

Methods for Assessing the Commercial Success of a Computer Game

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Abstract

The article offers a method of assessing the commercial success of a computer game at the design stage. The characteristics that most influence the success of the game and their parameters are considered. The genres, controls, and popular narrative models of the computer game for each type of player are evaluated. The weights of each characteristic for each player are determined. The consistency of expert assessments was checked on the basis of the ranking method. A formal representation of the success of a computer game has been made. A success score is calculated for each type of player and the percentage of the market segment that will like the game. The scheme of calculation of the estimated number of sold copies of the game is offered. Recommendations for attracting the majority of the audience are formed, which are based on the results of the evaluation of the concept of success for each type of player. The suggested recommendations should be taken into account when creating a promotional video for a computer game.

Keywords: computer game, gaming business, gaming market, evaluation of commercial success, quality of a game.

Introduction

Computer games have become so ingrained in our lives that it is almost impossible to imagine a personal computer or mobile phone that does not have any games. Today, the gaming industry is extremely profitable, more weighty and significant than a decade ago. The release of another sequel to the famous series of games brings developers and publishers billions of dollars. The cost of making computer games can now be compared to the cost of shooting blockbusters. One of the difficulties of the gaming business is the changing fashion to which computer games are also exposed. The process of developing a normal modern game takes about a year, for large projects can take up to 2 – 3 years, the development cycle of "casual" games takes about 4 – 6 months, despite the fact that there is a pipeline development of 2 – 3 projects. Demand for games may change during development. Because of this, it is sometimes easier for developers to close a project than to continue spending money on it. Publishers as well as developers often rely on their experience and market trends. Novice developers are more likely to close projects due to incorrect assessment of the expected commercial at the design stage. Therefore, it is necessary to properly evaluate the game at the concept stage that would increase its commercial success.

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Analysis of literature sources and problem statement

Scientific articles (All et al., 2014, Pushkar & Hrabovskyi, 2019, Horoshko, 2010) offer different variants of methodologies for evaluating the effectiveness of computer games. Particular attention in these studies is paid to information security. Consideration and systematization of the main methods of web engineering that can be used to create computer games can be found in Novak (2011), Diaz et al. (2005) or Hrabovskyi et al. (2020) and Robins (2010). Blow (2004) or Kanode and Haddad (2009) focus also on visualization and artistic techniques that should be used in the development of computer games. These studies somehow do not highlight the specific qualities that affect the success of computer games. The visualization techniques that should be used in the development of computer games are significant, however, one should also consider aspects of performance evaluation. Scientific articles (Aleem et al., 2016, Bellotti et al., 2013, Enfield et al., 2012, Petrillo et al, 2009) are aimed at solving the scientific and practical problem of providing a better understanding of the dimension of the developer as a factor in the success of the software game. The solution of this problem is focused mainly on the empirical study of the influence of key factors of the developer on the development of software games and, ultimately, on the quality of the resulting game. However, these studies do not provide comprehensive tools for calculating the effectiveness of computer games. Aspects of dynamic scaling of computer game complexity are given in scientific articles (Tan et al., 2011, Hrabovskyi et al., 2018). Particular attention is paid to the analysis of the use of 3d-animations. However, these studies do not take into account the methods of assessing the genres of computer games for each type of player computer game (excluding browser games). The following scientific research methods should be used to develop a methodology for assessing the commercial success of a computer game: axiomatic, comparison, analysis and synthesis, idealization, induction and deductions, analogies, expert approach.

Experiments And Research Results

The methodology for assessing the commercial success of a computer game should consist of the following steps:

- 1) assessment of the success of computer games in the audience:
 - a) assessment of existing concepts and characteristics of a computer game in terms of success criteria;
 - b) based on the evaluation of the choice of a concept that will interest most of the target audience;
- 2) market analysis for the presence of games with a similar concept and their calculation of the expected demand for a computer game;
- 3) the formation of recommendations for increasing the expected profit.

The characteristics that most affect the success of the game and their parameters are given in Table 1.

