The relationship between business models and firm performance as measured through business model components

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ABSTRACT

In this paper the relationship between firm performance and the business model components of (1) value creation, (2) market factors, (3) sources of differentiation and (4) revenue models is empirically examined using data attained from the mobile games industry. Hypotheses are tested using three separate sections of differing statistical tests. The particular tests used are the chi-square test of association, Spearman's rho and linear regression. Findings show that the business model components are especially able to significantly predict financial performance. Furthermore, the tests show that the several business model components have differing relationships with both financial and non-financial performance. Finally, the tests show that there are significant relationships between the business components themselves as well. This leads to the uncovering of four generic business models in the mobile gaming industry, which make up a large majority (58%) of all mobile games in the sample. These generic models are also significantly related to firm performance. In general, the study shows that business models can be made measurable and be analyzed in their relation to firm performance.

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Keywords

Business models, m-commerce, mobile games, financial performance, statistical analysis, value proposition

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1. INTRODUCTION

Business models, though only recently a topic of academic interest, have arguably been around since humans first started interacting with each other in trade. The core principle of the business model is, as is still learned in business studies, that it acts as a mechanism through which one party creates some form of value for another party and captures value from this transaction for itself (Shafer, Smith, & Linder, 2005, p. 200). This component of value creation in business models is reflected in many of the literature on business models (Osterwalder & Pigneur, 2002, p. 8; Zott, Amit, & Massa, 2011, pp. 1027-1028). Though perhaps the concept of the business model started out simple and intuitive, over time it has grown more complex due to the increasing complexity of the environments in which companies participate and compete. Business models have become increasingly important due to the rise of the internet, giving rise to the appearance of so-called e-business models. This is also the stream of research that has devoted the greatest attention to business models (Zott et al., 2011, p. 1024) and follows two complementary streams; (1) describing generic e-business models and providing typologies and (2) focusing on the components of e-business models (Zott et al., 2011, p. 1025). However, it is difficult to exactly define a component and so the issue here is that many different authors put forth various differing components, and it is hard to determine which ones are relevant and which ones are not (Shafer et al., 2005, pp. 200-201). Based on the findings by Zott et al. (2011, pp. 1027-1028) most scholars seem to agree on the following components as being integral to the business model; (1) value creation, (2) delivering value to customers and (3) generating value for the firm itself through revenue. M. Morris, Schindehutte, Richardson, and Allen (2006, p. 8) have proposed a framework for business model measurement that lists six core components in the form of questions; (1) value creation (how do we create value?), (2) market factors (who do we create value for?), (3) internal capability (what is our source of competence/advantage?), (4) source of differentiation (how do we differentiate ourselves?), (5) revenue model (how can we make money?) and (6) time, scope and size ambitions (what are our time, scope and size ambitions?). This provides us with a clear conceptual grasp of the business model, but leaves us to wonder how it is that these components may relate to one of the most important other elements of any firm; its performance. Though 1177 articles have been published on the subject of business models between 1995 and 2011 (Zott et al., 2011, p. 1019) there are indications that research on the impact of business models on firm performance is still a largely unexplored topic (Ladib & Lakhal, 2015, p. 169). Zott et al. (2011) find that conceptual research and even some empirical research has been done in this field, but this seems to mostly concern business model design or the business model as a single variable. One may wonder how the business model components are individually associated to firm performance and how they function together towards firm performance. Another unaddressed issue raised is that of how business models are measured (M. H. Morris, Shirokova, & Shatalov, 2013, p. 46). The aforementioned two gaps are already two major gaps that the study in this paper aims to fill. Finally, the industry of choice for this study is the mobile games industry. There are indications that academic research on games gets far less attention from marketing scholars than other entertainment industries (Marchand & Hennig-Thurau, 2013, p. 142). In addition there is also a call for further analysis of "killer applications" (very popular mobile applications) (Gretz, 2010, p. 94). It is curious that so little research exists on games, and mobile games specifically. Considering that the mobile market is estimated to be worth $70 billion annually by 2017 (Takahashi, 2014) and games make up 57.75% of the top selling applications (Roma & Ragaglia, 2016, p. 181), this would seem to be a highly impactful field of research. Yet there is a gap here. By using the mobile games industry, this study aims to fill this gap as well.

As such the research in this paper aims to expand upon previous research by conducting a study in which business model components are measured

and examined in their relationship to firm performance through several statistical tests, using empirical data from the mobile games industry. Therefore, the main research question that this paper aims to answer is:

What is the relationship between business model components and firm performance?

There are five sub-questions to the main research question. (1) How can business model components be measured? (2) What is the statistical relationship between business model components and firm performance? (3) What is the statistical relationship between the business model components themselves? (4) What generic business models can be constructed from analysis of the findings? (5) How are such generic business models related to firm performance?

2. THEORETICAL BACKGROUND AND HYPOTHESES

The lineage of business models goes back to when people first began engaging in barter exchange, with Chesbrough (2007) indicating that every firm has a business model. However, only recently has interest in business models as an academic concept been growing (Teece, 2010, p. 174). And since this interest started, a variety of research has been done in the field with 1177 articles having been published on the subject of business models between 1995 and 2011 (Zott et al., 2011, p. 1019). Yet despite this large amount of papers there has been no conclusive definition for the concept (Shafer et al., 2005, p. 200; Zott et al., 2011, p. 1022). A literature review that has been conducted as part of the study in this paper also reflected that no common definition has been formed yet. Sixteen of the papers did not explicitly define what a business model or business model innovation is. This is 41% of the papers found, which is consistent with the 37% of papers lacking an explicit definition as found by Zott et al. (2011, p. 1022). Among those that do define business models, the business model is defined as "the content, structure, and governance of transactions…" (Hu & Chen, 2015; Zott & Amit, 2007, 2008), a framework (Brettel, Strese, & Flatten, 2012), an overarching concept (Frankenberger, Weiblen, & Gassmann, 2013), a representation (M. H. Morris et al., 2013) and various others. Another approach to describing business models is splitting it into several components, most commonly done by the e-business model stream of research (Zott et al., 2011, p. 1025). In this field as well there is no consensus on which components shape a business model (Shafer et al., 2005, pp. 200-202), though some common components include the creation of value, revenue logic and customer selection (Zott et al., 2011, pp. 1027-1028). Moreover, Hu and Chen (2015, p. 4) find a range of articles that affirm that despite a lacking definition of business models there is wide acceptance for value creation and value capture as primary elements of business models. Despite such large amounts of research being conducted on business models there are indications that research on the impact of business models on firm performance is still a largely unexplored topic (Ladib & Lakhal, 2015, p. 169). A literature review to find articles with empirical research on the relationship between business models and firm performance was conducted. This literature review consisted of a search in SCOPUS for the terms "business model" and "performance". After that a review over the uncovered articles was conducted to filter specifically on pure empirical research (no case studies). The review confirmed the statement of Ladib & Lakhal as it yielded a total of 40 articles in general and five for business model components in particular. A literature review by Lambert and Davidson (2013, p. 673) yields a total of 69 papers that empirically research the business model and 39 that specifically research the relationship between the business model and firm performance. Both literature reviews show that the body of empirical research on the relationship between the business model and firm performance is a significant minority when compared to the entire body of business model research. Most of the research in the literature review of this study concerned business model designs, which "describe the primary drivers of value creation and the main

results of value capture" (Hu & Chen, 2015, p. 4) which indicates the potential importance of value creation and value capture as business model components. Another common focus was business model innovation, which is defined as the "modification or introduction of a new set of key components – internally focused or externally engaging – that enable the firm to create and appropriate value" (Hartmann, Oriani, & Bateman, 2013, p. 6). While this reinforces the importance of components as a way of conceptualizing business models, its focus falls outside the scope of the study in this paper.

