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FACTOR ANALYSIS OF INFORMATION PRODUCTS COMPETITION

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ABSTRACT

This paper presents findings of empirical studies in assessment of competitive factors affecting information product sales in the Internet. The authors considered two types of the information product: software and videogames. The authors took data for 15 categories of software. Each category was represented by 30 software products, 15 freeware, and 15 shareware. In addition, the authors analyzed 675 videogames issued for Xbox 360 since the launch of this console in 2005 till 2013.

In case of software, study results show customs take in attention different sets of the competitive factors depending on a price category of the product. The videogames as a product have such a specific competitive factor as a brand of the game. It is realized in sequels creation. The results show the sequels are sold better than original products, but the difference is unimportant when we control for the quality of the product.

Results of this research can be useful for companies related to design and distribution of software and videogames in terms of forming better marketing campaigns for new information products.

KEYWORDS: *software; videogames; competitive factors; Internet marketing; sales forecasting.*

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1. INTRODUCTION

Modern world cannot exist without the variety of ways for obtaining information offered by information technology markets. Rapid development of computer gadgets, appearance of new mobile devices (communicators, tablet computers) requires IT industry to supply software products for all types of physical platform on a continuous basis.

According to Pricewaterhouse Coopers, in 2013 software product market became the driving force of technological and social innovations with turnover of 255 bln. dollars[3].In 2013 turnover at international videogames market reached 93,3 bln. dollars[4].

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[3] "PwC Global 100 Software Leaders: The growing importance of apps and services", available at: http://www.pwc.com/en_GX/gx/technology/publications/global-software-100-leaders/assets/pwc-global-100-software-leaders-2014.pdf (accessed 12 May 2014)

[4] "Gartner Says Worldwide Video Game Market to Total $93 Billion in 2013", available at: http://www.gartner.com/newsroom/id/2614915 (accessed 12 May 2014)

Software is a complex intellectual product distributed mainly on-line via Internet. Modern position at the market is getting less and less trivial as larger share of the market goes to free software. Appearance of such goods is related both with specific features of certain companies' marketing policy and altruistic software engineers developing programs for their own needs and later spreading them in the Internet.

All software products can be subdivided into three categories based on price: paid software, freeware and shareware. The difference between the first and second type is evident: paid products have price higher than zero, free products cost zero. Shareware products are proprietary and allow users use it with some functional limitations during a fixe period (usually 30 days after installation).

Developers prefer shareware so that users can try them and then decide on purchasing. That is the main peculiarity of software market. Okina (2001) points out that information product has empiric nature: you need to try them before actually understanding their value.

Games represent another category of software. They are complex intellectual products featuring almost every type of information: audio, graphic, text, digital and video. Because of complexity, production of most popular video games is extremely expensive and successful product may stimulate its designers to create sequel. Sequel has a kind of an internal game brand – popular trademark. Another option of using brands in videogames industry is to license external brand from different sphere: music, cinema or sport.

2. MAIN EXTERNAL FACTORS INFLUENCING SOFTWARE SALES

Consumers have a set of specific external indicators helping them choose goods. In that respect software market is no different.

When analyzing consumer preferences at software market one might ask whether brand of the manufacturer has any influence on success of a program among the consumers. As Faheem Ahmed and Luiz Fernando Capretz point out, brand strategy is typical for software industry. Many software brands such as Windows, AutoCAD, MATLAB etc. have preserved a large customer audience having successfully captured largest portion of specialized market segments (Ahmed, 2007). John Sacranie (2010) says that the importance of designing software products with one brand for example in videogames sphere grows every year. The main reason behind increasing success of the brand according to Sacranie is the increasing production cost of information products.

In case of freeware and shareware, the situation is much more complicated. Stefan Koch (2005) has formulated hierarchy of users and designers of shareware and freeware. It is extremely complicated for designers to form a brand, as there are so many of them. When we speak of freeware and shareware there is a chance to form a brand of a product, but not of its designer.

Advertising remains one of the main marketing instruments of spreading information about products, including software ones. As Stephen J. Hoch and Young-Won (1986) point out, majority of consumers do not believe advertising promises but consider it useful for making purchase decisions. When we look at software designers use different advertising tools: from placing billboards in megapolices to issuing free demo-versions for users to try a program as Microsoft does. Distributers place computers in shops so that users can try a videogame at once.