Table 1. Characteristics that most affect the success of the game

Characteristics	Parameters
Genres	Action, Action-adventure, Arcade, Adventure, Strategy, RPG, MMORPG, Simulation, Indie, Puzzle, Racing, Other
Player type (audience)	Achievers, Killers, Socializers, Explorers
Theme / Setting	Adult, alternate history, anime, aquatic, artistic, cinematic, comedy, crime, cyberpunk, dating, espionage, fantasy, historic, horror, martial arts, medieval, military, modern, post-apocalyptic, prehistoric, Sci-Fi, Space, steampunk, superhero, time-travel, violent, western
Narrative model	Linear, branched, "amusement park", "building blocks"
Complexity	Easy to learn, easy to progress, easy to learn, hard to progress, hard to learn, hard to progress, hard to learn, easy to progress
Return of players to the game	The presence of different levels of difficulty - yes / no
Management	Mouse, keyboard, game accessories, mixed
Cross-platform	Yes / no / porting
System requirements	Low, acceptable, high

To determine the characteristics of the game that most affect the success of the game and the attention of players, an expert assessment was conducted. Game designers from Gameloft were experts. For convenience of calculations,

expert assessments are translated into a scale from 0 to 1. The sign "+" means 1, the sign "-" – 0, the sign "±" – 0.5 . Defined genre scores for each player type are presented in Table. 2.

Table 2. Genre ratings for each player type

Game genres The type of player	Action	Action–adventure	Arcade	Adventure	Strategy	RPG	MMORPG	Simulation	Indie	Puzzle	Racing
Achievers	+	+	+	+	+	+	+	-	+	±	+
Killers	+	+	±	±	+	+	+	-	-	-	±
Socializers	-	-	-	+	-	+	+	±	-	±	±
Explorers	-	+	-	±	-	+	+	+	±	-	-

Gameloft game designer estimates of computer game control types are presented in Table 3.

Table 3. Estimates of computer game controls for each genre

Game genres Type of management	Action	Action–adventure	Arcade	Adventure	Strategy	RPG	MMORPG	Simulation	Indie	Puzzle	Racing
Mouse	-	-	-	+	+	-	+	-	+	+	-
Keyboard	-	-	+	+	-	-	-	-	+	-	+
Game Accessories	-	+	+	+	-	+	-	+	+	-	+
Mixed	+	+	+	+	+	+	+	+	+	-	+

Identified popular narrative models for each type of player are presented in Table 4.

Table 4. Estimates of popular narrative models for each player type

Narrative models The type of player	Linear	Branched	"Amusement park"	"Building blocks"	Mixed
Achievers	+	+	+	+	±
Killers	+	+	±	-	-
Socializers	-	+	+	+	±

Explorers	-	+	+	+	±
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The Table 5 shows the weights of each characteristic for each player, which were determined by expert game designers from Gameloft.

Table 5. The weights of each characteristic for each player are determined

The type of player	Characteristics	Genres	Narrative model	Reproducibility	Setting
Achievers		35	20	25	20
Killers		30	10	40	20
Socializers		25	35	20	20
Explorers		20	30	35	15

The ranking method was used to check the consistency of expert assessments. The ranking results are given in Table 6.

Table 6. The ranking results

Experts	m1	m2	m3	m4	m5	m6	m7	m8	m9	m10	m11	m12	m13	m14	m15	m16
Criteria																
k1	3	4	3	4	2	4	4	4	4	4	4	4	4	4	3	4
k2	1	2	2	2	4	2	2	3	2	1	3	2	1	1	1	2
k3	4	1	4	3	3	3	3	2	3	3	2	3	3	2	4	3
k4	2	3	1	1	1	1	1	1	1	2	1	1	2	3	2	1

After all the criteria have been ranked, it is necessary to determine the percentage of importance α_i of each of the methods by the formula:

$$\alpha_i = \frac{r_i}{\sum_{i=1}^m r_i} \quad (1)$$

where r_i is the sum of the ranks for the i -th method,
 m - the number of the expert.

