Business Models for Educational Video Games: An Exploratory Analysis!

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Abstract

The video game industry is now one of the main creative industries at the global level. At the same time, billions of euros are invested in education. However, educational video games remain seldom studied from an economic and business point of view.

In this paper, we employ the Business Modelling methodological framework, as designed by Ballon (2007), to analyse the main features of an educational game's business model. We aim to synthesise the best practices observed in international industry cases of educational video games or 'serious games', in terms of services offered, technical design choices taken, and financial revenue schemes adopted. More in detail, 35 educational video games were analysed based on a scale of four business modelling parameters. Afterwards, the level of centralisation of the respective games was compared to their revenue models. In general games will rely on a continuum between – on one side – centralised production of individually sold games and – on the other side – decentralised

production of games available for free with a high density of advertising. The most interesting cases for stakeholders in the educational game industry may however lay in the middle, namely game platforms with hybrid revenue models (e.g. freemium) that ensure a certain control of game production while involving external content producers (e.g. teachers or parents).

KEYWORDS:

educational video games; business model; revenue model; best practices; openness; (de)centralization.

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1. Introduction

The video game industry is now one of the main creative industries at the global level. At the same time, billions of euros are invested in education. However, educational video games remain seldom studied from an economic and business point of view.

Educational games did not come into wide use until the 1990s with multimedia PCs, even though such games were created and used long before (Susi et al., 2007). At the time, educational games and other software evolved into "edutainment". However, interest in edutainment soon decreased, partly because of the poor quality of the games themselves, and partly because of a growing interest in the Internet (Michael and Chen, 2006). A general "law" in the video game sector consists in that when content is cheap to produce, the market gets saturated with poor quality content, consumers get disappointed by their purchases and soon leave the market. This is what is likely to take place currently with educational PC and online games. Actually, with low barriers to entry, there is a pressure towards lower prices, and consumers may not be willing to pay for educational games.

Mobile might be the new frontier, and "education apps are the fourth-most-represented category in Apple's App Store, with 24,727 programs, behind apps for books, games and other entertainment" (MacMillan, 2010) – although not all of them are games (e.g. calculators). On the other hand, on mobile platforms, the abundance of games again puts pressure on prices to diminish, which results in low profit (if at all) for games developers and publishers (taking into consideration the mobile platform provider's, e.g. Apple, 30% margin share).

In this paper, we employ the Business Modelling methodological framework, as designed by Ballon (2007), to analyse the main features of an educational game's business model. We aim to synthesise the best practices observed in international industry cases of educational video games or 'serious games', in terms of services offered, technical design choices taken, and financial revenue schemes adopted. The goal is to learn from these business model cases, culminating in an overview the business requirements that are critical to the viability of the cooperation between

the platform owner, game/content developer, content aggregators, and other potential stakeholders.

More in detail, 35 educational video games were analysed based on a scale of four business modelling parameters. Afterwards, the level of centralisation of the respective games was compared to their revenue models. Our preliminary finding is that games with a high centralisation tend to adopt direct revenue models, whereas video games with low centralisation tend to rely on indirect revenue models.

This study contributes to the literature by providing insights concerning the business model parameters prevalent in the educational video games industry. Furthermore this is to our knowledge the first study that attempts to qualitatively relate educational video games' degree of centralisation to the chosen revenue model.

Our methodology consists of business modelling through document analysis, a literature study, case studies and a small round of expert interviews. The expert interviews were conducted with one educational publisher and one game developer in Flanders[1].

The paper is structured as follows. Section 2 delineates the market analysed. It proposes definitions and taxonomies of video games in order to better define educational video games. Section 3 continues with a market overview for gaming in general and educational games in particular. Section 4 describes the methodology used to analyse business models and how it applies to educational games. Section 5 subsequently provides an analysis of best (and worst) practices observed in several international industry cases. This includes an overview of financial revenue schemes for educational gaming. Section 6 concludes.

[1] The interview with Vicky Vermeulen, ICT project manager at publisher dieKeure, took place on April 10, 2012. The interview with the CEO of Larian Studios, Mr. Swen Vincke, took place on August 28, 2012. The interviews were semi-structured. First, a list of topics was defined, which we further adapted and refined in line with the field of expertise of the interviewee.

2. Defining educational video games

Educational video games are a subset of video games in general. Kirschner (2004, p.3) defines games as "[…] competitive, situated, interactive (learning) environments, based on a set of rules and/or underlying model, in which – taking into consideration a number of restrictions – under uncertain circumstances, a challenging target is pursued". Whereas Kirschner's (2004) definition mainly looks at intrinsic qualities of a game, De Prato et al. (2010) focus more on technological aspects. According to De Prato et al. (2010, p.29), the most common definition of a video game is "an electronic or computerized game played by manipulating images on a video display or television screen".

Over the past years, a range of taxonomies of video games have been proposed by several authors. Educational games (and more generally serious games) can be distinguished from the other video games – and accordingly, defined – based on their purpose. Concretely, the purpose-based taxonomy of video games distinguishes (1) core[2] (2) casual[3] and (3) serious games

[2] Core games are considered by De Prato et al. (2010, p.32) as "a label that identifies the old basic category of video games the market was already used to: those games mostly bought in shops, to be played on personal computers, home consoles or handheld devices by (usually young) players used to dedicating part of their free time to this kind of entertainment". Core games vary according to the different degrees of involvement expected from the players. Another characteristic of core games is the increasing complexity that is valued by demanding users and justifies the purchase price.

[3] Casual games can be distinguished from core games because of their lower degree of complexity. Two main characteristics of casual games include (i) their higher degree of user-friendliness in terms of plots (e.g. searching, matching and time management exercises), (ii) the accessibility with respect to the distribution of the games (mostly distributed via casual games portals available on the Internet). Other main differences with core games lie in: (i) the number of target players (a much wider audience); (ii) the age of target players (can be children, adults or elderly people); (iii) the gender of target players (majority of female players) and (iv) the average duration of play session (considerably shorter) (De Prato et al., 2010). The first casual game according to De Prato et al. (2010) was Windows Solitaire, a card game included with the Microsoft Windows Operating System.

(De Prato et al., 2010). Educational games belong to the serious game category. The term 'serious' refers to the learning process and is directly at odds with the 'just for fun' label that games often have (VIWTA, 2008). The purposes of serious games vary from professional training and educational to propaganda, military training, or government awareness raising actions (De Prato et al., 2010). Therefore, the most common definition of serious games is "games used for purposes other than mere entertainment" (Susi et al., 2007, p.1). In particular, serious games can be used to teach something to the players (education or instruction), it is essential that the most important elements of learning are in focus (Susi et al., 2007, p.6). However, there can be a contradiction between the pedagogical aim and the entertainment component. For Zyda (2005), entertainment comes first, but for Michael and Chen (2006), entertainment is not the primary purpose (hence the risk of getting 'boring' games). Whatever the point of view, there is an agreement on the necessity to reach some balance between pedagogy and entertainment[4].

The literature reveals that there are many typologies of serious games, but all of them mention educational games as one category. For instance, Michael and Chen (2006) list military games, government games, educational games, corporate games, healthcare games, and political, religious and art games as serious games.

Fundamental characteristics in the design of educational video games include the possibility for the evaluation of learners' performance, adaptability and ease of integration (Michael and Chen, 2006). As an aside, analyses have consistently shown that all games could have a learning component (Mitchell and Savill-Smith, 2004). More precisely, games can support the development of a number of different skills, such as analytical and spatial skills, strategic skills and insight, learning and recollection capabilities, psychomotor skills, visual selective attention, etc. (Susi et al., 2007). The authors stipulate that even violent games can be beneficial in that they provide an outlet to alleviate frustration (Susi et al., 2007).