Research by Stahl (2006), Maass gives example of using mobile devices for obtaining advertising information about a product right in the shop. Research has demonstrated this instrument to be the most effective at the market of digital and software products.

While looking for a software product every user would first determine which category this product belongs to, that is ***software category*** defines target market segment of a program.

It must be mentioned that the more experienced the user is the higher requirements he has to software functional. For example average users would not pay attention to functional differences of paid Windows and free Linux choosing the most wide spread software, that is Windows. At

the same time, network specialists prefer Linux and the like as they provide higher stability and security in working with servers.

Expert evaluation and comments from other users influencing consumer decision in purchasing software seem to be the most studies in academic literature. Research by Naveen Amblee and Tung Bui (2007) has shown that freeware with expert evaluation have 90000 downloads more than those without evaluations. The same is with users' comments: software products with comments have 76000 downloads more than those without comments.

Some researchers (Basurou 2003; Eliashberg 1997; Boatwright 2006) view the role of experts or critics from both sides: as means of predicting consumers' expectations and instrument of influencing consumers' preferences.

From the point of view of researchers analyzing ***other consumers' evaluation*** (Astous 1999; Zhu 2009; Duan 2008; Kowatsch 2009), in a society with growing influence of Internet on people on-line reviews by users are one of the most important sources of information for other consumers.

Network effects have a significant influence on software market dynamic. Katz и Shapiro have identified three types of external network effects: direct, indirect and post-sales service effect (Katz 1985; Popov 2013).

Network effect research is quite well presented in literature. For example, Erik Brynjolfsson and Chris F. Kemerer (1995) analyzed network effect in electronic tables processing software.

As Katz and Shapiro (1994) say, such external network effects have serious influence on the theory of market balance: it might not exist, might be not the only one, or might be quite different from the situation where network effects are absent.

Lee and Mendelson (2008) state that software market has two segments with different customer preferences and positive network effects.

We can say the there are many factors influencing popularity of software. When making decision on purchasing software people consider software category, country of manufacture, expert evaluation, customer review as well as date of publication and software distributive data.

3. MAIN EXTERNAL FACTORS INFLUENCING VIDEOGAMES SALES

Genre is one of the most important elements forming consumer demand at videogames market. First, it is related to the fact that tastes differ but at different periods certain genres become sales leaders. Sacranie (2010) mentions that lately first-person shooters have become the most popular. Besides that, Sacranie says that producers can oversaturate the market with certain type of games. An example of this if a series of musical videogames «Guitar Hero», which caused significant growth of sales in musical genre in 2005 but by 2009 analogues games have virtually ended consumer interest to that genre.

Introducing innovations into sequels or games of the same genre have tremendous effect on success of a game. A vivid example of this is arcade game series "Need for speed" which starting from 1994 lead to creation of 20 sequels.

Game platform (console) is one of unique factors for video games market. Videogames designers face difficulties developing new products for several platforms. It is related to the complexity of adapting existing game to another platform. Each manufacturer has its own standards and technologies. All these factors make multi-platform game design very expensive.

Console research was conducted by Japanese scientists Maruyama and Ohkita (2011). Authors point out that increasing number of competing manufacturers and console differentiation characteristics lead to significant growth of exclusive license agreements with videogame manufacturers which in turn leads to increased demand for games fit for certain console. Using this business development strategy Nintendo managed to preserve leadership in the period from 1984 till 1994.

Critics' review is one of the best-studied factors. Most works cover cinema industry and there are virtually none devoted to videogames industry. But it must be mentioned that in terms of critical reviews cinema and videogames markets are almost equivalent. Reviews were studied by

Basurou, Chatterjee, Ravid (2003), Eliashberg and Shugan (1997), Desai and Basurou (2005), Boatwright, Basurou and Kamakura (2007). All of them agree on significant importance of critical reviews for sales of creative products.

Gamers' reviews from the point of view of researchers Feng Zhu and Xiaoquan Zhang (2010), society with rapidly growing influence of Internet on-line reviews from consumers are one of the most important sources of information for other consumers.