Table 7. Results of calculating the percentage of importance of genre selection for each player type, λ (%)

The type of player	«Achiever»	«Killer»	«Socializer»	«Explorer»
Characteristics				
Genres	0,36	0,3	0,3	0,18
Narrative model	0,2	0,15	0,36	0,3
Reproducibility	0,27	0,37	0,2	0,37
Setting	0,16	0,17	0,12	0,14

In order to verify the accuracy of the data obtained, we will identify consistency in the opinions of experts using the Kendall concordance coefficient, which is calculated by the formula:

$$W = \frac{12S}{m^2(n^3-n)} \quad (2)$$

where W is the concordance coefficient,
 S is the sum of the squares of the ranks,
 m is the number of experts,
 n - the number of analyzed ordinal variables.

Ranks should be calculated by the formula:

$$S = \sum_{i=1}^n (\sum_{j=1}^m r_{ij} - \frac{1}{2}m(n+1))^2 \quad (3)$$

The results of the calculations of the coordination coefficient are given in Table 8.

Table 8. Coordination coefficient results

The type of player \ Value of criteria	W
«Achiever»	0,67
«Killer»	0,73
«Socializer»	0,72
«Explorer»	0,72

Based on the obtained result, we can conclude that the opinion of experts is quite consistent. For a formalized representation of the success of a computer game, the following variables were defined:

- Gam - player type; sales market,
- G - computer game genre,
- S - game setting,
- H - difficulty of learning and progression in the game,
- N - narrative model,
- C - control of the game,
- Rab - return of players to the game,
- SR - system requirements.

The relationship of characteristics and their influence is shown in Fig. 1.

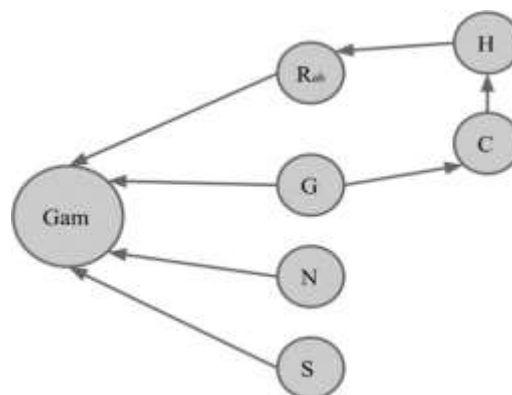


Fig. 1. Influence of game characteristics on player's choice.

The diagram shows that player's choice is influenced by game genre, setting, narrative and return of players to the game which is influenced by complexity determined by management choice and learning and progression model. It should be borne in mind that the choice of the characteristic parameter is influenced by the value of another characteristic. This is due to the fact that some characteristics of the characteristics are not compatible with each other. For example, due to the specifics of the RPG genre for the game, the linear model of the narrative is incompatible.

The model of "building blocks" is most suitable for this genre, although this does not deny the existence of a linear or branched main history and many minor ones. Performance appraisal is the determination of the percentage of the audience in which the game will be successful. To begin, you need to calculate the score for each type of player. The evaluation of the success of the game (Sc) for a certain type of player is calculated by the formula:

$$Sc(\text{Gam})=k1 \times a1(\text{G},\text{Gam}) + k2 \times a2(\text{N},\text{Gam}) + k3 \times a3(\text{Rab},\text{H}) + k4 \times a4(\text{S},\text{Gam}), \quad (4)$$

where k1-4 is the percentage of the weight of the impact of the characteristics of the game for each type of player (Table 5);

a1-4 (x,y) – a specific value in the matrix of the relationship of the considered characteristics.

By calculating the performance score for each type of player, we get the percentage of the segment that will like the game. Next, we need to calculate the performance score for the entire target audience by the formula:

$$Sc_{full} = \sum_{i=1}^n n_i \times Sc(\text{Gam}_i), \quad (5)$$

where ni is the percentage of players of a certain type in the target audience.

The next step is to perform a comparative analysis and identify the percentage of similarity with games with similar characteristics. The result is the estimated number of copies of the game sold (Cs), which should be calculated as the ratio of the evaluation of the success of the games and the total number of copies sold:

$$Cs = \frac{Csg}{PERaud_g} \times PERaud, \quad (6)$$

where Csg – the number of sold copies of game 1 with which we compare the selected concept;
PERaud_g- segment of the general target audience that received game 1.