[4] The label 'serious games' is also exploited by the Serious Games Initiative in Washington. The aim is to support and stimulate the development of video games for education, policy, management and the health and social sector. See <http://www.seriousgames.org/> for more details.

In this Section, we introduced definitions and a purpose-based taxonomy of video games. We also briefly touched upon the benefits users may derive from (educational) gaming. The next Section continues with a market overview for gaming in general and educational games in particular.

3. The market for educational games

The total video game industry is the youngest of the creative industries (Masnick and Ho, 2012). In spite of this, video games already constitute a large and increasing share of the media and content industries. The continuing integration of media services and technologies, as well as the conversion of stand-alone products into (online) services, brought about a shift in the structure and nature of the business models for video games (De Prato et al., 2010). This goes along with a change in the demographics of video gamers, with a growing proportion of female players, and relatively older players (ISFE, 2010).

Over the 2004-2013 period, the global video games market is expected to grow from less than USD 30 billion to over USD 70 billion (De Prato et al., 2010). However, Masnick and Ho (2012) report that the figure was already reached in 2011 (based on various reports from PwC, Gartner and IDATE). At this stage, serious games only constitute a minor part of the video games market, and the upsurge of mobile games, mobile applications and social games have lead to both a fragmentation and saturation of the market (Interview Larian Studios).

IDATE estimates that in 2010, the serious games market globally generated EUR 1.5 billion in revenue, and that by 2015 sales will be almost seven times what they are in 2010 – with an average annual growth rate of 47% between 2010 and 2015 (IDATE, 2010). Sue Bohle, executive director of the Serious Games Association, for her part, mentions that industry estimates range from USD 2-10 billion in revenue for the serious games space, depending on how much of the market for games, simulations and virtual worlds is included in the calculation (Business Wire, 2012).

Whereas figures on the total video games market size, and, to a lesser extent, the serious games market size are readily available, it is not a straightforward exercise to analyse the size of the educational games market. The reason for this lack of consistent information on educational games is twofold.

On the one hand, the market for educational games is relatively scattered. While a few titles (e.g. Call of Duty, The Sims, etc.) dominate the video games market at the global level, this is less the case for educational games. Such games seem to remain focused on national or linguistic markets maybe because there are too high costs related to translating or adapting to the curriculum. In addition, it seems difficult to compare games with very different business models, e.g. games bought with a price per unit and games available for free on an ad-funded platform (see Sections 4 and 5 for more details on business models).

The second reason for a lack of data on the market for educational games is the fact that it is (still) a very small market, as shown notably by some confidential sales data on the UK and US educational gaming market. Such data also show that the educational game market is the most dynamic in the UK, although total sales in physical outlets are in hundreds of units only, notably following the economic downturn. In the US, while there are many educational game platforms available (see Section 5 for a description of a few of them), serious games are generally rather oriented towards military or medical games.

According to Bloomberg (quoting Parthenon Group LLC), software sales for US schools and colleges were close to USD 5 billion in 2010 – which however may include more than educational games per se (e.g. the O.S. used to make the computers run) (MacMillan, 2010). Data from Ludoscience show that the number of educational games released yearly increased from 30 in 2005 to 50 in 2010 (global figures). However, such figures do not include all games released online. Ambient Insight (2011) states that the US game-based learning market reached USD 231.6 million in 2010. The growth rate is 12.3% and revenues are predicted to reach USD 413.2 million by 2015.

Interestingly, mobile packaged edugames are already outselling non-mobile (PC/web/console) edugames in the US. In 2010, revenues

for non-mobile edugames totalled USD 78.9 million. The growth rate is flat at 0.07% and revenues will only reach USD 82 million by 2015. Conversely, 2010 revenues for mobile edugames in the US were USD 117.4 million. The growth rate is 15.2% and revenues will reach USD 238.2 million by 2015 (Ambient Insight, 2011).

Despite these optimistic growth figures, evidence shows that educational game developers face difficulties in receiving funding from traditional channels, mainly because of (experience with) prior lost investments in educational gaming markets[5].

On top of that, the height of development costs for educational games further weakens the funding climate (Klopfer et al., 2009). As pointed out by Gabrillo (2012), crowdfunding is especially attractive for game developers. In crowdfunding, three different forms of investment can be distinguished, namely donations, active and passive investments (Lambert and Schwienbacher, 2010; Schwienbacher and Larralde, 2010). Whereas donors do not receive anything significant in exchange, passive investors get some reward (often the product to be developed as the outcome of the project), and active investors can get involved in the project for instance by giving feedback on product design features (Schwienbacher and Larralde, 2010). According to Lambert and Schwienbacher (2010), about 22% of the crowdfunding investments are pure donations, 32% are passive and 60% active investments.

Video games are particularly successful in obtaining crowdfunding (Kühl, 2012; Mollick, 2012). This popularity resulted in the creation of crowdfunding platforms specifically for gaming projects (Curtis, 2012), e.g. Gambitious, 8-Bit Funding and My Witty Games. It is interesting to note in this respect that – despite the popularity and some extremely successful crowdfunding campaigns for games, approximately 57% of the projects do not

[5] This said, investment patterns in the game-based learning market seem to be on the increase all over the world. To exemplify, Lumos Labs, a developer of PC-based brain trainer and brain fitness games, collected USD 32.5 million in venture capital in June 2011. Ambient Insight (2011) points out it is the single highest investment ever made to an edugame supplier. Furthermore, *8D World*, an education virtual world edugame for language learning for young children in Asia, obtained USD 12.5 million since 2009.

meet their target funding goal (Nelson, 2012). In total, only slightly less than half of all crowdfunding campaigns obtain crowdfunding (Mollick, 2012)[6].

Several independent game companies have used Kickstarter to launch new titles, e.g. most lately Larian for Divinity Original Sin[7]. Educational game developers found their way to Kickstarter as well. To start up a financial literacy game called Mindblown Life, Mindblown Labs asked funding of USD 60,000. Currently the game developer lists over 650 contributors who have pledged USD 1 to USD 3,000.

Interestingly, contributors at the USD 3,000 level get a virtual statue programmed in the game that looks like them, along with an in-game achievement named after them (Rice, 2012). Another initiative was launched by INversionGames, offering a word game playing card set developed by Scrabble enthusiasts. On Kickstarter, they asked for USD 1,000 to produce the cards, which was easily funded by 61 backers (Rice, 2012). Mindblown Labs reports that they are one of the few specifically educational offerings on Kickstarter. In addition, the dollar amounts for entertainment titles are usually significantly higher than for educational titles. To exemplify, Project Eternity, a title from Obsidian, has almost USD 4 million pledged through Kickstarter (Rice, 2012).

An analysis of the projects presented on the major crowdfunding sites, indicates that there is a growing interest of educational game developers to attract alternative funding mechanisms, although their share compared to other creative industries is still marginal. Nevertheless, crowdfunding through sites like Gambitious and Kickstarter holds the potential for removing lack of funding as a barrier to new educational game development (Rice, 2012).

In this Section, we set the scene for our business modelling analysis. We highlighted that the educational games market is very small, fragmented

[6] Drawing on a dataset of nearly 47,000 projects with combined funding over USD 198 million from Kickstarter, Mollick (2012) investigates the underlying dynamics of success and failure among crowdfunded ventures. He finds that personal networks and underlying project quality increase the chance of project success, and that geography plays a role in both the type of projects proposed (e.g. country music in Nashville, Tennessee) and successful fundraising.

