author of *A Casual Revolution*, Juul (2010), proposes a hierarchy for these game features, being fiction the most important and juiciness the least important; these conclusions will be used in the hierarchization of needs in the business idea section.
5. Several studies on players' motivations have arisen; however, there is still no integrated model (Boston, 2009).
6. Rigby and Ryan (2006) tested for supportive game features of these needs, such as dynamic difficulty mechanism, heroism meter and achievement badges (competence); characters customization and the ability to influence the type of rewards received and in-game dialogues (autonomy), which leads to a greater motivation for future play, recommendation intention and more positive ratings to the game at play (Ryan *et al.*, 2006).
7. As a way to increase perceived usefulness, games should embrace opportunities for self-expression, promote visibility and prioritize innovativeness (Ha *et al.*, 2007).
8. Maximize simplicity, include online tutorials to familiarize users with mobile game operations and adapt versions of mobile games to user terminals to improve the game experience and ease of use, which is considered a pre-requisite of enjoyment (Zhou, 2012).
9. Psychological factors have a greater impact on perceived enjoyment than technical factors, for game designers should develop content with creative and solid storylines (Ha *et al.*, 2007).

Besides, satisfaction was found to be an antecedent of perceived enjoyment and usefulness, while improving games based on the experience of users.

10. These conclusions highlight the importance of social platforms in gaming, which supports the decision of including AB Music in social networks such as Facebook.
11. Features with clear explanations of the game background, means of providing individual and final goals during play and describing the character's conditions. Besides, the existence of a magic operator it is important, as well as the ability to select appropriate types of feedback and to use sound as a form of feedback during play (Choi and Kim, 2004).
12. There are several levels of customization: space adaption, mission/task adaption, character adaption, game mechanics adaption, narrative adaption, music/sound adaption and player matching (Bakkes *et al.*, 2012).
13. The main conclusion this study provides is that in a game, there are different types of players that search for different things, for a game designer should make decisions about a game's mechanics according to the public he or she wants to target. However, it should be considered that Bartle designed this player-type theory for a very specific public (individuals that play MMORPGs for fun), and he criticizes its misusages, although he understands that, in the lack of other alternatives, his theory is used to support other types of games, such as casual games.
14. This taxonomy was created for gamification purposes. "Gamification is the use of game thinking and game mechanics in non-game contexts to engage users in solving problems".
15. Andrzej's Blog marczewski.me.uk/user-types/#.Ushoa9JdWSo
16. Consult the Marczewski's gamification player types for game features that directly support each user type http://marczewski.me.uk/user-types/#.UsnVQNJdWSo
17. Epic Win Blog www.epicwinblog.net/2013/05/gamification-player-types-meet-players.html
18. Consult the Manrique's gamification player types for game features that directly support each player type www.epicwinblog.net/2013/04/gamification-player-types-t-e-pyramid-ii.html
19. AmyJokim http://amyjokim.com/2012/09/19/social-engagement-whos-playing-how-do-they-like-to-engage/
20. Consult the social engagement verbs for a graphical representation of this model http://amyjokim.com/2012/09/19/social-engagement-whos-playing-how-do-they-like-to-engage/
21. This encompasses the ability to control aspects of the game's sound like the playlist, the volume-level (sound effects, music and voice/dialog) and the presence/absence of popular or familiar music.
22. Music will not only be one of the features of this game but also the unifying theme of the game; thus, several characteristics of the game will be designed accordingly, such as characters, game environment, rewards and the social experience. Besides, by allowing players to choose the music they prefer to be in their player, immersion can be potentiated.
23. Immersion is defined as a sense of "absorption" during game play and the consequent disconnection from the real world (Huiberts, 2010).
24. Although this role of sound seems to discourage the new product idea, the market research completes this analysis for the particular case of mobile-casual games.
25. Taking this dimension of sound into consideration, and to potentiate the dynamization role of music, this edition of *Angry Birds* was decided to be about music, so that the points of

connection between gameplay and music listening can increase and the gaming experience can improve.

26. These psychological needs seem to be behind several studies: Yee's motivations, Bartle player types, self-determination theory and Marczewski gamification player types. It is important to test not only their importance for digital games play but also for casual games in particular (Kilkku. www.kilkku.com/blog/2013/08/bartle-player-types-yees-motivations-and-self-determination-theory/).

27. Online survey (I) was carried out by the authors to assess the market potential throughout 218 respondents, from which 53 per cent were current players of mobile-casual games, 31 per cent were past players and 16 per cent never played this type of games before. Moreover, in terms of consumer-rooted and more specifically, geographic location, participants were from wide set of countries/regions, e.g. Portugal (82 per cent), other European countries (11 per cent), Latin America (5 per cent), USA (2 per cent) and Asia (1 per cent), which result in 20 different nationalities. Besides, demographics focused on gender distribution favorable to female respondents (61 per cent), about 71 per cent of the respondents were aged between 18 and 25 years, 14 per cent were in the age range 26-35 years, 7 per cent were more than 45 years, 5 per cent were aged between 36 and 45 years and 3 per cent were below 18 years threshold.