The developer must independently assess which segment of the general target audience he can count on for further calculations (PERaud). Therefore, the maximum expected number of copies sold will be calculated by the formula:

$$Csmax = Cs \times Scfull \quad (7)$$

Next, we should calculate the number of copies that need to be sold to recover costs, according to the formula:

$$Q = FC/(P - AVC), \quad (8)$$

where Q is the break-even point (sales volume),
FC – the amount of fixed costs,
P – unit price,
AVC – variable costs per unit of output.

After calculating the required number of copies sold, we can calculate the expected profit by the formula:

$$Pr = Cos \times (Csmax - Q), \quad (9)$$

where Cos – the price of the game.

The greater the difference, the greater the expected profit. The game must pay off more than twice to be considered commercially successful. This is because developers need capital to develop and release future games.

Recommendations for engaging the majority of the audience are based on the results of evaluating the concept of success for each type of player. Having identified the segments with the lowest values, it is necessary to determine what needs to be added to the game to meet more needs of a certain type of player. The same recommendations can be used when creating a promotional video. The player will be interested in the game if it makes him feel the desired pleasure. The results of the analysis of the three concepts of the computer game are presented in Table 9.

Table 9: The result of the analysis of concepts

Concepts	concept №1	concept №2	concept №3
Characteristics			

Genres	Arcade	Quest-adventure	Shooter-platformer
Setting	fantasy	fantasy	western
The complexity of learning	Easy to learn, difficult to pass	Easy to learn, difficult to pass	It's hard to learn, it's hard to pass
Narrative models	Linear	Branched	"amusement park"
In-game controls	Mouse, keyboard	Mouse	Mouse, keyboard
Return to the game	Provided	None	None

In the first stage, the concepts of computer games will be evaluated according to formulas (4) and (5). The result of the calculations is presented in Table. 10.

Table 10: The result of evaluating the success of computer game concepts

	Evaluate the success of the game (Sc) for a particular type player				Performance evaluation for the entire target audience
	«Achiever»	«Killer»	«Socializer»	«Explorers»	
concept №1	0,94	0,45	0,35	0,26	0,5
concept №2	0,8	0,65	0,8	0,9	0,78
concept №3	0,87	0,55	0,65	0,67	0,68

The evaluation of the success of the game Sc (Gam) will be calculated by formula (5).

We calculate the success of the concept №1.

$$Sc(\text{Achiever})=0.35 \times 1 + 0.2 \times 1 + 0.25 \times (1 \times 0,75) + 0.2 \times 1 = 0,94$$

$$Sc(\text{Killer})= 0.3 \times 0.5 + 0.1 \times 1 + 0.4 \times (1 \times 0,75) + 0.2 \times 0 = 0.45$$

$$Sc(\text{Socializer})=0.25 \times 0 + 0.35 \times 0 + 0.2 \times (1 \times 0,75) + 0.2 \times 1 = 0.35$$

$$Sc(\text{Explorers})=0.2 \times 0 + 0.3 \times 0 + 0.35 \times (1 \times 0,75) + 0.15 \times 0 = 0.26$$

$$Sc_{full} = 0,5$$

We calculate the success of the concept №2.

$$Sc(\text{Achiever})=0.35 \times 1 + 0.2 \times 1 + 0.25 \times 1 + 0.2 \times 0 = 0.8$$

$$Sc(\text{Killer})= 0.3 \times 0.5 + 0.1 \times 1 + 0.4 \times 1 + 0.2 \times 0 = 0.65$$

$$Sc(\text{Socializer})=0.25 \times 1 + 0.35 \times 1 + 0.2 \times 1 + 0.2 \times 0 = 0.8$$

$$Sc(\text{Explorers})=0.2 \times 0.5 + 0.3 \times 1 + 0.35 \times 1 + 0.15 \times 1 = 0.9$$

$$Sc_{full} = 0,78$$

We calculate the success of the concept №3.

