



FACULTY OF TECHNOLOGY

**THE ROLE OF PRODUCT PORTFOLIO
MANAGEMENT IN MARKET EXPANSION: A
CASE OF THE MOBILE GAMING INDUSTRY**

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ABSTRACT

The role of product portfolio management in market expansion: a case of the mobile gaming industry

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The rapid growth of mobile game consumer spending has led to Free-to-Play mobile game developers' constant competition for players by offering new games. The product portfolio management (PPM) approach helps tackle questions about the market, product and technologies based on a company's strategic targets. However, to discover game genre diversity by aligning product portfolio with business strategy and existing capabilities in new product development process is challenging. A single-case study was conducted to examine the important connection between PPM and business strategy as well as existing capabilities to propose a practical approach for seeking game genre portfolio expansion opportunities. The main results include proposing an analysis framework using PPM and mobile app intelligence software to identify game genres in market expansion that are strategic fit, bring the best economic value and are resonated with company's existing capabilities and competence. PPM focused areas and key performance indicators are proposed. This study is the first attempt to apply PPM approach with targets and KPIs in mobile game development. It contributes to the previous studies by extending the application of PPM approach in the initial stage of product development process in discoveries and innovation stage. Also, the results can be applied to other mobile game companies with similar new product development process.

Keywords: product portfolio management, new product development, free-to-play mobile games, market expansion

FOREWORD

The thesis was written from winter 2021 to autumn 2022 for a mobile game development company. The aim of the thesis is to explore mobile game market expansion directions with a game genre portfolio expansion analysis framework utilizing the product portfolio management approach.

I am much appreciated for the opportunity provided by the case company where I first had my internship and later worked as a thesis worker on an interesting and challenging topic. I would like to thank all the interviewees who provided their valuable insights related to the topic. Special thanks go to my supervisors Daniel from the case company and professor Harri Haapasalo from University of Oulu for their guidance and help throughout the thesis. Last but not the least, I would like to thank Osmo Kauppila from University of Oulu for the support.

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Oulu, 16.9.2022

Jinni Jinghui Lü
Jinni Jinghui Lü

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LIST OF ABBREVIATIONS

ARPU	average revenue per user
ARPPU	average revenue per paying user
DAU	daily active user
DNU	daily new user
ECV	expected commercial value
F2P	Free-to-Play
IAP	in-app purchase
IP	intellectual property
KPI	key performance indicator
LTV	lifetime value
MMO	massively multiplayer online
MVP	minimum viable product
NPD	new product development
NPV	net present value
PPM	product portfolio management
PvP	player versus player
QoE	quality of experience
R&D	research and development
RMT	real-money trade
ROI	return on investment
RPD	revenue per download
RPG	role-playing game
UA	user acquisition
WAU	weekly active user

1 INTRODUCTION

1.1 Study background

The fast growth of mobile game consumer spending has led to fierce competition in the mobile gaming market. According to data.ai's recent report on mobile gaming, in 2021 the consumers' spending on games reached as high as 116 billion USD and players downloaded 83 billion games globally, with a year-over-year growth rate of 15% and 5%, respectively (data.ai, 2022). Consequently, mobile game developers are constantly looking for opportunities to tap into the great potential of the market by offering new games to compete for consumers. However, with the increasing competition, launching a new game title and expanding into a new game category can be risky without knowing clearly the directions. Mobile game development, after all, is subject to financial, resource and time constraints.

In seeking success, developers tend to take various factors into consideration when expanding into new game genres, such as market size, revenue potential, compatibility with existing expertise and possibility of innovation. To address the need, extensive analytics tools are used in the mobile gaming industry to measure and follow performance, competitors, and market trends, urging companies to construct product portfolios that fit the organization and its objectives.

A product portfolio is a collection of products or services classified in a certain way to align with a company's strategic objectives (Haines, 2014). When companies are striving for sustainable business success by offering more choices to customers, product portfolios of a company are considered a vital factor in seeking competitive and business success against competitors (Tolonen, 2016). Product portfolio should be managed actively to achieve strategic business goals via products (Copper et al., 2001).

Product Portfolio Management (PPM) concept focuses on a company's resource allocation on selected product projects that are strategically aligned, bring the best economic value and are balanced with short- or long-term goals (Cooper et al., 2001). In active PPM the overall portfolio is reviewed and its performance is measured and optimized periodically. Inside the portfolio, projects are compared against each other and go/kill decisions are made on individual projects constantly. Through active PPM,

resource allocation reflects organizational strategic prioritization and new product strategies are developed. It should be aware that PPM is an executive-level and dynamic decision-making process.

1.2 Research problems and objectives

The thesis focuses on how product portfolio management, especially new product portfolio management, helps decision making on the market expansion directions in terms of mobile game genre diversity. The thesis is written for a Finnish mobile game development company that is globally successful with their flagship free-to-play(F2P) racing game franchise. The case company has 10-year experience in developing racing games and their current live games all reside in the racing genre.