28. Online survey (II) was carried out by the authors to assess the potential games' features throughout 80 respondents, from which 36 had relevant experience with gaming. Again, in terms of demographics, female representation was larger (56 per cent), and the majority of players (81 per cent) were aged between 18 and 25 years, 14 per cent were between 26 and 35 years, and 5 per cent were between 36 and 45 years. While 81 per cent of the respondents are Portuguese, 19 per cent are foreign. In terms of consumption-specifics, e.g. usage rate and usage occasion, the analysis shows the majority of the participants (57 per cent) spend less than 2 h per week playing, 37 per cent plays between 2 and 5 h weekly and 6 per cent play each week, between 5 and 10 h (3 per cent) or more than 10 h (3 per cent). Moreover, while 60 per cent of the respondents affirm searching for positive emotions and pleasure in gaming, 34 per cent look for collecting, achieving and completing in the game and 6 per cent want to meet people, collaborate and compete.

29. For a game to work, game elements have to be connected and interact in several dimensions, namely, regarding to mechanic, story, aesthetics and technology. See more in "The Art of Game design", developed by Schell, in 2008.

30. NMusic was founded in 2010, by Celestino Alves, having Diligence Capital SGPS as shareholder and PT as telecom partner; in 2011, Pathena SGPS became NMusic's investor; in 2012, it joined the Startup Lisboa, a Portuguese Business Incubator, and started its expansion process; The streaming service was launched to allow users to listen to millions of songs on the computer, mobile phone, tablet and television, without advertising and free of charge.

31. See Section 4.1.3.

32. In fact, games and music are the most profitable digital industries, representing 42 and 32 per cent, respectively, of global revenues coming from digital sales of 2011 (IFPI, 2012).

33. Upgraded music services and new features emerge, as companies try to create an overall better user experience to attract more customers in which mobile accessibility is a premise, while exploring social media and set up channels, feeds and profiles (IFPI, 2013).

34. There are network value opportunities which potential generate complementary sources of competitive advantages, e.g. throughout the impact in new ways of content creation as a

result of the combination of music and games, the integration of providers, the collaboration between developers and publishers and also technology integrators, contributing for a global value chain and maximizing profit margins.

35. According to NMusic, Musicbox accounts with more than 150,000 users.
36. Angry Birds reached in March 2013 more than 1.7 billion downloads (AWS Case Study: Rovio. http://aws.amazon.com/pt/solutions/case-studies/rovio/).
37. AB Music will face the indirect competition from current mobile-casual games (none of them offering access to music) and even more indirect competition from streaming services.
38. Digital convergence refers to the agglomeration of information technologies, telecommunication, consumer electronics and entertainment industries.
39. New products and services will emerge, not driven by demand on a specific content, but by innovative technical abilities, which reinforces the importance of innovation for these industries (Mateos-Garcia *et al.*, 2008).
40. The integration of what once were features of distinctive goods into new products and services allows for more competitive prices.
41. Zynga is a good example of vertical integration: the games company created its own platform as a way to reduce the influence of Facebook in its cost structure (Berger, 2012).
42. Musicthinktank www.musicthinktank.com/blog/4-emerging-trends-in-social-media-how-theyll-impact-the-musi.html
43. Digitalmusictrends http://digitalmusictrends.com/
44. See more on http://expandedramblings.com/index.php/how-many-people-play-angry-birds-infographic/#sthash.QDfn4UjD.1fUzCf1i.dpbs
45. Every game is composed by mechanics (the rules and procedures of the game), story (the sequence of events revealed during play), aesthetics (how a game "looks, sounds, smells, tastes and feels") and technology (materials and interactions that make a game possible) (Schell, 2008).
46. The results of this survey will be analyzed and applied in the "Market Specifics" section.
47. Head-up display "is the method by which information is visually relayed to the player as part of a game's user interface".
48. The correlation analysis based on the two online surveys and SPSS allowed us to rank needs in accordance with customer priorities. This ranking process allows to prioritize several game components based on customer motivations according to Likert psychometric scale, by measuring both percentage and mean values for each described type of need.
49. Discovery, autonomy, role-playing and customization were considered important for the gameplay. However, autonomy in casual games restricted for this type of games prioritizes simplicity.
50. Mastery of controls, a sense of competence, achievement and progression, the right level of difficulty and relevant feedback were considered important for the gameplay.
51. Socialization, collaboration, teamwork, relationship and social status had a relative low score comparing with other players' needs.
52. SPSS analysis percentage (81.0 per cent) and mean (3.62) for "autonomy" ranks 2 of 19.

53. SPSS analysis percentage (56.7 per cent) and mean (3.36) for "role-play entertainment" ranks 4 of 19).
54. SPSS analysis percentage (43.2 per cent) and mean (3.00) for role-play "competition" ranks 10 of 19.
55. SPSS analysis percentage (24.3 per cent) and mean (2.55) for role-play "social interaction" ranks 15 of 19).

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