$$Sc(\text{Achiever})=0.35 \times 1 + 0.2 \times 1 + 0.25 \times (1 \times 0,5) + 0.2 \times 1 = 0.87$$

$$Sc(\text{Killer})= 0.3 \times 1 + 0.1 \times 0.5 + 0.4 \times (1 \times 0,5) + 0.2 \times 0 = 0.55$$

$$Sc(\text{Socializer})=0.25 \times 0 + 0.35 \times 1 + 0.2 \times (1 \times 0,5) + 0.2 \times 1 = 0.65$$

$$Sc(\text{Explorers})=0.2 \times 1 + 0.3 \times 1 + 0.35 \times (1 \times 0,5) + 0.15 \times 0 = 0.67$$

$$Sc_{full} = 0,68.$$

Thus, according to the results of calculations, the most popular among players of all types is the game based on the concept of №2. Assuming that each type of player makes up a quarter of the target audience, it can be concluded that concept №1 will succeed in half of the target audience, concept №2 will succeed in 78% of the target audience, and concept №3 will succeed in 68% of the target audience. We will evaluate the success of the existing games "Myst", "The longest journey", "The book of unwritten tales" with a similar concept. The result of the analysis of concepts is presented in Table 11.

Table 11: The result of game analysis

Games	Myst	The longest journey	The book of unwritten tales
Characteristics			
Genres	adventure	adventure	adventure
Setting	fantasy	fantasy	fantasy

The complexity of learning	easy to learn, difficult to pass	easy to learn, difficult to pass	easy to learn, easy to pass
Narrative models	linear	linear	linear
In-game controls	mouse	mouse	mouse
Return to the game	provided	none	none

We calculate the success of "Myst" for the audience.

$$Sc(\text{Achiever})=0.35 \times 1 + 0.2 \times 1 + 0.25 \times 1 + 0.2 \times 1 = 1$$

$$Sc(\text{Killer})= 0.3 \times 0.5 + 0.1 \times 1 + 0.4 \times 1 + 0.2 \times 1 = 0,85$$

$$Sc(\text{Socializer})=0.25 \times 1 + 0.35 \times 0 + 0.2 \times 1 + 0.2 \times 1 = 0,65$$

$$Sc(\text{Explorers})=0.2 \times 0.5 + 0.3 \times 0 + 0.35 \times 1 + 0.15 \times 1 = 0,7$$

$$Sc_{full} = 0,8$$

We calculate the success of " The longest journey" for the audience.

$$Sc(\text{Achiever})=0.35 \times 1 + 0.2 \times 1 + 0.25 \times 1 + 0.2 \times 0,75 = 0,95$$

$$Sc(\text{Killer})= 0.3 \times 0.5 + 0.1 \times 1 + 0.4 \times 1 + 0.2 \times 0,75 = 0,8$$

$$Sc(\text{Socializer})=0.25 \times 1 + 0.35 \times 0 + 0.2 \times 1 + 0.2 \times 0,75 = 0,6$$

$$Sc(\text{Explorers})=0.2 \times 0.5 + 0.3 \times 0 + 0.35 \times 1 + 0.15 \times 0,75 = 0,56$$

$$Sc_{full} = 0,73$$

We calculate the success of "The book of unwritten tales" for the audience.

$$Sc(\text{Achiever})=0.35 \times 1 + 0.2 \times 1 + 0.25 \times 1 + 0.2 \times 0,5 = 0,9$$

$$Sc(\text{Killer})= 0.3 \times 0.5 + 0.1 \times 1 + 0.4 \times 1 + 0.2 \times 0,5 = 0,75$$

$$Sc(\text{Socializer})=0.25 \times 1 + 0.35 \times 0 + 0.2 \times 1 + 0.2 \times 0,5 = 0,55$$

$$Sc(\text{Explorers})=0.2 \times 0.5 + 0.3 \times 0 + 0.35 \times 1 + 0.15 \times 0,5 = 0,53$$

$$Sc_{full} = 0,68$$

The Table 10 shows that among the three concepts, the concept of №2 will be the most successful in the audience both in terms of general and individual indicators. The result of the analysis of the game market "Myst", "The longest journey", "The book of unwritten tales" are given in Table 12.