Yong Liu mentions that review activity from viewers is much higher during pre-release period and first post-release weeks (Liu, 2006). Viewers' opinion has prognostication type influence on first weeks box-office and total box-office. Duan (2008) states positive interrelation between viewers' opinion and sales where defining factor is not review opinion but again the number of reviews.

Brand of the game is implemented via creation of sequels. Sequel is a continuation of a game (film) based on development of the plot, use of same characters and trademark. To some extent sequel is a reflection of an already created game brand. The more popular the new game is the higher are the chances of creating its continuation in a certain period of time: an image of this series and its reputation is formed in consumers' minds. Designing a sequel is one of the most widely used methods for stimulating sales: according to the IGN.com list of most expected games of 2014 almost 82% of all expected games are sequels.

There is a set of researches aimed at sequels. As John Sacranie (2010) says the importance of designing sequels in game industry is growing every year. The main reason for it is increasing cost of designing a game: manufacturers aim at avoiding risks related to multiple failures of newly created games in recent years. Therefore manufacturers tend to create sequels which gave some guarantees in terms of successful sales. It is easier to predict commercial success of a game if you already have relevant sales data. Weak side of this instrument is related to absence of new ideas which might lead to decline of consumers' interest to this series of games.

Therefore we can name such competitive factors of videogames market as genre, game platform, critical and customer reviews and game brand.

4. MODEL

As we have stated before at software market customer can rely on external factors that fall into the following model:

$$D = f(Cr, Us, Br, Adv, Fun, Comp, S, Y) \quad (1)$$

where D – number of downloads
Cr – critical reviews,
Us – customer reviews,
Br – brand,
Adv – advertising,
Fun – functional,
$Comp$ – competition,
S – distributive scope.
Y – year of manufacture.

In order to present this model for paid and free software we can express dependence between sales (in this research downloads) and factors influencing them as two linear regression equations:

$$S = a_0 + a_1 Cr + a_2 Us + a_3 Br + a_4 Adv + a_5 Fun + a_6 Comp + a_7 S + a_8 Y + \varepsilon, \quad (2)$$
$$S = b_0 + b_1 Cr + b_2 Us + b_3 Br + b_4 Adv + b_5 Fun + b_6 Comp + b_7 S + b_8 Y + \varepsilon, \quad (3)$$

The task of this research is to prove that vector of coefficients $(a_0, a_1, \ldots, a_n)$ does not equal the vector $(b_0, b_1, \ldots, b_n)$. In other words when choosing paid software clients are influenced by one set of external factors and by other set when choosing free software.

To show the difference between sets of external factors we suggest that above mentioned factors have positive influence on popularity (number of downloads). Some factors cannot be tested within this research. For example, it is rather difficult to define software brand for majority of free software products which was mentioned in descriptive part of this research. It is also difficult to evaluate advertising costs product because of the lack of information.

We use similar approach when analyzing videogames. All factors influencing sales of videogames can be shown in a model where sales act as effect variable.

$$S = f(G, Pl, D, Gr, WOM, M, ESRB) \quad (4)$$

where S – sales,
G – genre of the game,
Pl – platform (number of consoles for the game)
D – designer,
Gr – critical reviews,
WOM – gamers' reviews,
M – multiplayer,
$ESRB$ – age rating.

Besides factors described above (genre, platform, designer, reviews from critics and reviews) we also use brand factor. It would be reasonable to subdivide brand into two categories: internal and external. By external brand we mean a game based on a book (for example, «Metro 2033», «The Witcher: Rise of the White Wolf» etc.), film, series or cartoon («James Cameron's Avatar: The Game», «The X-Files Game», «The Simpsons Game» etc.), comics («Lego Batman: The Videogame» etc.) etc., creative work of a singer or group («50 Cent: Blood on the Sand», «Guitar Hero: Aerosmith» etc.), sports team or competition («FIFA» series, etc.). Consumers are willing to buy such games because they have seen the film, listen to this singer or a group or support the team virtual analogue of which participates in one of the games from a sports series.

On the other hand, some customers expect continuation of already created games. This can be caused by different factors: development of a plot, high – quality gameplay (game process), etc. This is internal brand of the game.