[7] See <http://www.kickstarter.com/projects/larianstudios/divinity-original-sin?ref=live for more information>.

and that little information is available on sales figures. Inherently, the success of online educational games is hard to measure, taking into account that many portals are free and rely on advertising revenue. We also briefly touched upon the potential of crowdfunding for educational game development. In the next two Sections, we will take a closer look at the business model design of educational games, and apply it to selected international case studies.

4. Business modelling parameters for educational video games

This Section describes the main features of a business model in general (4.1), and as applied to the analysis of educational video games and game platforms (4.2).

The premise of this Section is that the business model is crucial for the success of an educational video game. Indeed, the best educational games will succeed based on their intrinsic qualities, in particular how fun and entertaining they are (standard reference for a game) and how efficient they are in teaching the players. However, their business model – e.g. which users will be targeted, how revenues will be earned, how the games will be distributed, etc. – plays a crucial role in their potential to reach consumers and to allow the game to be profitable enough or the platform to generate enough revenues to be sustainable.

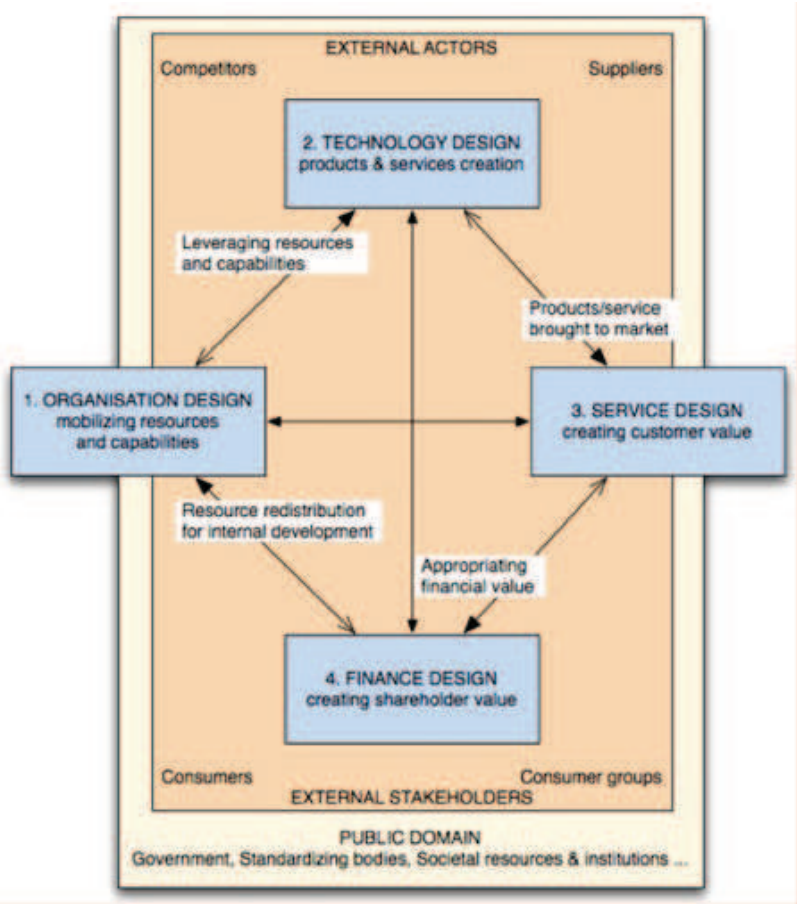
The main questions that will be answered in this Section are: What are the key features of a business model? How can these features play a role in the success of an educational video game/platform in terms of profitability, sustainability and sales?

4.1 Methodological framework

We employ the Business Modelling methodological framework, as designed by Ballon (2007), to analyse the main features of an educational game's

business model. The discipline of business modelling has antecedents in the academic work on strategic management. It is multidimensional, strategic in character, and adopts a resource-based view. It can be seen as a synthesis of the multidimensionality of Kaplan and Norton's (1996) balanced scorecard view, the resource-based view of Barney (1991), and Hamel's (2000) strategic management insights.

Figure 1
Business modelling cycle



Source: Braet and Ballon, 2007

Kaplan and Norton's (1996) Balanced Scorecard approach introduces a functional-level strategic focus to business projects, but lacks a

market-level of analysis. The resource-based view offers an elaboration on the different dimensions that have to be taken into account while describing possible business models. The resource-based view is a fruitful foundation for the construction of business models, since it takes into account – through its affinity with neo-institutional economics – external stakeholders by viewing institutions and public policy as affecting economic performance, and because it accommodates path dependencies (Hunt and Morgan, 1997).

Based on this literature, Ballon (2007) identifies four business model design parameters (Value Network, Functional Architecture, Financial Model, Value Proposition) that can be grouped into two categories of parameters. On the one hand Value Network and Functional Architecture belong to Control Parameters, on the other hand Financial Model and Value Proposition belong to Value Parameters (see Figure 1).

4.2 Adaptation of Ballon's (2007) framework to the analysis of educational games

This methodology will be used to categorise the games' main characteristics. On the one hand, characteristics deemed as important by the literature are identified and integrated within the methodology (e.g. the type of platform, as identified by e.g. De Prato et al., 2010; Neufkens, 2009). On the other hand, the methodology allows identifying some features that are rarely considered by the literature on educational gaming (e.g. the analysis of the organisation design induces the analysis of the distribution of the game).

Based on Ballon's (2007) methodology, the relevant characteristics of the games in our sample were grouped in five categorie, namely (1) General characteristics of the game / game company; (2) Value Network Parameters; (3) Functional Architecture Parameters; (4) Financial Model Parameters; and (5) Value Proposition Parameters. Each category will be defined below.

4.2.1 General characteristics of the sampled educational games

These characteristics are not directly related to the game's business model, and are generic in nature. They include the number of games available, country of origin and release date (age). A fourth intrinsic characteristic is discipline/field (e.g. mathematics, language, etc.). The discipline relates to the fact that every educational game is designed to teach something to the player, this something is always related to one (or a few) disciplinary field(s). A final intrinsic characteristic is language(s).

Every game in our sample is available in one or a few languages[8].

4.2.2 Value Network characteristics

The first design parameters of a business model are the Value Network parameters. They correspond to what kinds of actors participate in the production and distribution of the game, what is their role and what kinds of relationships exist between them (Ballon, 2007). Adapted to the educational video game industry, this leads to a set of variables, rarely analysed by the literature.

[8] A related characteristic is *language (in)dependency*, i.e. whether the game needs to be translated to be played by users from another country. In case translation is required, there are different gradations possible (only the instruction guide, contextual elements in the game like the introduction, non-crucial dialogues, and/or elements in the game itself). In this respect, a related issue is whether the game can easily be adapted from a cultural point of view. While this point is difficult to assess, it is an important one to keep in mind for developers willing to export their game. For example, parents in the US may more easily accept in-game advertising (including ads in educational games). Concretely, advertising in the classroom is something that is generally acknowledged in the US – which is not the case in most Western European countries. In terms of costs, beyond translation costs, the adaptation of the game (especially when it is supposed to follow a curriculum), may require links with an educational publisher in every country, with additional costs in countries where the curriculum varies between the regions, e.g. between the German *Länder*. Analysing the language (in)dependency of every game is beyond the scope of additional costs in countries where the curriculum varies between the regions, e.g. between the German *Länder*. Analysing the language (in)dependency of every game is beyond the scope of this paper, as it would require deep knowledge of the curricula in each country included in the sample.

A first characteristic is the level of integration of the value chain. Inherent to this is the question whether certain activities, such as animation, 3D modelling, testing, dubbing, translations, etc. are outsourced. More in detail, game platforms can be classified according to the degree of centralisation of content production, with some platforms producing all content they make available while others do not produce any of the content available on or through their platform (see Section 5.4 for more details).