M. H. Morris et al. (2013) propose an approach for measurement and analysis of company business models and suggest that generic models emerge in an industry. Roma and Ragaglia (2016) use a very similar method to Morris, Shirakova & Shatalov, though they are more profoundly measuring the relationship between one business model component and firm performance. These are the only two articles found in the literature review that particularly use measurement of business model components and finding their relationship to firm performance. Yet business model components, such as value creation and value capture, have been said to enable the conceptualization and measurement of business models (Baden-Fuller & Haefliger, 2013; Hu & Chen, 2015; Zott & Amit, 2008, 2010). Though we have previously found that there are multiple approaches to determining which business model components make up a business model (Zott et al., 2011, p. 1025), the components used in this study derive from the framework for business model measurement proposed by M. Morris et al. (2006). In particular the components used in the study in this paper are (1) value creation, (2) market factors, (3) sources of differentiation and (4) revenue model (M. Morris et al., 2006). Performance will be represented by the estimated monthly revenue from those games ranked highest grossing. Previous empirical research has found that rank and sales in online commerce have a relationship (Brynjolfsson, Hu, & Smith, 2003; Chevalier & Goolsbee, 2003).

2.1 Value creation

Value creation is one of the most mentioned components of business models (Zott et al., 2011, pp. 1027-1028). A study by Marchand and Hennig-Thurau (2013, p. 142) presents a framework for value creation in the video industry. This framework consists of multiple elements, among which the game content (Marchand & Hennig-Thurau, 2013, p. 142). It can be argued that the game, and by extension its content, stands at the base of value creation as without a game there is no value to be created. All other elements of the framework are then irrelevant. Therefore, the study in this paper uses game content as representing value creation. The variable used is the genre of a game as the study by Marchand and Hennig-Thurau (2013, p. 145) present the genre of a game as the main constituent of its content. And indeed there are indications that the genre of a game has influence on its success potential (Cox, 2014, p. 194; Marchand & Hennig-Thurau, 2013, p. 145).

Identifying the role of value creation in firm performance further, we can look at a study by Zott & Amit in which they identify the source of value creation in e-business and found four: (1) Efficiency, (2) Novelty, (3) Lock-In and (4) Complementaries (Amit & Zott, 2001, p. 504). Hu and Chen (2015, p. 5) reinforce that business model designs describe "the primary drivers of value creation and the main results of value capture". Later on Zott & Amit conducted a study in which they regressed both an efficiency centered business model design and a novelty centered business model design against firm performance, where they hypothesized that the more novelty-centered or efficiency-centered a business model design, the higher the firm's performance (Zott & Amit, 2007, pp. 183-185). They found evidence that the hypothesis for the novelty-centered design could be supported, but not the hypothesis for the efficiency-centered design (Zott & Amit, 2007, pp. 190-191). This suggests that different types of value creation may lead to different levels of firm performance. Value creation in this study is represented by the game category (genre)

and Roma and Ragaglia (2016, p. 178) have found studies that show that "products of different categories have different natures" and that this means that this leads to "significantly different purchasing behavior, willingness to pay and needs to satisfy" (Grewal, Iyer, & Levy, 2004; Levin, Levin, & Heath, 2003; Reibstein, 2002; Wang, Zhang, Ye, & Nguyen, 2005). As such the first hypothesis of the study is:

Hypothesis 1. *There is a significant difference between several types of value creation in their relationship to higher financial performance (***H1a***) and higher non-financial performance (***H1b***).*

2.2 Market factors

The second business model component is that of market factors. M. Morris et al. (2006, p. 34), whose framework is used in this study, asks for who the value is created as the question for this component. No matter the nature of the organization, one can always say that an organization sells to the target customer. And in one of the studies found during the literature review it was already visible that the target customer may have an impact on the performance of a firm (Rédis, 2009). M. Morris et al. (2006, p. 34) further identify that the "nature and scope of the market in which the firm will compete" must be identified. M. Morris et al. (2006, p. 34) present scope as the measure of internationalization that the firm wishes to use and so the first market factor variable is that of internationalization. The second market factor identifies the customer more clearly by using the age of the customer as measured through the age required to download and use a mobile game. Studies on market orientation list market segmentation as a key element of market orientation (Piercy, 1992). Furthermore, it has been found that different age requirements are linked to different user demand (Ghose & Han, 2014, p. 1481). The third market factor is that of channel visibility; how well the product is, or will be, visible within the market. This may be unique to products in the digital age, and it has been found that visibility and findability are two characteristics of app marketplaces (Jansen & Bloemendal, 2013, p. 203). Therefore, one could argue that if a app is more visible in the market, it reaches more customers. While market orientation and market factors are two separate entities, it can be argued that they are related to each other. Market orientation "helps a business develop an understanding of its target market and their needs" (Day & Wensley, 1988; Pujari, 2006, p. 79). As such it seems that market orientation is a process for helping firms understand market factors and has been found to be "one of the key factors of firm success" (Pujari, 2006, p. 79). By extension this could indicate that market factors play a role in the success of a firm. As such the hypotheses for market factors are the following:

Hypothesis 2 (H2). *Mobile games with a high degree of internationalization attain higher financial performance (***H2a***) and higher non-financial performance (***H2b***).*

Hypothesis 3 (H3). *Mobile games with a high degree of channel visibility attain higher financial performance (***H3a***) and higher non-financial performance (***H3b***).*

Hypothesis 4 (H4): *There is a significant difference between different age requirements in their relation to higher financial performance (***H4a***) and higher non-financial performance (***H4b***).*

2.3 Sources of differentiation

The third business model component is differentiation or sources of differentiation, which M. Morris et al. (2006, p. 34) define to be "salient points of difference that are not cosmetic and transitory, but rather, are sustainable". The article further defines five bases of differentiation which are (1) operational excellence, (2) product capabilities, (3) innovation leadership, (4) low cost, or (5) intimate customer relationships or experiences (M. Morris et al., 2006, p. 35). In this research the focus will be on the product capabilities as this is easiest to measure externally. Certainly future studies could incorporate the other bases as well. The product capabilities in this study will be that of user-defined characteristics that the mobile games exhibit most strongly. Within games there are three main game design elements to be focused on. (1) context, which is the world the

player acts in as created by spaces, objects, stories, characters and such, (2) participants, which are the players themselves and how they interact with the game and (3) meaning, which is the emotional or meaningful response when players act in the game (Nacke, 2014; Tekinbas & Zimmerman, 2003). Though it is certainly interesting to see which of those characteristics is most successful in driving firm performance, it also begs the question whether there are differences in performance for different sources of differentiation. Ebben and Johnson argue that strategy focus is one way of expressing differentiation over other typologies such as the classical cost leadership or differentiation typology by Porter (Porter, 1980), and in their study focus on the efficiency and flexibility strategies (Ebben & Johnson, 2005). Here they find that focusing on one source of differentiation is better than mixing sources of differentiation, yet they found no support for performance differences between the two differentiations strategies (Ebben & Johnson, 2005). Yet one could argue that they focused on efficiency and flexibility, which is related to the firm level. Product capability differentiation may be different however, and indeed product differentiation variables seem to differ in their significance to performance (Sashi & Stern, 1995). Another study finds that new-product differentiation leads to different performance results when placed in combination with other variables to determine pathways to profitability (Lisboa, Skarmeas, & Saridakis, 2015). This does seem to indicate that differentiation might play an interesting role in achieving performance. Therefore, the second hypothesis of this business model component is:

Hypothesis 5 (H5). *there is a significant difference between different sources of differentiation in their relation to higher financial performance (***H5a***) and higher non-financial performance (***H5b***).*

2.4 Revenue model

The final business model component reviewed in this research is the revenue model, or the way the firm itself captures value. Previously we have seen that business model designs are made up of different primary drivers of value creation and results of value capture (Hu & Chen, 2015). A classification of video game business models by Osathanunkul yields that there are some general revenue models for video games (Osathanunkul, 2015). This study, together with a quick observation of the mobile games industry, reveals that there are four general revenue models for mobile games (1) free-to-play with advertisements, (2) free-to-play with micro-transactions, (3) pay-to-play and (4) pay-to-play with micro-transactions. In this study the free-to-play advertisement driven revenue model will be dropped as measuring advertisements has presented to be too challenging to do in the context of this study; there are no free, reliable sources of advertisement revenue for mobile games. By far the most common model in the 100 highest top grossing mobile game is that of the free-to-play micro-transaction model. 99 of the 100 mobile games in a list of top grossing games on www.sensortower.com is free-to-play micro-transaction driven, giving an early indication of performance differences between revenue models. Furthermore, a study by Lehdonvirta focuses on the success of sales of virtual items in games (Lehdonvirta, 2009), indicating that those revenue models selling virtual items may perhaps perform better than those that do not. It has also been found to be a trend to move from free models to payment-based models in regards to online products (Pauwels & Weiss, 2008). This is in line with what was found in the analysis of the top 100 performing games in the market. A previous study on the performance of revenue models in the app market has shown that both the paid revenue model and freemium revenue model separately seem to be associated with higher performance than the purely free revenue model (Roma & Ragaglia, 2016). Lunden (2013) suggests that payment-based models, such as those with micro-transactions, are better able to monetize on mobile applications. Finally, Ghose and Han (2014, p. 1481) found that demand for mobile apps with micro-transactions increases while it decreases for those with in-app advertisements. Though the latter is not measured in this study, it gives a strong indication that there are differences

between revenue models in terms of performance. This leads to the following hypothesis for the revenue model component:

Hypothesis 6 (H6). *There is significant difference between the different revenue models in their relation to higher financial performance (***H6a***) and higher non-financial performance (***H6b***).*

2.5 Business model components together

Finally, it is interesting to determine which component is the most significant of all the business model components in their relation to firm performance. Since the literature review yielded no previous studies on measurement of all business model components combined, it is hard to base a hypothesis of the most significant business model component on previous research. Yet a previous study on revenue models does indicate that revenue models seem to matter significantly in the performance of a mobile application (Roma & Ragaglia, 2016). The entire study by Roma & Ragaglia is littered with references to other studies to make the revenue model sensible as a strong player in performance (Roma & Ragaglia, 2016). And as the revenue model is the firm's way of capturing value and earning money, it would make sense therefore that:

Hypothesis 7 (H7). *The revenue model has the strongest effect on financial performance (***H7a***) and non-financial performance (***H7b***) when compared with the other business model components.*

3. METHODOLOGY

The study is divided into three general sections; one consisting of chi-square tests (section I), one consisting of Spearman's rho tests (section II) and the final one consisting of mainly regressive tests (section III). All sections aim to uncover the statistical relationship between business model components and firm performance, although using differing statistical tests. Section I takes a categorical approach, section II a numerical approach and section III a predictive approach. This way of running tests has been chosen as each section steps further into statistical analysis and quantification of business models and their components. All data was put into Microsoft Excel, which was also used for all statistical analysis together with online statistical calculators[1]. Though the study in this paper is very similar in its focus as the study by Roma and Ragaglia (2016), their approach to data gathering would lead to some skewed data in the research in this paper as the data would most likely not be equal, which was a necessity for some of the statistical tests. Though they do implement dichotomous coding, which this study also used. This method of coding is similar to the methodology by Morris, Shirakova & Shatalov. Therefore, this study will expand upon the methodology of both these studies through the methodology described in this section.

3.1 Data collection

The sample population was comprised of mobile games in the top grossing/selling games in the iOS app market. The sample was equally divided over the genres of "action", "puzzle", "role playing" and "arcade" as these four genres were the only genres that presented an equal amount of mobile games over the revenue models. Dividing games equally over the revenue models was done as an extra-ordinary amount of games use the free-to-play micro-transaction driven revenue model, which would skew the data. An equal method of gathering would ensure higher reliability in the Chi Square calculations, as it would diminish the chances of breaking the <20% assumption. The study is based on those mobile games that (1) had sufficient ratings in the Google Play store to be qualified for highlighted reviews and (2) were present both on the iOS App Store and Google Play store. The primary data sources used were SensorTower – a website specialized in data

[1] The online calculators used were a Chi-Square calculator, Spearman's Rho calculator on http://www.socscistatistics.com.

mining both the iOS and Google Play stores – and Google Play to find highlighted reviews for the mobile games. All data was gathered over a period that was as short as possible to ensure that the data gathered was equal for all mobile games. This had as a reason that the data mining website updates their data frequently and gathering apps from different data updates may harm the reliability of the study. The data was gathered using the game genre as a point of reference in terms of how many games would be gathered. Since the study consists of six variables to measure, it was determined to gather at least 5 cases per variable per game genre to ensure sufficient cases for each of the statistical tests. This led to 30 games per genre. Within this set of 30 games per genre, an equal amount of games was collected over the three revenue models in the study. The 4 genres were chosen as this number seemed to be sufficient to find differences between genre performance, while still retaining a relatively large sample size. This method of data collection made the initial sample size 120. Since not all games met the requirements for measurement, such as lacking highlighted reviews, some cases had to be dropped. This led to the final sample consisting of 108 games. The final sample can be found under appendix I.

3.2 The variables

Variables are mentioned with their full name and their shorter indicator in brackets, which are used in the tables to present the findings from the tests. A list of specific measures can be found under appendix II.

3.2.1 Dependent Variables

The two dependent variables for section I are (1) the financial performance of a mobile game as measured through their estimated monthly revenue (FP and (2) the non-financial performance of a mobile game as measured through the rating given to that mobile game by its user (NFP).

The two dependent variables for section II are (1) the financial performance of a mobile game dichotomously coded to be 1 when higher than the median and -1 when lower than the median (FP) and (2) the non-financial performance of a mobile game dichotomously coded to be 1 when higher than the median and -1 when lower than the median (NFP).

3.2.2 Explanatory Variables

Value creation (VC) – measured through the genre of a mobile game following the study by Marchand and Hennig-Thurau (2013).

Market factors: internationalization (MFI) – measured numerically through the internationalization rating given to mobile games by SensorTower, which is a metric that is calculated based on the international performance of the mobile game, which is measured by (Kimura, 2014). This is measured through whether the app has been localized per country it is released in on (1) description, (2) title, (3) language support and (4) keywords (Kimura, 2013). It is further based on the distribution of an app's performance over all the countries it is active in (Kimura, 2013)

Market factor: US channel visibility (MFV) – measured numerically through the visibility rating given to mobile games by SensorTower, which is a metric that is calculated based on (among others) (1) keyword performance, (2) category ranking performance and (3) review/rating performance (Kimura, 2015).

Market factor: customer segment (MFC) – measured categorically through the age requirement given to a game.