The main objective of the thesis is to help organizations within the F2P mobile gaming industry to explore and manage game genre expansion possibilities by constructing an analysis framework utilizing the product portfolio management concept with its focused areas and metrics, which is achieved with the help of the following three research questions:

RQ1: How does product portfolio management facilitate a F2P mobile game company to achieve its business performance success?

The first research question aims to build a theoretical foundation for the later empirical part of the thesis by connecting the focused research areas of product portfolio management and free-to-play mobile gaming industry. The answer to the first research question provides key elements from literature to help the construction of current state analysis interview questions and later build the analysis framework.

RQ2: What is the current state of product portfolio management and market expansion challenges in the case company?

The second research question aims to find the current processes, practices and challenges in the case company based on the studied topics in the literature. The answer of the second research question provides an empirical foundation for building the analysis framework.

RQ3: What kind of product portfolio management analysis framework would expedite market expansion?

The third research question aims to find out how to construct the analysis framework and what are the key elements. The answer of the last research question is formed based on the answers to previous two research questions and it presents the main finding of the research.

1.3 Research process

The research is conducted as a single case study. In the literature review part, relevant research of thesis's subject on PPM and mobile game free-to-play business model are explored. Following the theoretical part, the current state analysis part investigates the current practices and challenges associated to the topics in the case company. Based on the knowledge from previous two parts, the last section of the research presents the construction of an analysis framework which aims to serve the case company to tackle the identified challenge. The research process is illustrated in figure 1.

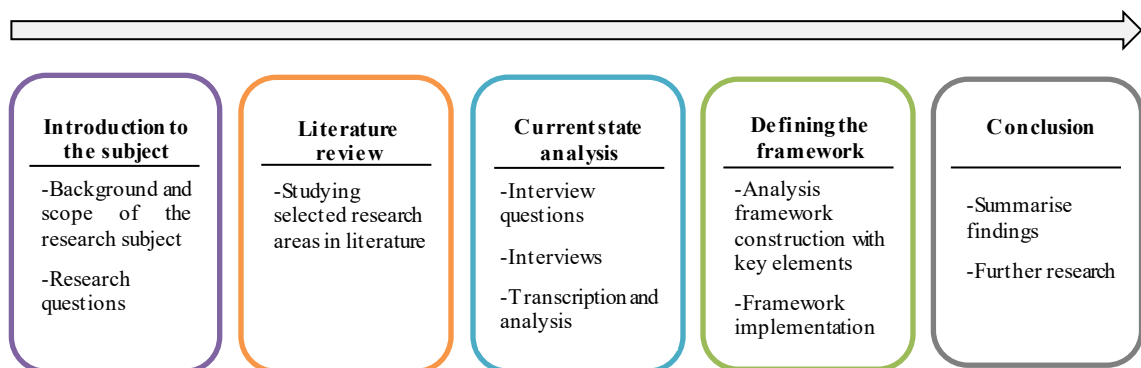


Figure 1. Research process

The research process started when an idea of possible topic of the thesis was proposed to the case company. A need for the study was then identified, which followed by making a research plan. While writing the research plan, the aim and scope of the research were set based on high level understanding of the current state and the challenge of the case company. Three research questions were formed to guide the study by determining the focus and purpose of each part of the thesis.

Based on the scope of the research and in order to answer the first research question, Chapter 2 covers the theoretical review of related research areas from literature. To build a foundation for the empirical analysis, topics of product portfolio management, free-to-play mobile game business model and user lifecycle are studied. Synthesis of literature review is done at the end of Chapter 2 to connect all studied research areas and analyze them as a whole to form the groundwork for the analysis framework.

To answer the second research question, the current state analysis in Chapter 3 was conducted based on the interviews and internal materials in the case company. Interview questions are formed on literature review and are sent to interviewees several days before the interviews. To obtain a thorough understanding of the current state, interviewees are executives from different functions across the organization. Most of the topic related internal materials were discovered through interviews as they are only available for certain function of the company. The current state analysis answers the second research question by comparing the case company's practices around research areas to the literature and identifying the existing challenges.

In Chapter 4 the construction of the analysis framework is carried out based the literature review and the current state analysis. The analysis framework is formed to find out the game genre diversity opportunities for the case company. The key elements of the framework and analysis steps are defined in the section as well. As a part of the thesis work, the framework is further implemented as a tool for game genre portfolio expansion analysis. The analysis result is presented in the end of the chapter.

In the end Chapter 5 concludes the research with the key findings, theoretical and managerial contributions, research evaluation and suggestions for further research.

2 LITERATURE REVIEW

2.1 Product portfolio management

The product portfolio management procedure has been utilized in various fields for different types of products such as physical products, IT solutions, and financial assets among others (Tolonen et al., 2014). Product portfolio management can be viewed as an approach contributing to strategic decisions on markets, products, and technologies (Cooper et al., 1999) and to enable continuously successful incremental and disruptive innovations with focused resource allocation (O'Reilly III et al., 2004). For a company conducting product portfolio management, it is important to understand that product portfolio management should be practiced on both existing and new products, and it deals with many areas including market analysis, product development strategy, and product life cycle management (Van de Weerd et al., 2006).