A second Value Network parameter is the distribution model. Basically, the distinction can be made between (i) Retail / download shops (e.g. Online sites such as Steam or Direct2drive); (ii) Download services (e.g. Xbox Live Arcade, Wii Ware, PlayStation Network); and (iii) Online (via Google, SNS, etc.), the latter being mainly ad-based.

4.2.3 Functional Architecture characteristics

Functional Architecture parameters correspond to the architecture of technical components. A first parameter is the type of platform (see De Prato et al., 2010; Neufkens, 2009). Games differ according to the platform they will be available on[9]. We discern four types of platforms, namely (1) Location-dependent (or arcade games); (2) Hardware-dependent (console games and handheld console games); (3) OS-dependent (PC games and mobile games)[10]; and (4) Browser-dependent, i.e. online games. The second Functional Architecture parameter is input and output device(s). It is important to distinguish games based on the input (joystick, keyboard, etc.) and the output devices (PC or TV or phone screen, etc.) used.

[9] This is also an important driver of innovation in the video game sector. New consoles regularly appear. Online games are an important sector, in particular for educational games. Mobile devices constitute one of the latest greatest sources of innovation for the sector, with games on mobile phones and tablets constituting a serious source of competition for the other platforms

[10] The games in our sample that can be played on mobile devices will use Apple's iOS.

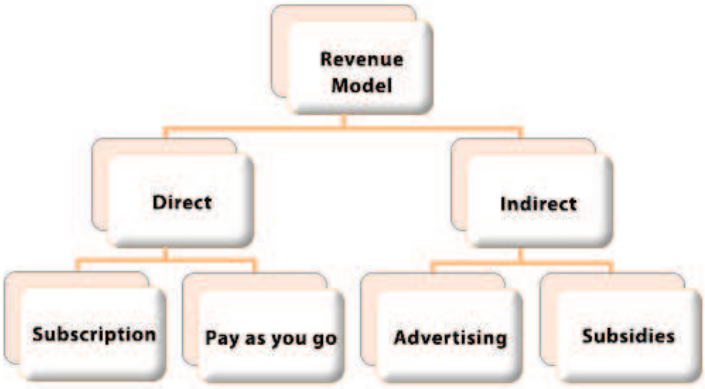
4.2.4 Financial Model characteristics

Financial Model parameters are related to how the financial streams (costs and revenues) are set up and shared between actors. As such, the respective parameter is defined as type of revenue model. In the case of video games, discussions have generally focused on the revenue model (rather than e.g. how revenues are shared between business partners) (see e.g. De Prato et al., 2010).

Revenue models differ according to whether they stem from the users (direct revenue models) or from another source (indirect revenue models) – beyond the usual "free or fee" debate. Direct revenue models differ according to whether the consumer should pay for every consumption (e.g. the standard retail model where the consumer pays for every game) or the amount paid is not correlated with the uses (e.g. the subscription that allows the consumer to have access to as many games as he/she wants). Indirect revenue models differ according to whether revenues stem from (private) partners interested in reaching an audience (advertising) or from (public) institutions as a part of their objectives (subsidies) (see Figure 2).

Figure 2

A TYPOLOGY OF REVENUE MODELS



Source: Ranaivoson, 2010

The Internet allows for more complexity in terms of revenue models. First, it has allowed for the emergence and development of hybrid revenue models

that combine the features of every of these models. The most notable in the case of media (notably for software) is the freemium model. The freemium model is based on the existence of two or more versions of the product being available. The free version is available for everyone (it may require a registration, though) and allows access to basic functionalities. There is also one (which is then usually called 'premium') or several better versions, which allow to access more functionalities, e.g. more games, account, bonus, etc. The success of such versioning relies on the fact that on the one hand the basic version is good enough to attract many users and on the other hand the better version is differentiated enough from the basic version to incite enough people to pay to acquire (generally to subscribe to) it. Ambient Insight (2011) states that the so- called 'freemium' model is now becoming the prevalent business model for mobile applications.

Secondly, the Internet also expands the ways of advertising (Neufkens, 2009). Advertising on the Internet takes several forms, from banners to Google AdWords to product placement in the games. Brands or companies can also partner with the game platform, even to the extent that the game is packaged with something else (e.g. a subscription to an Internet service). And more generally the advertising can take place on the platform that hosts the games and/or on the page where the game takes place (e.g. for a Flash game) and/or in the game itself (i.e. in-game advertising)[11]. Thirdly, the Internet has allowed for the development of micropayments for virtual items, i.e. the possibility for (generally very small) purchases inside or in relation to the game, e.g. virtual items such as clothes for an avatar or access to game extensions (of course, here the boundary with the freemium model can be very thin).

A final issue relevant for educational video games relates to possible support by the State. Actually such content is not necessarily profitable while having a social value (hence beyond its economic value). This may justify State support in the form of e.g. subsidies or tax credits.

[11] Advergames were first named in 2001 and are usually sponsored and distributed for free with the aim to advertise a specific product/service or organisation, and continue attracting corporation interests due to the expected return from the extended stay of users on the company's webpage (De Prato et al., 2010). Edutainment can generally be recognised as BTL.

4.2.5 Value Proposition characteristics

Finally, Value Proposition parameters correspond to how the product is positioned (towards the market and vis-à-vis competing offers) and the potential level of involvement of users.

A first important characteristic of the value proposition is the target group, and more in detail the age/level of the targeted users. Since educational games can also take place in the context of a classroom, a related item is what the game is supposed to teach; does it follow a curriculum or not. Teachers and parents can be the buyer (e.g. subscriber) although not necessarily the main users of the games.

The two final parameters that define a game's value proposition are related to issues opened up by new possibilities, namely 3D and open source. 3D remains seldom used in educational games, probably for cost reasons. Besides, some games allow some or all users to contribute, e.g. by creating their own games or exercises, or by giving feedback. The questions then are the importance of such contribution in the global value of the game and how these contributions are treated by the game provider (e.g. in terms of intellectual property rights on content provided by users).

The above methodology to analyse educational games is applied in the next Section to our sample of educational games and game platforms.

(iii) Through The Line (TTL) (referring to all marketing activities that mediate expected return from the extended stay of users on the company's webpage (De Prato et al., 2010). De Prato et al. (2010) distinguish three types of advergames, namely (i) Above The Line (ATL) (referring to all promotional activities done by companies through mass media); (ii) Below The Line (BTL) (referring to promotions such as sales promotions, consumer promotions, PR, events, etc.); and (iii) Through The Line (TTL) (referring to all marketing activities that mediate between the two previous ones, being close to viral marketing). Edutainment can generally be recognised as BTL.

5. Best practices analysis

This Section analyses 35 educational games or game platforms, focusing on the four business model parameters as defined in the previous Section. Section 5.1 first explains how data was collected. In 5.2, the methodology is applied to the whole sample. It highlights the most interesting findings across the sample based on the four business modelling parameters. In 5.3, the main differences between the online/PC and mobile educational games in our sample are addressed. Finally, the Value Proposition and Financial Model parameters are compared in order to detect patterns in business model design choices taken across the sample (5.4).

5.1 Data collection

It is practically impossible to provide an exhaustive analysis of all the educational games or game platforms that are available globally, or even at the level of the UK and the US. Therefore, we decided to focus on a restricted sample of educational games, and in the selection, we endeavoured to find concepts and business models that are really divergent one from another. The objective was to create a sample that allows to draw lessons in terms of designing a business model, without having the intention to be representative for the total supply-side of the educational video games market.