Sources of differentiation (SD) – measured by collecting highlighted reviews given by users to games. These highlighted reviews indicate some element of the game that the user enjoyed particularly. These elements were divided into three groups; Context, Participants and Meaning as these are three pillars of game design (Tekinbas & Zimmerman, 2003). Division was made based on the characteristics of each game design element and highlight review. For example, the highlighted review "addictive" was put into "meaning" as it is something that comes from the participant interacting with the context. Differentiation is then measured by calculating which source of differentiation has the

highest relative amount of users mentioning that source of differentiation in their review.

Revenue model (RM) – measured categorically through the pricing method used for the mobile games.

3.3 Methods

The statistical tests used in section I of this research are:

Chi-Square Test of Independence as this is able to measure differences between categories.

The statistical test used in section II of this research are:

Spearman's Rho as this can be used to determine a relationship/association between two ordinal variables. This was chosen over Pearson correlation as it is anticipated that Spearman's rho is more appropriate for describing dichotomous data as this resembles ordinal data. Pearson correlation tests were run to check the reliability of the Spearman's rho tests and results were almost identical.

The statistical test in section III of this research is:

Multiple Linear Regression as this can be used to numerically determine the relationship between multiple explanatory variables and the two dependent variables. To ensure that this test was correctly applied, all variables were recoded to the same scale to ensure compatibility.

3.4 Recoding

Some of the data required recoding to be used for the chi-square test of independence, such as when measuring mobile game genre against financial performance. Except for the source of differentiation, all numerical variables were recoded to being either "higher" or "lower" than the median of their respective variable sample. The median was chosen as (1) it removes the influence of outliers and (2) it is a valid metric of performance as half of the population is above it and the other half below. Since the sample size is 108, this gives an equal group above and below the median. This in turn is highly useful for a chi-square test of independence.

The source of differentiation was re-coded to enable distribution into the three game design elements. The recoding process was done by dividing the total amount of reviews by 1000 for each mobile game, which gave a weight. Then the total amount of highlighted reviews and every individual highlighted review was divided by this weight. The numbers that resulted from this calculation were then added to the appropriate game design element. Finally, all data was recoded to enable conducting the Spearman's rho and linear regression tests. This was done in a similar fashion as the studies by M. H. Morris et al. (2013) and Roma and Ragaglia (2016). Dummy coding was done on all variables in order to transform them into dichotomous variables with a value of either 1 or -1 as this seemed to give the most consistent results. The dependent variables were also transformed into dichotomous variables, which would normally require a logistic regression to be conducted. However, since the median was used as a division between high and low performance, the split between the two was a perfect 50/50 therefore warranting the use of linear regression as its results will in this case be similar to that of logistic regression.

4. FINDINGS

Findings are presented per research section and are then further divided according to the research sub-questions. We will start with some general distribution findings based on the top 100 games in the iOS app market.

4.1 Descriptive statistics

Before diving into the main findings of the study it is useful to look at some descriptive statistics found when analyzing the top 100 top grossing games in the iOS market[2].

These findings indicate that 62 separate companies are behind the top 100 games and the total

[2] Date of data collection: 18/06/2016

earnings of this top 100 is roughly $453.4 million monthly. The biggest developer in terms of games has released 7 of the games in this top 100. However, more interestingly is that only 3 of these 62 developers have earned the majority (51%) of the total monthly revenue flowing from the top 100 games. Moreover, only 10 developers take 75% of the total monthly revenue, showing that the Pareto law applies here. All but one of the games were developed by a firm. Moreover, Roma and Ragaglia (2016, p. 180) have previously found 9 top developers in their study, of which 4 appear in the 100 top grossing games. Yet one could argue that there are far more well-established developers behind the top 100 highest grossing games. And indeed when looking at the top 10 developers of monthly revenue we find that 4 of them are in the top 25 developers across the entire iOS app store. This indicates that the performance of top games could be partially driven by the size of the developer that releases them.

Additionally, it may also be interesting to present that 98 of the 100 games uses the free-to-play micro-transaction driven revenue model and that 4 of the 14 genres in the 100 top grossing games are the majority with 58% (casino, casual, strategy and puzzle). The biggest genre by amount of games is the casino genre, with 21 of the 100 games. When looking at distribution across genre by revenue, it is found that 49% of the total monthly revenue comes from one single genre: strategy. Going one step further, 3 of the 14 genres (strategy, casual and casino) account for 79% of the revenue. This again shows the Pareto law in effect and moreover, presents early indications that the earlier presented hypotheses may be supported.

4.2 Section I: Chi-Square statistical analysis

4.2.1 Statistical relationships between business model components and firm performance.

Sub-question two pertained to the chi-square measurement of any relationships between business model components and firm performance. The sub-question itself was:

What is the statistical relationship between one or more of the quantified business model components and firm performance?

The results of the twelve separate tests that were run to answer this question are presented in table 1.

Table 1. Chi-square test results sub-question 2

	Chi-Square Statistic		P-Value	
	FP	NFP	FP	NFP
VC	11.111	7.852	.011**	.049**
MFI	0.148	0	.700	.084***
MFV	33.333	0.148	.000*	1
MFC	2.450	8.201	.654	.700
SD	5.429	20.039	.143	.779
RM	42.684	0.500	.000*	.000*

Note: * p < 0.01, ** p < 0.05, *** p < 0.1,
n = 108

What can be concluded from these tests is that hypotheses H1a and H1b are both supported, which means that there is a significant difference between several value propositions and their relation to higher financial and non-financial performance.

Hypotheses H2a and H2b have been rejected; there is no indication that higher internationalization leads to higher financial or non-financial performance.

Hypothesis H3a is supported, which means that higher channel visibility is related to higher financial performance. However, hypothesis H3b has been rejected meaning that there is no relationship between higher channel visibility and higher non-financial performance.

Hypothesis H4b is supported, which means that there is a significant difference between several age requirements and their relation to higher non-financial performance. Hypothesis H4a has been rejected, which means that there is no significant difference between several age requirements and their relation to higher financial performance.

Hypotheses H5a and H5b have been supported; there is significant different between several primary sources of differentiation and their relation to higher financial and non-financial performance.

Hypothesis H6a is supported; there is significant difference between the revenue models and higher financial performance. Hypothesis H6b has been rejected, which means there is no significant difference between the revenue models and higher non-financial performance.

4.2.2 The relationship between the business model components.

Sub-question three pertained to the chi-square measurement of the relationships between the business model components themselves. The sub-question was:

What is the statistical relationship between one or more of the business model components themselves?

The results of the fifteen separate tests that were run to answer this question are presented in table 2.

No statistical tests were run for the relationship between revenue model and value creation as data was gathered with a specific amount of mobile games per revenue model and game genre (value creation). Though no hypotheses were developed for this sub-question, the statistical tests yield some interesting results. All of the business model components have significant relationships with at least two other business model components.

These findings indicate that there may be significant multicollinearity in the multiple linear regression test planned to be taken for the quantitative section of this study. However, for section I of the study, this is not an issue as chi-square tests do not indicate how much of the relationship is explained by the independent variable. They simply indicate that there is a significant relationship between two variables.