Table 12. The result of market analysis

Indexes \ Games	Year of development	Number of copies sold, mln	Budget, thousands of \$	Approximate profit, thousand \$	Performance evaluation
Myst	1993	8	10000	17920	0,8
The longest journey	2000	0.45	2500	645,5	0,73
The book of unwritten tales	2012	0,1	65	934	0,68

The analysis accurately reflects the distribution of the audience according to the Bel curve. Myst has the most copies since it was one of the first point-and-click games. Next, we calculate the estimated number of copies of the game sold. To do this, we will compare the game concept with the latest successful game "The book of unwritten tales". Assume that this game falls into the "late majority" segment of the White curve, and therefore the audience distribution $P_{eraud1} = 34\%$. In the pessimistic scenario, we assume that the game by concept will fall into the last segment of the "outsiders" of the White curve, and therefore $P_{eraud2} = 16\%$. Through the ratio, calculate the estimated number of copies of the game sold (Cs):

$$Cs = 100 / 0,34 \times 0,16 = 47 \text{ thousands of copies}$$

Thus, the estimated number of copies sold is forty-seven thousand copies. We calculate the maximum expected number of copies sold by formula (7).

$$Cs_{max} = 47000 \times 0,78 = 36660 \text{ copies}$$

Next, we calculate the number of copies that must be sold to recoup costs, according to formula (8). Fixed costs include development costs, namely wages and rent. According to preliminary estimates, the amount of fixed costs

will be 25 thousand dollars. To distribute the game, it is better to choose the digital game distribution service "Humble Bundle", as it contains only 5% commission and each copy of the game. Based on the prices of competitors, the price of one copy of the game will be \$ 2.99. Variable costs per unit of production include 5% of the commission service "Humble Bundle". Calculate the break-even point for sales:

$$Q = 25000 / (2,99 - 0,05 \times 2,99) = 8801 \text{ copies}$$

After calculating the required number of copies sold, you can calculate the expected profit by formula (9).

$$Pr = 2,99 \times (36660 - 8801) = 83298\$$$

It is expected that the estimated profit will be 83.2 thousand dollars, which will be three times the development costs. This suggests that the game based on the concept being evaluated will be commercially successful.

To form recommendations for attracting a larger audience, it is necessary to refer to the results of the evaluation of the concept of the game for success in the audience. According to the evaluation, the game will have the least popularity among players such as "killer". Killer players get positive feelings because of their superiority over others. Knowledge of something is useless if it cannot be applied in practice; and even if it can be applied in practice, "killers" do not feel any pleasure if it is a soulless "bot" run by scripts, and not a living person. Therefore, if the game does not provide communication, it must be taken out of the game. To enhance interaction between players, one can:

- 1) in the in-game certificate to give only general information, without going into details,
- 2) if players are stuck somewhere, give them clues with mysterious hints,
- 3) add to the game optional, but difficult to solve puzzles,
- 4) add different levels of difficulty to the game,
- 5) Add the ability for players to share their achievements on social media.

All these events will promote active communication in forums. Going through difficult puzzles, the "killer" will brag about it on social networks, which will show its superiority over other players. When creating a promotional video, it is necessary to promise to meet the needs of all types of players. To do this, consider the following recommendations:

- 1) To interest players-researchers it is necessary to include shots with a leisurely overview of the game world. Or add location shots from different angles. This will create the impression of a diverse game world. An important fact for them is the musical accompaniment. Due to the dissonance of the accompaniment and the image, players may lose interest in the game.
- 2) Dialogues should not be neglected to meet the needs of the Socializer player. They are most affected by changing voices.
- 3) To meet the needs of the player- "Achiever" it is enough to show that there are different levels of task performance and provide incentive rewards for completing missions.

Both when creating a game and when creating a promotional video, it is important to keep in mind the balance between fulfilling all or many conditions of success and art.

Conclusions

The study analyzed the specifics of the process of assessing the commercial success of a computer game based on the characteristics of its concept. A method for evaluating the commercial success of a computer game, which is a scientific result of this work, was developed and proposed for practical use. The process of developing the methodology was based on the analysis of the relationships between the characteristics of the computer game and the analysis of trends in the computer game market. Based on the developed methodology, recommendations were formed to attract the majority of the target audience, which should be taken into account when creating a promotional video for a computer game. The direction of further research may be the development of methods for optimizing the characteristics of a computer game.

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