At the start of the sample selection, we collected information on stand-alone games, i.e. games that are available by themselves, not in a set of games, such as Monkey Tales. In the course of the sample selection, it appeared that it was also (and probably even more) interesting to take examples of educational game 'platforms', i.e. platforms that give access to several (sometimes thousands of) games. Some of these platforms not online provide access to (or even download of) educational games but also other kinds of video games, other kinds of content (e.g. images, videos) for children, or teacher resources.

Our sample is made of 35 educational games or game platforms; including 20 PC/online educational games and 15 mobile educational games.

The selection of the PC and online educational games relies on several insights (rather than one systematic approach). Firstly, all have English as the only or one of the languages available. Secondly, the sample includes 4 online educational games that are amongst the most visited at world or national level (based on Alexa ranking)[12]. Thirdly, we included the Top 10 sites for educational games, as referenced by Techlearning[13]. Fourthly, there are 2 games or game platforms in the sample that are among the finalists of BETT 2013[14]. Finally, to further increase the diversity in terms of business models, we included 4 offline educational PC games[15].

The selection of mobile educational games is more straightforward since it is based on Apple's iTunes ecosystem. Concretely, a set of 15 apps among the "best" educational apps available on iTunes were chosen for our analysis. To select those games, we focused on the applications that belong

[12] Alexa provides information on web traffic. It ranks all sites according to the web traffic they are able to attract. It is possible to select top sites for the game category and narrow down the focus to video games and educational video games. For more information, please consult <www.alexa.com>. The following 4 PC/online educational games were selected based on their Alexa traffic figures (as of July 21, 2012): *Mondokiddo* (19,243,769), *WordReference Games* (264), *Poptropica* (5,106) and *BBC Bitesize* (47). The inclusion of Mondokiddo was based on information provided by business partners within the project.

[13] In chronological order, these 10 sites are *Funbrain, Game Classroom, Gamequarium, Braineos, Tucoola, Tutpup, BrainNook, Clever Island, What2Learn* and *ABC Ya*. See <http://www.techlearning.com/Default.aspx?tabid=67&EntryId=3281>, last accessed April 10, 2013.

[14] One of the expert interviewees advised us to look at the business models of the BETT 2013 finalists (http://www.bettshow.com). The Bett Awards are considered to be the most prestigious in the education sector, and are committed to celebrating a distinctive and diverse digital education resources market that meets the needs of the education system. However, after an analysis of the finalists, only two out of ten prove relevant for our purposes, namely the "Innovation in ICT" finalists *Education City* and *Planet Sherston.*

[15] *Ludwig*, *Playing History*, *The Mindty Ant*, and *Monkey Tales*.

to the category "education", and retained the top 10 in every subcategory[16]: top 10 Free, top 10 Paid and top 10 Grossing[17]. One advantage with iTunes' categorisation is that it not only reports on the apps that were the most downloaded (for free or paying apps) but also those that generated the highest turnover (the top 10 grossing). Although no information is available on the educational apps' cost structures and hence their profitability, the top 10 grossing category can be deemed an important proxy for the successfulness of the chosen apps. On the other hand, there is a bias in our mobile selection. First of all, it deliberately focuses on "best practices"[18]. Secondly, the analysis was conducted in November 2012, and the composition of the top 10 is likely to evolve rapidly.

5.2 The peculiar business model features of educational video games

Starting with the general characteristics of the game(s) (companies), within the sample, 23 games originate from the US and 6 from the UK. The remainder of the games originate from Austria, France, Denmark, PR China, Israel and Belgium. Eight out of 35 games analysed are available in other language(s) besides English. In terms of geographical scope, approximately a third of the games in our sample are explicitly dedicated to the US and UK (school system), whereas the remainder has a more international appearance.

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[16] On how the ranking is made on iTunes, see <http://news.cnet.com/8301-13579_3-57517241-37/app-store- rankings-rejiggered-in-move-to-ios-6/>, <http://mattgoffrey.wordpress.com/2012/03/23/changes-to-itunes-app- rankings-mean-huge-opportunities-secrets-to-increasing-your-rankings/> and <http://www.zdnet.com/blog/hardware/apples-app-store-shame/15933>.

[17] The apps include: *Mickey Mouse Clubhouse*; *Lumosity Brain Trainer*; *Christmas Pets*; *Bubble Guppies*; *Stack the States*; *Phone for Kids*; *Christmas Fun*; *Team Umizoomi Maths*; *The ABC Song*; *Nickjr draw and play*; *Princess Coloring Book*; *Old MacDonald*; *Jack's Never Land*; *The Wheels on the Bus*; *Peekaboo Presents*. There are less than 30 apps because (i) some apps belong to two categories (top 10 Grossing and one of the two other categories); (ii) some apps are not games and were therefore dropped, namely *iTunes U*, *Star Walk*, *Toca Tailor, Skyview, PBS Kids Video, Khan Academy, Paint Sparkles Draw* and *Toca Kitchen*.

[18] Arguably, this is also the case for the selection of most of the PC/online educational games.

The oldest games in our sample were released in 1997 (Funbrain) and 1998 (BBC Bitesize), and the most recent ones in 2012[19]. Language and maths (number but also geometry or even algebra) are the most common disciplines among the sample, although some game platforms propose games that deal with a large array of disciplines, to the extent that the educational aspect may prove hard to distinguish. Concerning the number of games offered by our cases, 11 educational game platforms offer over 80 games (up to more than 2,000).

In terms of Functional Architecture, our sample does not include arcade games (if there are such things as educational arcade video games) and console (on TV or handheld) games (e.g. Kawashima's Brain Training on Nintendo's DS). Therefore, all games in our sample are on PC, online, mobile, or a combination (see Table 1).

Table 1

THE DISTRIBUTION OF PLATFORM CHOICE OF OUR SAMPLE

Platform	N° of games in the sample	Platform	N° of games in the sample
PC-only	3	PC and mobile	1
Online-only	12	Online and mobile	3
Mobile-only	15	PC, online and mobile	1
Total	35		

The majority of games or platforms use keyboard and mouse as input device and the PC screen as an output device, except for those available on mobile devices, where input and output devices are similar (iPhone, iPod touch and/or iPad). Interestingly, only one game in our sample mentions the teacher's whiteboard as a possible output device (Education City).

[19] For mobile apps, only the release date of the latest version could be found. However the boom for mobile apps only started with the release of the iPad by Apple in 2010.

Turning to Value Network parameters and the distribution model, whereas all mobile educational games require downloading, the situation is more diverse for PC and online games. The majority of the PC/online games (11) can only be played online via the browser. Some games require to be installed but then do not require the player to be online. From the PC/online games in the sample, only 4 out of 20 games need to be downloaded, 4 can be downloaded or played online (a typical case of versioning, cf. infra) and 1 can be downloaded or bought through retail (CD).

In terms of level of integration of the value chain, in most cases, every player is usually playing by themselves, without contact with other players; and for most platforms there are no links between the various games available (e.g. what is done in one game does not influence what takes place in another game). In other words, platforms are generally a collection of stand-alone games in simple 'worlds' (rarely worlds, often sets of games that have no links with each other).

Turning to the Financial Model parameters, the three main revenue models (not necessarily mutually exclusive) adopted by our sample are freemium (15), pay-as- you-go (8) and advertising (6). Furthermore, 3 educational games are subscription- based and 3 are free with no advertising (see Table 2).