Table 3. Chi-square test results sub-question 3

	Chi-square statistic					P-Value				
	VC	MFI	MFV	MFC	SD	VC	MFI	MFV	MFC	SD
VC	x					x				
MFI	5.934	x				.115	x			
MFV	13.778	2.374	x			.003*	.123	x		
MFC	13.778	4.944	8.413	x		.000*	.293	.078***	x	
SD	41.143	1.368	4.039	45.666	x	.000*	.713	.257	.000*	X
RM	x	3.073	29.935	11.599	10.656	x	.017**	.000*	.170	.099***

Note: * p < 0.01, ** p < 0.05, *** p < 0.1, n = 108. Revenue model versus value creation omitted due to sample size selection based on equal distribution of those two business model components

4.3 Section II: Spearman's rho statistical analysis

4.3.1 Statistical relationships between business model components and firm performance.

Figure 3-6 show the results from the Spearman's rho tests.

Table 3. Spearman's rho test results market factors

	FP	P-Value	NFP	P-Value
MFI	-0.037	.704	0	1
MFV	-0.556	.000*	-0.037	.704
MFC_3	-0.019	.843	0.212	.028**
MFC_7	-0.023	.810	-0.023	.810
MFC_12	0.127	.191	0	1
MFC_16	-0.031	.753	-0.153	.114
MFC_18	-0.101	.301	-0.168	.083***

Note: * p < 0.1, ** p < 0.05, *** p < 0.1, n = 108. MFC calculated per age requirement group.

Table 4. Spearman's rho test results value creation

	FP	P-Value	NFP	P-Value
Action	0.278	.004*	-0.192	.046**
Puzzle	0.021	.826	0.235	.014**
RP	-0.235	.014**	0.021	.826
Arcade	-0.064	.510	-0.064	.510

Note: * p < 0.01, ** p < 0.05, *** p < 0.1, n = 108. Value creation calculated per genre. RP = roleplaying

Table 5. Spearman's rho test results revenue model

	FP	P-Value	NFP	P-Value
F2P MT	.629	.000*	0	1
P2P MT	-0.297	.002*	-0.059	.542
P2P	-0.332	.000*	0.059	.550

Note: * p < 0.01, ** p < 0.05, *** p < 0.1, n = 108. Revenue model calculated per model. F2P MT = free-to-play micro-transaction, P2P MT = pay-to-play micro-transaction and P2P = pay-to-play

Table 6. Spearman's rho test results differentiation

	FP	P-Value	NFP	P-Value
Context	-0.186	.054***	-0.281	.003*
Participants	-0.207	.032**	-0.272	.004*
Meaning	0.221	.022**	0.324	.001*

Note: * p < 0.01, ** p < 0.05, *** p < 0.1, n = 108. Differentiation calculated per differentiation element.

Hypotheses H1a and H1b are supported as findings indicate that the relationship between some value creations is more statistically significantly associated with financial and non-financial performance than others.

Hypotheses H2a and H2b are rejected as findings indicate that the relationship between internationalization and financial and non-financial performance are not statistically significant.

Hypothesis H3a is supported and hypothesis H3b is rejected as findings indicate that the relationship between visibility and financial performance is statistically significant, but the relationship between visibility and non-financial performance is not.

Hypothesis H4a is rejected and hypothesis H4b is supported as findings indicate that the relationship between age requirement and non-financial performance is significant, but the relationship between age requirement and financial performance is not.

Hypotheses H5a and H5b have been supported as findings indicate that the relationship between some sources of differentiation is more statistically significantly associated with financial and non-financial performance than others.

Hypothesis H6a is supported and hypothesis H6b is rejected as findings indicate that some revenue models have a more statistically significantly associated relationship with financial performance than others. No statistically significant relationships were found between revenue models and non-financial performance.

Overall these findings are completely in line with the findings from section I, strengthening to aggregate findings of this study.

4.4 Section III: Linear Regression

In this section an attempt has been made to create a model of quantified business model components to put into a linear regression. Though this is not a test to test hypotheses, but rather an attempt to find if quantified business model components can be used to predict firm performance, the outcomes as presented in tables 7 and 8 seem to present evidence of hypothesis rejection or support that falls in line with what was already found in sections I and II. Furthermore, these findings suggest that at least some of the business model components are able to significantly predict performance.

Table 7 shows that the business model components as represented by their most significant sub-components explain 54.86% of variation in the model and that all business model components seem to be able to predict financial performance with high statistical significance. These findings indicate that it is indeed possible to quantify business model components and have them predict financial performance. Though some explanation for variation in the model is missing, more than half is present in its current design. This means that the majority of variation can be explained by the business model components as represented by their most significant sub-components.

Table 7. Combined regression financial performance

Meta regression outcomes			
Multiple-R	.741	R-Squared	.549
Component regression outcomes			
		Coefficient	P-Value
Intercept		0.063	.670
VC (*Action*)		0.354	.000*
MF (*Visibility*)		0.271	.001*
RM (*F2P MT*)		0.462	.000*
SD (*Meaning*)		0.459	.041**

Note: * p < 0.01, ** p < 0.05, *** p < 0.1, n = 108

Table 8. Combined regression financial performance

Meta regression outcomes			
Multiple-R	.380	R-Squared	.145
Component regression outcomes			
		Coefficient	P-Value
Intercept		0.524	.032**
VC (*Puzzle*)		0.119	.342*
MF (*MFC_3*)		0.026	.829*
RM (*P2P MT*)		0.010	.921
SD (*Meaning*)		0.980	.004*

Note: * p < 0.01, ** p < 0.05, *** p < 0.1, n = 108

Table 8 presents the combined regression results for non-financial performance. The findings do not present the same picture as table 7. The design used for non-financial performance was not able to explain a majority of the variation in the model, nor was it able to have all business model components be statistically significant in their ability to predict non-financial performance. It is however still interesting to see how differentiation seems to remain statistically significantly able to predict non-financial performance. Based on these tests hypothesis 9 is supported for financial performance as the representing sub-component (*free-to-play micro-transaction revenue model*) has both the highest significance in the combined regression and the highest r-square in the separate regression. Hypothesis 9 can be rejected for non-financial performance however. Tables 9-16 provide more detail with individual regression for each of the business model components against financial and non-financial performance.

Table 9. Individual regression market factors vs. non-financial performance

	R-Squared	Intercept	P-Value	Coefficient	P-Value
MFI	0	0	1	0	1
MFV	.001	0	1	-0.037	.704
MFC_3	.045	0.061	.536	0.221	.028**
MFC_7	.001	-0.018	.883	-0.030	.810
MFC_12	0	0	1	0	1
MFC_16	.023	-0.202	.207	-0.253	.114
MFC_18	.028	-0.253	.148	-0.303	.083***

Note: * p < 0.01, ** p < 0.05, *** p < 0.1, n = 108

Table 10. Individual regression market factors vs. financial performance

	R-Squared	Intercept	P-Value	Coefficient	P-Value
MFI	.005	0.001	0.989	-0.037	.703
MFV	.309	0	1	0.556	.000*
MFC_3	.000	-0.006	.956	-0.020	.843
MFC_7	.001	-0.018	.883	-0.030	.810
MFC_12	.016	0.070	.528	0.145	.191
MFC_16	.001	-0.040	.802	-0.051	.753
MFC_18	.010	-0.152	.388	-0.182	.301

Note: * p < 0.01, ** p < 0.05, *** p < 0.1, n = 108

Table 11. Individual regression revenue model vs. non-financial performance

	R-Squared	Intercept	P-Value	Coefficient	P-Value
F2P MT	.395	0.222	.007*	0.667	.000*
P2P MT	.088	-0.112	.263	-0.317	.001*
P2P	.110	-0.110	.257	-0.351	.000*