Based on abovementioned we can see interdependence between sales and factors influencing them as a linear regression equation:

$$S = a + b_1 G + b_2 Pl + b_3 D + b_4 Gr + b_5 WOM + b_6 M + b_7 ESRB + b_8 Be + b_9 Bi + \varepsilon, \quad (5)$$

where Be – external brand factor,
Bi – internal brand factor sequel),
a – absolute term,
$b_1 \ldots b_9$ – coefficient,
ε – error.

5. DATA

As the basis for the research, we took data from download.cnet.com, which is a service for purchasing and downloading majority of existing software. We took data for 15 categories of software. Each category was represented by 30 software products, 15 freeware, 15 shareware. The choice was made from 15 program categories with 30 software products from each category, of which 15 were free and 15 were shareware. The choice was made from a program list from each

category sorted by date of last review or rating publication. Such method of choice allows for obtaining complete set of data on all variables present in regression model. Software included into this database is used at present which excludes outdated or unpopular programs from the analysis. Database attributes are given in the Table 1.

Table 1: Contents of database for software research

№	Variable	Description
1	software	Name of the software
2	pricetype	Type of software according to price
3	cnet_rat	Expert evaluation from cnet.com (critical evaluation)
4	user_rat	Users' evaluation
5	price	Price of software product
6	downloads	Number of downloads on 19.02.2012
7	size	Size of distributive
8	relisedate	Year of publication
9	sphere	category
10	revildownloads	Number of downloads of the closest competitor

We analyzed 675 videogames issued for Xbox 360 since the launch of this console in 2005 till 2013. Sampling includes almost all games created for this platform. The database contains variables presented in Table 2. .

Let's clarify some of them.

Dummy variable Sequel is the main variable in the research. In our case it took the value of 1 if the game fell under one of the following categories: triquel, sequel, midquel, remake, etc. English version of Wikipedia.org was used as the source of information for defining presence of internal brand.

Variable Sales demonstrates how many billions of copies had been sold according to VGCharts.com by May 2014. VGCharts Network is a network of sites devoted to videogames, including VGChartz, gamrFeed, gamrReview, gamrTV and gamrConnect. VGChartz.com is the core of this network and provides information on weekly sales of videogames in each region..

Table 2: Content of database on videogames research

№	Variable	Description
1	***Sequel***	Dummy variable defining whether the game is sequel (1) or not (0)
2	***Sales***	Sales (mln. copies of videogame)
3	***ExBrand***	Dummy variable defining presence of external brand of the game (1 yes, 0 no).
4	***Year***	Year of issue
5	***Critics***	Critical evaluation ranging from 0 to 100
6	***Genre***	Genre of the game
7	***GS_amount_us***	Number of evaluations from GameSpot.com
8	***IGN_amount_us***	Number of evaluations from IGN.com users
9	***Multiplayer***	Dummy variable defining presence of multiplayer: 1 yes, 0 no.
10	***ESRB***	Age rating
11	***Publisher***	Videogame publisher
12	***Platform***	Number of platforms compatible with the game

Variable Critics contains critical evaluation on aggregated data from MetaCritics.com. Evaluation scale is from 0 to 100. This variable is the best proxy for unobserved characteristic – quality of the game.

Variables GS_amount_us and IGN_amount_us show us the number of gamers' evaluation from Gamespot.com and IGN.com respectively. The aim of these variables is to show the level of popularity of the game among users.

Variable ESRB provides information about age rating Entertainment Software Rating Board. ESRB is an NGO engaged in defining age ratings for videogames and other entertainment software in the USA and Canada.

And finally variable *Platform* shows the number of platforms for which the game was issued. As we have mentioned earlier, we analyzed the games issued for the 7th generation of consoles.

6. ANALYSIS OF DATA AND RESULTS OF RESEARCH ON SOFTWARE

In order to test suggested hypotheses we have conducted regressive analysis individually for freeware and paid software. Let's look at several models different in terms of a set of factors included into analysis. Analysis results are given in Tables 3 and 4.

In case of paid software, the largest influence comes from reviews and critical evaluation. This is supported by many researchers mentioned in descriptive part of the article.