Table 2

REVENUE MODELS ADOPTED ACROSS THE SAMPLE, PLATFORM-BASED OVERVIEW

Platform/ Revenue model	Freemium	Pay-as- you-go	Advertising	Subscription	Free (no advertising)	N° of games in the sample
PC-only	*- Ludwig*	*- The Mindty Ant* *- Monkey Tales*				3
Online-only	*- Mondokiddo* *- What2Learn* *- Braineos* *- Brain Nook*		*- Funbrain (limited advertising)* *- Game Classroom* *- Gamequarium*	*- Clever Island* *- Education City* *- Planet Sherston*	*- Tutpup* *- BBC Bitesize*	12
Mobile-only	*- Lumosity Brain Trainer* *- Christmas Pets* *- Phone for Kids* *- Christmas Fun* *- The ABC Song* *- Princess Coloring Book* *- Old MacDonald* *- The Wheels on the Bus*	*- Micky Mouse Clubhouse* *- Bubble Guppies* *- Stack the States* *- Team Umizoomi Maths* *- Nickjr draw and play* *- Peekaboo Presents*			*- Jack's Never Land*	15
PC and mobile	*- Playing History*					1
Online and mobile	*- Poptropica*	*(ABC Ya Mobile)*	*- ABC Ya* *- Tucoola*			3
PC, online and mobile			*- WordReference Games (limited advertising)*			1
Total	15	8	6	3	3	35

It stands out that freemium revenue models are frequently adopted by online and mobile game platforms. They take the form of a free access to part of the services and the need to subscribe to access the rest (the best?) of the platform. Even the pure subscription models always allow testing one or a few games. So rather than 'free vs. fee', there is a continuum between 'subscription only' and 'everything for free'.

The pay-as-you-go model is frequently adopted by stand-alone games and mobile games. In ad-funded games, the advertisements can occur in several places, in particular for the platforms: on the main page, on a game's page, or in the game (product placement or even advergaming).

The 3 free games in our sample that are not advertisement-based, and the ones that have limited advertising, are either government-funded (BBC Bitesize) or cross- subsidised by other initiatives. To exemplify, in the case of Funbrain, most of the advertising consists of links to related products or services (e.g. the online game Poptropica) and to Froot Loops' site aimed at children[20]. While this limited advertising may not suffice for the service to break even, the service may have two aims/sources of revenues. Firstly, Funbrain belongs to the publisher Pearson, which may use it to be present in the market of online educational video gaming. Thus Pearson would be willing to incur losses, only waiting for a good opportunity to enter the market.

Secondly, the advertising on Funbrain's site mainly links to a service named Poptropica, that has elements of a massive multiplayer online role-playing game (and is hardly related to educational issues) and is aimed towards children from 6 to 15. Thus Funbrain can be used as a place to attract children to this other (potentially more lucrative) service. Poptropica is ranked 5,106 in terms of traffic according to Alexa (1,017 in the US: last accessed 23/07/12) and relies on a freemium model with over 75 million registered users (not all registered users have a subscription). Therefore, Funbrain may not earn money but its probable incurred losses would be justified by the opportunity to be present in the online educational video

[20] Froot Loops is a brand of breakfast cereal produced by the food processing company Kellogg's

gaming and the fact that it constitutes an access to the potentially more lucrative Poptropica.

Finally, what stands out from the Value Proposition parameters is that none of the platforms in our sample provide 3D games, whereas a minor part of the stand-alone games are in 3D (Ludwig, Playing History, The Mindty Ant, Monkey Tales)[21]. Also, few games or platforms seem to follow a curriculum. At best, the games are classified according to the grade they are best adapted to. Finally, the targeted users' age varies from 1 (preschool, or kindergarten) to 15. BBC Bitesize goes even beyond by targeting adults (e.g. with games related to business management).

5.3 The differences in business model features: a comparison between PC/online and mobile educational games

The analysis of mobile educational apps shows a few interesting differences with the PC and online educational games. The main difference concerns the revenue model choice. For mobile apps, two main forms exist, namely pay-per-download and freemium. With pay-per-download the app can be downloaded for a given price (between USD 0.99 for Stack the States and USD 3.99 for Bubble Guppies – hence very low compared to PC educational games, e.g. every Monkey Tales game costs EUR 14.95) and then played at will, completely for free (and offline) by the children. In case of the freemium model, the app can be downloaded for free but it is mandatory to pay to access certain features. Usually these features will be games or activities. This is the favourite revenue model of the seller 'Kids Games Club'. It gives free access to a few activities (e.g. first song pages for the ABC Song) or to the first stages of each game (e.g. for Christmas Fun). It is then possible to make in-app purchases to get one or all activities. To exemplify, the seller 'Baby Education Animal Weather Toys LTD' allows a free download of Christmas Pets (with access to one full game), whereas it

[21] There seems to be a trend towards more and more serious games including real time 3D technology (and/or use of Kinect technology) but this may not concern educational games since their budget remains low (inferior to 50k€).

costs USD 1.99 to buy the full set of the four other games, or each game can be purchased separately for USD 0.99.

Other mobile revenue models include subscriptions and advertising, but they are rarer, especially when compared to online educational games. For instance, the free version of Christmas Pets displays advertising – which is removed when the full app is purchased. Lumosity Brain Trainer is a freemium game that relies on subscriptions (USD 4.99 for 3 months; USD 6.99 for 6 months; USD 9.99 for 1 year, in addition, the subscription gives free access to a 35 session course). This does not necessarily mean that there are no educational apps relying on subscription or advertising but they do not appear in the "best" apps categories as set forth by iTunes at the moment of analysis.

In general, it seems that hybrid models are interesting for the mobile game providers. As an indication of this, among the top 10 Grossing, one can find games that belong to the top 10 Free (e.g. Lumosity Brain Trainer, Paint Sparkles Draw or some of the games released by 'Kids Games Club').

Besides revenue model choice, a second huge difference between mobile apps and game platforms consists in the lower number of games available. For the online educational games it is not uncommon to find several hundreds of activities available or accessible on the site (e.g. What2Learn, Education City) whereas this number is limited to around 10 activities for mobile apps. The maximum is reached by Phone for Kids with 30 games/activities. This may be related or due to technical constraints (limitation of mobile device storage, cost of bandwidth use) or constraints faced by users more generally (remain connected while playing can be too costly if relying on 3G networks). Thirdly, for mobile apps, there also seems to be a greater emphasis put upon privacy issues. Some apps state that they have a privacy policy. To exemplify, Stack the States insists that the game does not contain third party ads, in-app purchases or integration with social networks. Nor does it use analytics / data collection tools or links to other apps by 'Dan Russell-Pinson' in the iTunes App Store. This may partially explain why not so many of the "successful" apps rely on advertising.

Finally, the educational apps in our sample seem to rely more strongly on notorious (and beloved) characters, i.e. are more often based on licenses. For PC or online educational games, the notoriety of companies can be

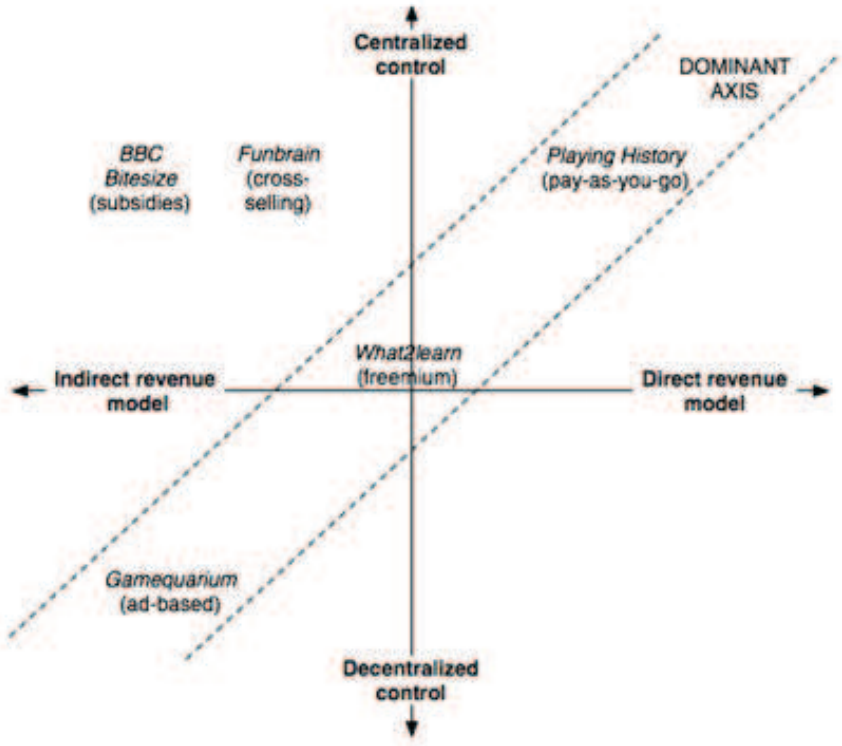
important (e.g. all the educational games released by Pearson). However, the most famous games are not necessarily licenses. On the contrary, the most successful educational mobile apps are in general (i) based on licenses (e.g. Disney or Nickelodeon characters); (ii) or belong to successful series (e.g. Toca Boca or the games released by 'Kids Games Club').