Note: * p < 0.01, ** p < 0.05, *** p < 0.1, n = 108

Table 12. Individual regression revenue model vs. non-financial performance

	R-Squared	Intercept	P-Value	Coefficient	P-Value
F2P MT	.395	0.222	.007*	0.667	.000*
P2P MT	.088	-0.112	.263	-0.317	.001*
P2P	.110	-0.110	.257	-0.351	.000*

Note: * p < 0.01, ** p < 0.05, *** p < 0.1, n = 108

Table 13. Individual regression value creation vs. non-financial performance

	R-Squared	Intercept	P-Value	Coefficient	P-Value
Action	.037	-0.1113	.315	-0.22	.046**
Puzzle	.055	0.136	.216	0.272	.014**
RP	.001	0.012	.913	0.025	.826
Arcade	.004	-0.037	.741	-0.074	.509

Note: * p < 0.01, ** p < 0.05, *** p < 0.1, n = 108

Table 14. Individual regression value creation vs. financial performance

	R-Squared	Intercept	P-Value	Coefficient	P-Value
Action	.077	0.161	.139	0.321	.003*
Puzzle	.001	0.012	.913	0.25	.826
RP	.055	-0.136	.216	-0.272	.014**
Arcade	.004	-0.037	.741	-0.074	.510

Note: * p < 0.01, ** p < 0.05, *** p < 0.1, n = 108

Table 15. Individual regression source of differentiation vs. non-financial performance

	R-Squared	Intercept	P-Value	Coefficient	P-Value
Context	.395	0.222	.007*	-0.766	.028**
Participants	.088	-0.112	.263	-1.743	.025**
Meaning	.110	-0.110	.257	0.718	.009*

Note: * p < 0.01, ** p < 0.05, *** p < 0.1, n = 108

Table 16. Individual regression source of differentiation vs. financial performance

	R-Squared	Intercept	P-Value	Coefficient	P-Value
Context	.108	0.397	.007*	-1.189	.001*
Participants	.090	0.197	.078***	-2.427	.002*
Meaning	.137	-0.627	.001*	1.072	.000*

Note: * p < 0.01, ** p < 0.05, *** p < 0.1, n = 108

5. DISCUSSION AND LIMITATIONS

5.1 General implications

The main implications of this study derive from the findings related to the hypotheses, a summary of which is presented in table 17. The findings on hypotheses H1a and H1b imply that developers need to conduct thorough analysis on which game genre they are developing a game for, as both financial and non-financial performance differ per genre. The reasoning behind this could be that as different genres offer different values, the perceived value of genres differs. Perceived value in mobile games is found to be related to their value-for-money (Hsu & Lin, 2015, p. 9). The findings by Hsu & Lin combined with the findings in this study could indicate that some genres offer better value-for-money than others, increasing the perceived value of those genres. Value-for-money in this sense then could likely come from the micro-transactions purchased in those genres offering more value in those genres as opposed to other genres. For example, micro-transactions purchased in an "action" game offer more value to the player than micro-transactions purchased in a "role-playing"

Table 17. Summary of hypotheses

Hypothesis	Status	Explanation
H1	a: Supported (Financial) b: Supported (Non-Financial)	Value creation in a business model as conceptualized in this study plays a role in the financial and non-financial performance of a business model.
H2	a: Rejected (Financial) b: Rejected (Non-Financial)	Internationalization in a business model as conceptualized in this study plays no role in the financial and non-financial performance of a business model.
H3	a: Supported (Financial) b: Rejected (Non-Financial)	Channel visibility in a business model as conceptualized in this study plays a role in the financial, but not the non-financial, performance of a firm.
H4	a: Rejected (Financial) b: Supported (Non-Financial)	Target customer age in a business model as conceptualized in this study plays a role in the non-financial, but not the financial, performance of a firm.
H5	a: Supported (Financial) b: Supported (Non-Financial)	Source of differentiation on the product capability level as conceptualized in this study plays a role in the financial and non-financial performance of a business model.
H6	a: Supported (Financial) b: Rejected (Non-Financial)	The revenue model of a business model as conceptualized in this study plays a role in the financial, but not the non-financial, performance of a firm.
H7	a: Supported (Financial) b: Rejected (Non-Financial)	The revenue model is the most significant business model component for the financial, but not the non-financial, performance of a firm.

game. As perceived value is a trade-off between perceived benefits and perceived costs (Lovelock, 2011), the cost of the micro-transactions in a genre could be outweighed by the benefits it brings to that genre driving higher financial performance. The satisfaction of the player with this higher value-for-money may then also be reflected in the non-financial performance. This certainly puts a unique spin on business models in (mobile) games and could be a highly interesting topic to research further, as it delves deeper into both the value creation and revenue model components together. It can also bring insight to developers of mobile games with lower-performing genres that they could benefit from innovating their product as this may bring increased opportunity of offering increased value-for-money. A study on business model innovation in the mobile games industry could shed more light on whether this could be true. The findings on hypotheses H2a and H2b indicate that internationalization does not play a big role in the financial and non-financial performance. This could mean that developers can spend less time tweaking their product for all their international markets and focus more time on other important activities concerning the marketing of their product. The findings on hypotheses H3a and H3b give some interesting insights in how developers can boost their channel visibility to attain higher financial performance, though this will not have an impact on non-financial performance. This means developers will have to think thoroughly on how to make their mobile game more visible in the market, and this may mean sacrificing some branding (Gauchet, 2016). The findings on hypotheses H4a and H4b have the implication that while higher non-financial performance seems to be related to the age requirement of a mobile game, this has no apparent relationship to financial performance. It is up to developer to make the decision on age requirement. A more important decision point may be determining the importance of the differentiation factors that a different age requirement yields, as these age requirements are usually an indication of the maturity of a game in terms of violence and such. And we have indeed found strong indications during the chi-square test section that age requirement exhibits strong association with sources of differentiation. Sources of differentiation in turn had a significant relationship with both kinds of performance, so source of differentiation could be a mediating factor through which age requirement affects performance. For example, a game with a specific age requirement may exhibit more or less of a certain game design element, thereby impacting performance. The findings on hypotheses H5a and H5b have the implication that developers have to think critically about how they design their game. The game design element of "meaning" has the highest significance for financial performance, which can be driven by any of the factors within it. This study divided the many factors of the games into the three game design elements according to the method explained in the methodology section. An example of how a developer could approach the design of their game, is making it more addictive as this is an important factor in the "meaning" game design element. The findings on hypotheses H6a and H6b give developers a clear view that the free-to-play micro-transaction driven revenue model is the absolute way to go to attain higher financial performance. The reasoning behind this is that the free-to-play micro-transaction driven revenue model "allows players with different levels of willingness to pay for additional content" and "enables a wider range of player segments to access the game" (Alha, Koskinen, Paavilainen, Hamari, & Kinnunen, 2014, p. 2; Paavilainen, Alha, & Korhonen, 2015). It could definitely be interesting to have future studies conducted on the specific mechanics of micro-transactions, such as which in-game content works best to drive revenue. Finally, findings on hypotheses H7a and H7b show that the revenue model is the most significant business model component when it comes to the financial performance of a firm. This finding is further enhanced by the possibility of the revenue model working through the value creation component to offer more value-for-money, as found earlier. This again highlights the importance of firms to adopt the free-to-play micro-transaction driven revenue model.