Reviews and evaluations from users are also important. Users' reviews can have negative influence on popularity of software.

Positive influence on popularity can also come from popularity of other programs. This supports the fact that software products market is highly competitive and consumers are oriented towards already popular products which leads to network market effects described above.

It was rather unexpected to find out that price factor does not influence customers' preferences when we use complete model. Therefore, we can say that popularity of paid products is influenced only by those factors not related to price.

Analysis demonstrates that neither the year of publication of the game nor its distribution influence its popularity.

Analysis shows that in case of freeware customers are mostly influenced by competing software popularity (networking effect). First of all users pay attention to all possible options of solving their applied problems with the help of different software products. Customers can use both freeware and paid software.

Besides popularity of competing products expert evaluations also have significant influence on the success of freeware. At the same time the influence of other customers' evaluation becomes insignificant compared to paid software.

Influence of date of issue and distributive is insignificant just like in case of paid software.

Table 3: Regression data analysis for paid software

VARIABLES	(1) logdownloads	(2) logdownloads	(3) logdownloads	(4) logdownloads	(5) logdownloads	(6) logdownloads
logprice	0.419**	0.388**	0.379**	0.344*	0.347*	0.288
	(0.191)	(0.188)	(0.187)	(0.190)	(0.191)	(0.190)
cnet_rat2		0.0684***	0.0793***	0.0762***	0.0741***	0.0757***
		(0.0251)	(0.0253)	(0.0255)	(0.0259)	(0.0256)
user_rat2			-0.0458**	-0.0468**	-0.0475**	-0.0448**
			(0.0207)	(0.0207)	(0.0208)	(0.0206)
logsize				0.0799	0.0767	0.0617
				(0.0846)	(0.0850)	(0.0842)
relisedate					0.0460	0.0523
					(0.0892)	(0.0883)
logrevil						0.189**
						(0.0789)
sphere	YES	YES	YES	YES	YES	YES
Constant	7.311***	6.080***	6.599***	6.710***	-85.72	-100.9
	(1.019)	(1.100)	(1.115)	(1.122)	(179.3)	(177.4)
Observations	225	225	225	225	225	225
R-squared	0.474	0.492	0.504	0.506	0.506	0.520

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Regression data analysis for freeware

VARIABLES	(1) logdownloads	(2) logdownloads	(3) logdownloads	(4) logdownloads	(5) logdownloads
cnet_rat2	0.0455	**0.0553***	**0.0544***	**0.0540***	**0.0525***
	(0.0284)	**(0.0290)**	**(0.0293)**	**(0.0295)**	**(0.0289)**
user_rat2		-0.0367	-0.0360	-0.0364	-0.0373
		(0.0231)	(0.0233)	(0.0235)	(0.0230)
logsize			0.0193	0.0183	-0.00543
			(0.0829)	(0.0833)	(0.0819)
relisedate				0.0182	0.0487
				(0.108)	(0.106)
logrevil					**0.240*** **
					(0.0763)
sphere	YES	YES	YES	YES	YES
Constant	7.293***	7.710***	7.669***	-28.89	-93.62
	(0.772)	(0.813)	(0.834)	(216.6)	(213.0)
Observations	225	225	225	225	225
R-squared	**0.299**	**0.307**	**0.308**	**0.308**	**0.340**

7. Data analysis and videogames research results

We used regression analysis as the research tool. Table 5 shows results of regression for several models including different set of variables starting from simplest (2 variables) to model with descriptive formula (5).

If model involves effect variable LogSales and variable Sequel, coefficient evaluation supports hypothesis on positive influence of internal brand on sales. When we add other variables situation remains the same until we add variables Critics and LogGSAmount. As seen from the last regression they and variable Platform have the largest influence on sales. Internal brand of the game becomes insignificant.

It leads us to the following conclusion: if we control the variable Critics (in fact, quality of the product) presence of the brand does not stimulate sales. In fact if customer has to choose between two games of comparable quality and one of them is a sequel presence of a trademark would not influence the decision on purchase.