5.4 Results: a link between the centralisation of control and the type of revenue model

In this subsection, we relate Value Proposition characteristics to Financial Model parameters, in order to detect patterns in business model design choices taken across the sample.

Figure 3

Visualisation of the games' centralisation level compared to revenue model choice



Our finding is that games that score high on centralised control will more likely follow a direct revenue model, while games with a low score on centralised control will score higher on modularity and follow an indirect revenue model. The dominant axis of traits therefore runs from the bottom left to the top right of Figure 3 above. Centralised control means that all the content is provided by the game or the game platform provider (it can even have been developed directly by the provider, but the most important is that such a provider has a direct, ex ante control of everything made available to the players). On the other hand, decentralised control means that the provider may select the content but more likely does not produce such content itself, and does not follow how such content may evolve. This is notably the case when the provider provides links to educational games hosted by other services.

Games in the top-right quadrant will aim for direct revenue sources such as subscriptions for online platforms, or 'pay–as-you-go' for stand-alone games. What2Learn falls halfway between the two extremes of the dominant axis, by combining a moderate level of advertising with a freemium revenue model.

Two notable examples that fall outside of this dominant axis are BBC Bitesize and Funbrain, which both combine an indirect revenue model with a centralised locus of control. In the case of BBC Bitesize this can be explained by the fact that it is a public broadcaster's educational game platform, which relies on public subsidising as the indirect revenue source. Having access to public funds gives an organisation the ability to maintain centralised control of the available game content. In the case of Funbrain this atypical combination of centralised control plus advertisements, can be explained by the observation that the publisher Pearson uses the educational games to create cross-selling opportunities. Funbrain can be seen as a loss-leader for direct revenue model-based platforms such as Poptropica. The educational status of this last game is debatable, showing how Pearson elects to deploy the distinctly 'serious games' such as Funbrain in a free model (as far as the end-consumer is concerned) in order to create an educational image for the parent company and attract consumers to their other, paying offerings.

Table 3 sets off the level of centralised control against the degree of advertising per game (platform). Again, the dominant axis of traits is

visible (running from centralised control/low level of advertising towards decentralised control/high level of advertising). Table 3 also shows which games follow a freemium revenue model (those with "(f)"), which corresponds to 15 games in our sample.

Table 3

AN OVERVIEW OF THE LEVEL OF CENTRALISATION AND ADVERTISING PER GAME

Centralised	*Funbrain* *BBC Bitesize*	*Tucoola* *Princess Coloring Book (f)* *Christmas Pets (f)*	*Playing History (f)* *Ludwig (f)* *Mondokiddo (f)* *The Mindty Ant Poptropica*[22] *(f)* *Braineos (f)* *Tutpup* *Brain Nook (f)* *Clever Island ABC Ya Education City* *Planet Sherston Monkey Tales* *Lumosity Brain Trainer (f)* *Phone for Kids (f)* *Christmas Fun (f)* *The ABC Song (f)* *Old MacDonald (f)* *The Wheels on the Bus (f)* *Micky Mouse Clubhouse* *Bubble Guppies* *Stack the States* *Team Umizoomi Maths Nickjr draw and play Peekaboo Presents Jack's Never Land*
Moderately centralised		*What2Learn (f)* *WordReference* *Games*	
Decentralised	*Gamequarium* *Game Class-room*		
Level of centralisation/ advertising	**High level of advertising**	**Moderate level of advertising**	**Low level of (or no) advertising**

It is important also for decentralised or moderately centralised educational game platforms to ensure that enough content is provided.

[22] Note that the status of 'educational' game is debatable.

Gamequarium and Game Classroom "solve" the problem by providing links to content hosted by other educational game providers. For What2Learn there is a need to provide incentives for teachers to put educational games online.

Interestingly, all the mobile games in our sample are centralised, i.e. users are not free or allowed to add content or to use their content.

To conclude, there is a strong link between the type of revenue model and the degree of centralisation of game content production: in general, games will rely on a continuum between – on one side – centralised production of individually sold games and – on the other side – decentralised production of games available for free with a high density of advertising. The most interesting cases for stakeholders in the educational game industry may however lay in the middle, namely game platforms with hybrid revenue models (e.g. freemium) that ensure a certain control of game production while involving external content producers (e.g. teachers or parents).

6. Conclusion and suggestions for further research

In this paper, we discussed the Technical, Functional, Financial and Design parameters of educational video games' business models based on a selection of 35 case studies. It first showed that there are several models that can be followed. The question is whether the platform should be profitable. Maybe not, if it plays a role in terms of image and mission (and then publicly funded as in the case of BBC Bitesize); or if it is used mainly to promote other private services (as in the case of Funbrain).

If the platform aims to be profitable, freemium (or other hybrid) models currently appear as interesting examples. Actually too much advertising, as in the case of Gamequarium, may make the platform not very appealing for children and most of all for parents and teachers. Although Al Jou-Jou (2012) suggests that quite simple, low- budget educational games without powerful graphics could potentially apply in-game advertising as a new way to generate revenues; monetising educational games through

advergames does not seem to hold much potential. Derryberry (2007) states that "perhaps the most controversial trend for serious games is the use of in-game advertising or sponsorship. This offers some promising opportunities for serious game developers in seeking new sources of funding and revenue". Conversely, skeptics of this business model think that in-game advertising may negatively impact the learning experience (Al Jou-Jou, 2012).

In contrast, freemium relies on a limited free access (to only some of the games, or with some functionalities disabled, such as identification, tracking of results, possibilities of customising one's avatar, i.e., a demo) that is financially supported by the subscription of some children, families or teachers in order to benefit from the whole game[23]. This depends of course on the quantity and quality of games to be made available and the functionalities developed for the platform. An additional difficulty consists in the large competition of services proposing free, ad-based online educational games, which are driving prices (and, some would argue, quality) down. More generally, versioning appears to be at the core of the strategies for educational video game producers. Versioning (a form of price discrimination) consists in different versions of a given content being provided for different prices (thus in the case of freemium, free vs. paying versions). The consumers choose the version they are going to use based on their preferences (i.e. their willingness-to-pay for the product). Accordingly, the price often varies according to the amount of content available. There can be the possibility to buy the access to every discipline separately or to buy a package (e.g., for Planet Sherston, the full package costs GBP 799 annually, vs. GBP 249 for a given subject taken separately). Price discrimination can also take place among different types of users, typically for parents and teachers. To exemplify, in the case of Planet Sherston, the Home Used Edition costs GBP 40.83. This is of course related to the number of children who are going to have access to the service in the end. In-game item selling also holds potential for educational games in the form of special functions that facilitate the learning itself, such as replays of the completed exercises, game statistics, a search function to partner up

[23] About the 'whales' (the paying players whose expenses support the free-to-play games), see http://www.wired.com/gamelife/2012/11/meet-the-whales/all/.

with other players of equal skill and/or experience level. Players could then augment their skills and advance more quickly due to their learning experience (Al Jou-Jou, 2012). Also, in an educational game, players experience personal learning that may motivate players to share these achievements.