Another implication of the study is that the findings allow us to analyze and find generic models in the indus1try. As we have already previously determined, 98 out of the 100 top performing mobile games had the free-to-play micro-transaction driven revenue model, indicating that this is a very popular revenue model to lead to high performance, which has been supported in this study. As data was gathered equally along the different types of value creation in order to have appropriate data for some of the statistical tests, these were not used to analyze the data for generic business models. As the study shows that financial performance seems to be much more well-explained by the business model components than non-financial performance, the generic models were only chosen to be linked to financial performance. And thus internationalization and age requirement were dropped from the generic models as these have proven to not be significant for financial performance. This left 24 different business models that the mobile games could have. Out of these 24 business models, the 4 most used ones embodied 58% of all games in the sample. This is a significant majority and indicates that these models may indeed be generic models used in the industry. These models were (1) high visibility games with the "meaning" source of differentiation driven by the free-to-play micro-transaction revenue model (24% of games), (2) low visibility games with the "meaning" source of differentiation driven by the pay-to-play revenue model (15% of games), (3) low visibility games with the "meaning" source of differentiation driven by the pay-to-play micro-transaction revenue model (10% of games) and (4) low visibility games with the "context" source of differentiation driven by the pay-to-play revenue model (9% of games). A chi-square test was run to measure these four generic models against financial performance and the test came out with a chi-square of 35.3047 and significant at an alpha of 1% ($p<0.01$). It shows that the first model is very much related to higher financial performance, whereas the other three are very much related to lower financial performance.

5.2 Implications for literature

This paper provides empirical results which show that business model components are indeed able to be made measurable and furthermore are statistically significant in their relationship to firm performance as found by three separate statistical approaches. This analysis has implications for both existing and emerging literature.

The findings of the study add to the existing knowledge of business model measurement and the relationship between business models and firm performance by showing the specific roles that business model components play in firm performance and how they are related to each other. It successfully expands upon studies such as those by Roma and Ragaglia (2016) and M. H. Morris et al. (2013). It also reinforces the measurement model of M. Morris et al. (2006) as sufficiently capable of measuring business model components. Though the app market itself has been analyzed before both academically (e.g. Roma & Ragaglia, 2016) and non-academically (e.g. Munir, 2014; Pappas, 2013; Sourcebits, 2014; Wilcox, 2013), the mobile games market specifically is one that has not been analyzed before in an empirical academic fashion. This while we have found in the introduction that this is developing to be a highly lucrative market. This study provides valuable insight into the relationships that are at play in business models, even yielding generic business models for an entire industry. Furthermore, the approach to measurement of business model components in this study, combined with the approaches in studies such as the ones by M. H. Morris et al. (2013) and Roma and Ragaglia (2016), provide future studies with a solid foundation to further research in measurement of business models, their components and their relationship to firm performance. Specifically, in the mobile application and games industry, though the model used can extend across industries.

Additionally, the findings show that the business model components overall are more strongly related to financial performance than to non-financial performance. Yet the business model

component of differentiation is very strongly related to both financial and non-financial performance. This implies that game design in very important in the overall success of a mobile game. Overall the study adds to the studies on business model components and organization performance. It reaffirms that different types of value creation lead to different levels of performance, as implies in previous studies on business model design (e.g. Hu & Chen, 2015; Ladib & Lakhal, 2015; Zott & Amit, 2007). The same can be said of the other business model components.

Finally, this study could start a new stream of research particularly focused on the business models of games, how this can assist developers and how they are related to firm performance.

5.3 Practical implications

The managerial implications of this study lie mainly in the insights that the hypothesis tests gave and the generic business models presented, as choosing one of these models may ensure more success than others. The entire study assists mobile game developers by providing them with guidelines on which business model components to introduce when facing decisions for business and product development. In particular developers that use the first generic model around their app may find themselves enjoying higher financial performance. Furthermore, the findings on sources of differentiation can assist developers with choosing which game design elements to focus on in the development process of their game. Across the different types of game genres, it shows that choosing the free-to-play micro-transaction driven revenue model and opting for high visibility will significantly help in attaining higher performance. Internationalization does not seem to have any significant impact on either form of performance, though this does imply that releasing an application globally may mean lower performance. It could simply be an indication that the method for measuring internationalization had its limitations.

5.4 Limitations

Though the study had interesting findings, there are some limitations to it.

First of all, the various assumptions for the different statistical tests were not always met. Yet the tests were run anyway to get an indication of the relationship and get equal results for all business model components. Additionally, the variables were measured using different statistical models across three different sections. As results remain the same across the sections, it could be assumed that the findings are reliable.

Secondly, the recoding method used for the linear regressions were dichotomous for both dependent and independent variables. This is not an ideal way of modeling data, yet it was previously argued that a 50/50 split across the data will yield nearly the same results for logistic regression and linear regression.

Thirdly, the study relied heavily on the use of its data sources. This means that any flaw in the data sources will have inevitably come into the findings of the study. However, the use of these data sources was necessary to ensure being able to conduct the study.

Fourthly, this study measured the business model components of the mobile game industry. While the findings are very interesting, they are related to this particular industry. Other industries may exhibit other results and therefore future studies could focus on different industries using a method that is a combination of the method in this study and the study by Roma and Ragaglia (2016).

Finally, the linear regression of all business model components together required the use of only one subcomponent each. This is because the subcomponents themselves show perfect multicollinearity due to the use of dichotomous coding; if one subcomponent is present, none of the others are. Therefore, the most significant subcomponents per component were chosen. While this may limit the applicability of the findings, a potential rebuttal is that the findings still indicate

whether there is variation in performance when the business model changes on the component level. When reasoning like this, the study in this paper may even have some implications on the field of business model innovation as we have previously found the definition to be "modification or introduction of a new set of key components – internally focused or externally engaging – that enable the firm to create and appropriate value" (Hartmann et al., 2013, p. 6).

5.5 Future studies

This study should serve as a solid foundation for future studies to expand upon. It would especially be interesting for these studies to improve upon the methodology for measurement, recoding the data and performing the linear regression. The study by Roma and Ragaglia (2016) has a very interesting approach. Perhaps a study that combines their methodology along with the business model component conceptualizations of the study in this paper could yield interesting findings. Additionally, further studies on the measurement of business models, their components and their relationship with firm performance could substantiate the relatively few studies that exist on it so far. And though the study in this paper finds interesting results on how business model components function together, future studies could focus more on the interaction effects between the business model components.