We should explain why regression analysis does not use such a variable as gamers' evaluation. The thing is that gamers can evaluate the game only after buying it. But when making decision on a purchase they consider the factors given in our analysis. Introduction of gamers' evaluation as a variable is unreasonable because of multi-collinearity: evaluation of gamers and critics are strongly correlated which would shift regression coefficients. Analysis uses variable LogGSAmount, as in that case statistics of R-squared at 0,7888 is higher than in the case of using variable LogIGNAmount (0,7828).

As for external brand of the game Table 5 shows that it does not have any influence on sales in any of the models.

Table 5: Regressive data analysis for videogames

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sequel	**0.545*** (0.111)**	**0.545*** (0.112)**	**0.504*** (0.115)**	**0.494*** (0.114)**	**0.527*** (0.117)**	**0.285** (0.112)**	**0.261** (0.110)**	0.0220 (0.0906)	0.0771 (0.0705)
ExBrand		0.000548 (0.117)	-0.00596 (0.117)	-0.146 (0.130)	0.0667 (0.150)	-0.0760 (0.143)	0.0512 (0.143)	0.0993 (0.117)	0.0317 (0.0908)
Multiplayer			**0.212* (0.125)**	0.200 (0.125)	**0.240* (0.144)**	**0.261* (0.135)**	**0.378*** (0.134)**	0.158 (0.110)	0.0926 (0.0857)
Platform				**0.112** (0.0461)**	**0.106** (0.0484)**	**0.153*** (0.0471)**	**0.219*** (0.0483)**	**0.218*** (0.0393)**	**0.216*** (0.0306)**
Genre dummies					YES	YES	YES	YES	YES
Publisher dummies						YES	YES	YES	YES
ESRB dummies							YES	YES	YES
Critics								**0.0502*** (0.00334)**	**0.0174*** (0.00323)**
LogGSAmount									**0.552*** (0.0324)**
Constant	-1.499*** (0.0865)	-1.499*** (0.0918)	-1.626*** (0.119)	-1.838*** (0.147)	-2.219*** (0.226)	-1.326*** (0.436)	-1.308*** (0.430)	-4.883*** (0.423)	-6.894*** (0.350)
Observations	675	675	675	675	675	675	675	675	675
R-squared	**0.043**	**0.043**	**0.048**	**0.059**	**0.146**	**0.444**	**0.470**	**0.650**	**0.789**

Standard errors are indicated in parentheses
*** p<0.01, ** p<0.05, * p<0.1

8. CONCLUSION

This paper presents findings of empirical studies in assessment of competitive factors affecting information product sales in the Internet. The author considered two types of the information product: software and videogames.

Firstly, the authors aimed at demonstrating the difference between free and paid software from the point of view of factors influencing their popularity. Research results show that consumers are influenced by different sets of factors depending on price category of software products.

In case of paid software, consumers are mainly influenced by expert evaluations of certain product. This can be explained by the fact that consumers are afraid of incurring material and emotional damage when choosing the product that does not met all requirements. Therefore consumers tend to listen to experts who have certain knowledge in the given sphere and experience of working with necessary software. Users' evaluation and popularity of competing programs are also important factors.

It is worth mentioning that the price of paid software doesn't have considerable influence on customers' choice.

As for free software, users are influenced by popularity of competing software which can be explained by several reasons. First, there is almost no risk of incurring financial loss. Consumers tend to consider their own opinion and specific needs. Still expert evaluation factor remains important.

While researching videogames market we have received the following results: when looking at multi-factor model neither internal nor external brands have any influence on sales. If we take expert evaluation and users' comments out of equation internal brand becomes one of the most important factors influencing sales.

We have found out that with every year manufacturers tend to issue more and more sequels. It happens not because each sequel can boost sales but because sequels decrease risks incurred by producers. Internal brand of the game acts as security for the issuing company. It also decreases production costs as sequels have similar technology.

Results of this research can be useful for companies related to design and distribution of software and videogames in terms of forming better marketing campaigns for new information products.

This research is not ideal and as any other has several limitations. Firstly, presented linear regression models are not irrefragable. As regression test shows it is necessary to add missing internal and external factors influencing consumers' preferences. Secondly, research is subjective as work with data required using personal experience and intuition as different sources give different data on some software. Yet this research can be elaborated further and used in future research projects.

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