The expert interviews revealed that in-game purchase is not possible if purchase is to be made by children but in-game purchase by teachers or parents may be a good option. Examples of such purchases include the access to their registered players' profiles (i.e. the teachers' pupils or the parents' children); also the children could challenge their parents to play (e.g. in order for them to get access to an item or to a hidden level) and the parents could pay a small amount instead of having to accept the challenge. Finally, another limitation of in-game selling for teachers is that the decision for teachers to pay to access to content is not a decision made by them, there is a whole process to allow teachers to spend money in this direction – if they are even willing to. Hence, upfront payment for teachers/schools is more reliable than payments to be made once the access to the game has been provided.

The paper concludes with the finding of a strong link between the type of revenue model and the degree of centralisation of game content production. Finally, our analyses show (in different ways) that stand-alone content providers may be in a weak position. It appears to be difficult to build services "out of the blue": 'successful' services usually rely on powerful economic players and/or prestigious brands.

In terms of future research, we see several interesting paths. Firstly, it would be interesting to investigate the educational games market overseas. For instance, Disney has created an enormous educational market in Asia. Analysing the business models of these players would certainly fortify insights in business stakeholder requirements. Secondly, it would be relevant to study in depth what big educational publishers such as Pearson and Elsevier are doing, checking their business strategy and diving deeper in the cross-subsidisation patterns detected. Thirdly, it would be interesting to study the willingness-to-pay for educational games, in order to help educational game publishers in the price setting, both for individual (home) use and school licenses.

REFERENCES

AL JOU-JOU, J. (2012) *Business models in the context of educational online games*, Master Thesis, School of Management & Governance, Universiteit Twente, the Netherlands;

AMBIENT INSIGHT, (2011) *The US serious games market: Segment size and opportunity*;

BALLON, P. (2007) *Business modelling revisited: the configuration of control and value*, Info: The journal of policy, regulation and strategy for telecommunications, information and media 9 (14);

BARNEY, J. (1991) *Firm resources and sustained competitive advantage*, Journal of Management 17, 99-120;

BRAET, O.; BALLON, P. (2007) *Business model scenarios for remote management*, Journal of Theoretical and Applied Electronic Commerce Research 2, 62-79;

BUSINESS WIRE, (2012) Spend on Serious Games Growing Steadily; Now a Multi-Billion Dollar Industry, August 23, Available at <http://www.businesswire.com/news/home/20120823006124/en/Spend-Games- Growing-Steadily-Multi-Billion-Dollar-Industry>, last accessed on April 10, 2013;

CURTIS, T. (2012) New crowdfunding services offers a game-focused twist on the Kickstarter formula, Gamasutra (2012, Jun 5). Retrieved from <http://gamasutra.com/view/news/171668/New_crowdfunding_service_offers_a_gam efocused_twist_on_the_Kickstarter_formula.php>;

DE PRATO, G; FEIJÓO, C.;NEPELSKI, D.; BOGDANOWICZ, M.; SIMON, J. P. (2010) *Born digital/grown digital: Assessing the future competitiveness of the EU video games software industry*, JRC-IPTS Scientific and Technical Reports, European Commission;

DERRYBERRY, A. (2007) *Serious games: online games for learning*. Adobe Whitepaper, November, 2007;

GABRILLO, J. (2012) *Independent gaming gets a boost from crowdfunding*, The National gets-a-boost-from crowdfunding?utm_source=rss&utm_medium=hmp&utm_campaign=feed>;

HAMEL, G. (2000) *Leading the revolution*, Boston, Mass., Harvard Business School Press;

HUNT, S.D.; MORGAN, R. M. (1997) *Resource-advantage theory: A snake swallowing its tail or a general theory of competition?*, Journal of Marketing 61,74-82;

IDATE,(2010) *Serious Games*, Market & Data Report, July;

ISFE, (2010) *VIDEO GAMERS IN EUROPE*, GAMEVISION EUROPE;

KAPLAN, R.S.; NORTON, D.P. (1996) *The balanced scorecard: translating strategy into action*, Boston, Mass., Harvard Business School Press;

Kirschner, P. (2004) *ICT in het onderwijs: The next generation*, Alphen aan de Rijn, Kluwer;

Klopfer, E.; Osterweil, S.; Salen, K. (2009) *Moving learning games forward*. Retrieved from <http://hal.archives-ouvertes.fr/hal-00593085>;

Kühl, E. (2012) *Kickstarter versteckt erfolglose Projekte,* Die Zeit. Retrieved from <http://www.zeit.de/digital/internet/2012-08/kickstarter-erfolg-projekte- google>;

Lambert, T.; Schwienbacher, A. (2010) An empirical analysis of crowdfunding, Social Science Research Network. Retrieved from <http://www.crosnerlegal.com/images/47770544_An_Empirical_Analysis_of_Crowd funding.pdf>;

MacMillan, D. (2010) *Google pushes education software to schools through app store*, Bloomberg. Available at <http://www.businessweek.com/technology/content/dec2010/tc20101227_227798.ht m>, last accessed on April 10, 2013;

Masnick, M.; Ho, M. (2012) *The sky is rising. A detailed look at the state of the entertainment industry*;

Michael, D.; Chen, S. (2006) *Serious games: Games that educate, train, and inform*, Boston, MA, Thomson Course Technology;

Mitchell, A.; Savill-Smith, C. (2004) The use of computer and video games for learning: A review of the literature, Learning and Skills Development Agency;

Mollick, E. R. (2012) *The dynamics of crowdfunding: Determinants of success and failure*. Retreived from <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2088298>;

Nelson, N. J. (2012) *Most games on Kickstarter fail, and it's worse than we thought*. Turnstyle News. Retreived from <http://turnstylenews.com/2012/06/21/most-games-on-kickstarter-fail-and-its-worse- than-we-thought/>;

Neufkens, M. (2009) *What's in a game?* Een beschrijvend en analyserend kwalitatief onderzoek van de game-industrie in Vlaanderen, Master Thesis, Vrije Universiteit Brussel;

Ranaivoson, H. (2010) *Innovation and diversity. Does innovation threaten the cultural sectors?* Colloquium "Creativity, Culture and Innovation: Finding New Links". Flagey, Brussels;

Rice, J., (2012) *Educational Games Research, The Rise of Kickstarter in Educational Videogames*, October 30, 2012, available at <http://edugamesresearch.com/blog/2012/10/30/the-rise-of-kickstarter-in-educational- videogames/?utm_source=feedburner>;

Schienbacher, A.; Larralde, B. (2010) Crowdfunding of small entrepreneurial ventures Retrieved from <http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1699183>;

Susi, T.; Johannesson, M.; Backlund, P. (2007) Serious games – An overview. School of Humanities and Informatics University of Skövde, Sweden;

Technology Strategy Board (2009) *Driving Innovation*. Creative Industries,

Technology Strategy 2009-2012;

VIWTA, (2008) *Game On!* We krijgen er niet genoeg van, Vlaams Instituut voor Wetenschappelijk en Technologisch Aspectenonderzoek, Vlaams Parlement;

ZYDA, M. (2005) From visual simulation to virtual reality to games, Computer 38 (8).

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