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7. APPENDICES

7.1 Appendix I: Sample overview

Game Name	Developer	Genre	Revenue Model	Game Name	Developer	Genre	Revenue Model
Marvel Contest of Champions	Kabam	Action	F2P MT	Summoners War	Com2Us Corp.	Role Playing	F2P MT
Dragon Ball Z Dokkan	Bandai Namco Entertainment Inc.	Action	F2P MT	Star Wars Galaxy of Heroes	Electronic Arts	Role Playing	F2P MT
Brave Frontier	Gumi Inc.	Action	F2P MT	Walking Dead: Road To	Scopely	Role Playing	F2P MT
Kill Shot Bravo	Hothead Games Inc.	Action	F2P MT	Magic Rush Heroes	ELEX Wireless	Role Playing	F2P MT
Injustice: Gods Among Us	Warner Bros.	Action	F2P MT	Dragon Soul	Topgame	Role Playing	F2P MT
Sword of Chaos	Allstar Games	Action	F2P MT	Seven Knights	Netmarble Games Corp.	Role Playing	F2P MT
World of Tanks Blitz	Wargaming Group Limited	Action	F2P MT	Marvel Future Fight	Netmarble Games Corp.	Role Playing	F2P MT
Deer Hunter 2016	Glu Games Inc.	Action	F2P MT	Final Fantasy Record Keeper	DeNa Co. Ltd.	Role Playing	F2P MT
Crime City	Funzio Inc.	Action	F2P MT	Age of Warring Empire	Zealot Games	Role Playing	F2P MT
Five Nights at Freddy's	Scott Cawthon	Action	P2P MT	The Bard's Tale	InXile Entertainment	Role Playing	P2P MT
The Amazing Spider-Man	Gameloft	Action	P2P MT	Baldur's Gate Enhanced	Overhaul Games	Role Playing	P2P MT
Pacific Rim	Reliance Big Entertainment	Action	P2P MT	Knights of Pen and Paper	Paradox North	Role Playing	P2P MT
Modern Combat 4: Zero Hour	Gameloft	Action	P2P MT	Ravensword: Shadowlands 3D	Crescent Moon Games	Role Playing	P2P MT
The Amazing Spider-Man 2	Gameloft	Action	P2P MT	Star Traders RPG Elite	Trese Brothers	Role Playing	P2P MT
Gangstar Rio: City of Saints	Gameloft	Action	P2P MT	Block Story Premium	Mind Blocks	Role Playing	P2P MT
Real Steel	Reliance Big Entertainment	Action	P2P MT	Earth and Legend	Dvide Arts Inc.	Role Playing	P2P MT
The Survivor: Rusty Forest	Evgeniy Ershov	Action	P2P MT	Aralon Sword and Shadow 3D	Crescent Moon Games	Role Playing	P2P MT
The Dark Knight Rises	Gameloft	Action	P2P MT	Crashlands	Butterscotch Shenanigans LLC	Role Playing	P2P
Grand Theft Auto: San Andreas	Rockstar Games	Action	P2P	Attack The Light	Cartoon Network	Role Playing	P2P
Five Nights at Freddy's 4	Scott Cawthon	Action	P2P	Doom and Destiny	HeartBit Interactive S.r.l.	Role Playing	P2P
Survivalcraft	Igor Kalicinski	Action	P2P	Final Fantasy VI	Square Enix Inc.	Role Playing	P2P
Five Nights at Freddy's 3	Scott Cawthon	Action	P2P	Dragon Quest	Square Enix Inc.	Role Playing	P2P
PewDiePie: Legend of Brofist	Outerminds Inc.	Action	P2P	Chrono Trigger	Square Enix Inc.	Role Playing	P2P
Downwell	Devolver Digital	Action	P2P	Final Fantasy IV	Square Enix Inc.	Role Playing	P2P
Grand Theft Auto III	Rockstar Games	Action	P2P	Prison Life RPG	Nob Studio	Role Playing	P2P
Sonic The Hedgehog	SEGA	Action	P2P	Final Fantasy III	Square Enix Inc.	Role Playing	P2P
GTA: Chinatown Wars	Rockstar Games	Action	P2P	Might & Magic Clash of Heroes	Ubisoft	Role Playing	P2P
Candy Crush Jelly Saga	King	Puzzle	F2P MT	Cooking Fever	Nordcurrent	Arcade	F2P MT
Cookie Jam	SGN	Puzzle	F2P MT	Angry Birds Friends	Rovio Entertainment Ltd.	Arcade	F2P MT
Toy Blast	Peak Games	Puzzle	F2P MT	Subway Surfers	Kiloo	Arcade	F2P MT
Panda Pop	SGN	Puzzle	F2P MT	Hungry Shark Evolution	Future Games of London	Arcade	F2P MT
Charm King	PlayQ Inc.	Puzzle	F2P MT	Disney Crossy Road	Disney	Arcade	F2P MT
Marvel Puzzle Quest	D3PA	Puzzle	F2P MT	Piano Tiles 2	Cheetah Technology Corp. Ltd.	Arcade	F2P MT
Juice Jam	SGN	Puzzle	F2P MT	Angry Birds Transformers	Rovio Entertainment Ltd.	Arcade	F2P MT
Sugar Smash: Book of Life	SGN	Puzzle	F2P MT	Candy Blast Mania	Storm8 Studios	Arcade	F2P MT
Genies & Gems	SGN	Puzzle	F2P MT	Bubble Mania	Storm8 Studios	Arcade	F2P MT
Scribblenauts Remix	Warner Bros.	Puzzle	P2P MT	Minecraft: Pocket Edition	Mojang	Arcade	P2P MT
Monument Valley	Ustwo Games Ltd.	Puzzle	P2P MT	Vector Full	Nekki Games	Arcade	P2P MT
Doodle God	Joybits Ltd.	Puzzle	P2P MT	Fruit Ninja	Halfbrick Studios	Arcade	P2P MT
Where's My Water	Disney	Puzzle	P2P MT	Ski Safari: Adventure Time	Defiant Development	Arcade	P2P MT
Cogs	Lazy 8 Studios	Puzzle	P2P MT	Predators	Fox Digital Entertainment Inc.	Arcade	P2P MT
Hitman GO	Square Enix Inc.	Puzzle	P2P MT	Worms 3	Team17 Software Ltd.	Arcade	P2P MT
Where's My Mickey	Disney	Puzzle	P2P MT	Temple Run: Oz	Imangi Studios LLC	Arcade	P2P MT
Lara Croft GO	Square Enix Inc.	Puzzle	P2P MT	Granny Smith	Mediocre AB	Arcade	P2P MT
Cut The Rope	Chillingo Ltd.	Puzzle	P2P MT	Temple Run: Brave	Imangi Studios LLC	Arcade	P2P MT
The Room	Fireproof Games	Puzzle	P2P	Geometry Dash	RobTop Games AB	Arcade	P2P
The Room Three	Fireproof Games	Puzzle	P2P	Clear Vision 2	Dpflashes Studios	Arcade	P2P
The Room Two	Fireproof Games	Puzzle	P2P	Grand Theft Auto Vice City	Rockstar Games	Arcade	P2P
Hook	Maciej Targoni	Puzzle	P2P	Shadowgun	Madfinger Games A.s.	Arcade	P2P
Threes	Sirvo LLC	Puzzle	P2P	Pocket God	Bolt Creative	Arcade	P2P
Devil's Attorney	1337 Game Design AB	Puzzle	P2P	Sonic The Hedgehog 2	SEGA	Arcade	P2P
1000000	EightyEight Games Ltd.	Puzzle	P2P	Super Hexagon	Terry Cavanagh	Arcade	P2P
World of Goo	2D Boy	Puzzle	P2P	Eufloria HD	Omni Systems Limited	Arcade	P2P
Mind Games Pro	Mindware Consulting Inc.	Puzzle	P2P	Max Payne Mobile	Rockstar Games	Arcade	P2P

7.2 Appendix II: List of specific measures

Variable Name	Shorthand in tests	Variable Purpose	Measured Through	Variable Type	Source
Financial performance	FP	Dependent	Estimated monthly revenue	Ratio	www.sensortower.com
Non-Financial performance	NFP	Dependent	Game rating	Ordinal	Google Play
Value creation	VC	Explanatory	Mobile game genre	Nominal	Google Play
Market focus: internationalization	MFI	Explanatory	Internationalization score given by SensorTower	Interval	www.sensortower.com
Market focus: visibility	MFV	Explanatory	Visibility score given by SensorTower	Ratio	www.sensortower.com
Market focus: customer segment	MFC	Explanatory	Age requirement given to games according to the Pan European Game Information (PEGI) organization	Nominal	Google Play
Sources of differentiation	SD	Explanatory	Highlighted reviews divided into game design elements	Nominal/Interval	Google Play
Revenue model	RM	Explanatory	Pricing method used for the mobile game	Nominal	www.sensortower.com