2.1.1 Product

In general, a product can be seen as an offering that is possible to be ordered by customers, will be sold and delivered to customers to satisfy their needs, and can be invoiced by the provider (Harkonen 2021). A product can be tangible or intangible or has a combination of both attributes (Harkonen et al., 2015). Tangible means the physical aspects of a product while intangible means non-physical ones. Although traditionally products are more thought of as manufactured material artifacts, software or service are also products. A software-based product has intangible nature, consisting of computer programs, procedures, associated documentation, and data for delivery to users. Service as a product is provided to take care of a customer's needs without transferring the ownership of an asset. Services are characterized by heterogeneity, customer participation, and perishability (Chai et al., 2005) and are also intangible. A tangible product can be offered with intangible supporting services (Harkonen et al., 2015).

2.1.2 Product lifecycle

Tolonen et al. (2015) define product lifecycle phases as new product development (NPD), maintenance, warranty, and archive. NPD phase covers research and development of new products which are based on either new or existing technologies or platforms. Maintain phase covers ramp up, sales, delivery, and ramp down of the product. Within this phase,

new products are not being developed, instead, incremental improvements can be done to existing products. Improvements can be for example related to cost reduction. Warranty phase covers the spare part business of the product, as well as care services. Archive phase covers product data archive required by law for obsolete products.

Haines (2014) introduced a product management life cycle model from the view point of product realization. The model starts from a product idea, and with a focus on new product development.

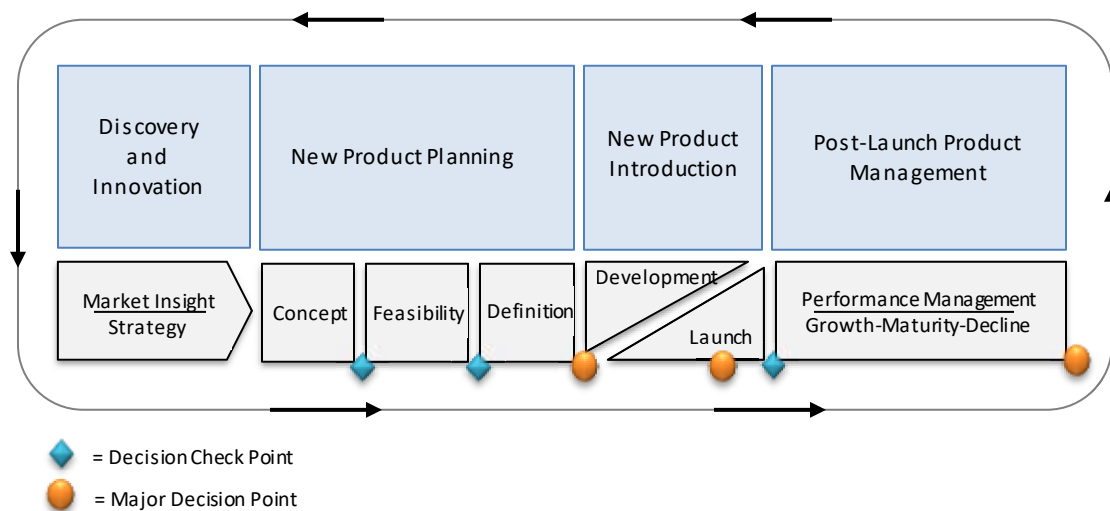


Figure 2. Product management life cycle model (adapted from Haines 2014)

The product management life cycle model is comprised of four phases: discovery and innovation, new product planning, new product introduction, and post-launch product management. Among all the phases, the new product planning phase and new product introduction phase belong to the NPD process.

The discovery and innovation phase is to collect data, derive market insights and formulate strategies. Activities are being carried out over time to learn the new challenges faced by customers, emergent industry trend, and actions taken by the competitors. (Haines, 2014)

The new product planning phase includes three stages: the concept stage, the feasibility stage, and the definition stage. More time and effort are required in this phase to ensure optimal product investment decisions are being made. In the concept stage, new ideas are generated and assessed, the revenue potential is estimated, and portfolio fit is considered.

A decision checkpoint is reached at the end of the stage and a review should take place on whether the concept will proceed to the next stage. The output of the stage is an opportunity statement. In the feasibility stage, ideas that have passed through the concept stage are being reviewed and qualified carefully. The multi-dimensional assessment is done from market, technology, human resource, and economic perspectives. After feasibility stage's decision checkpoint and review, the outputs are a preliminary business case, a preliminary launch plan, and a high-level functional support plan from each function. A project will move to the definition stage only after it is considered feasible. In the definition stage, products are specified for further development with carefully considered product requirements and business capabilities. The actions needed in this stage are market research, technical, resource, and operational analysis of the project. The output documents of this stage are a final business case, a marketing plan, and product requirements. (Haines, 2014)

The product introduction phase focuses on execution to build and deliver products according to product requirements. This phase includes two stages: the development stage and the launch stage. Once a project is approved and funded, it moves to the development stage where the product with its supporting materials and documentation are developed. The launch stage begins already during the previous stage and involves activities to bring the product to market. Cross-functional teams work together to prepare the product for the market and ready the market for the new product. (Haines, 2014)

The post-launch product management phase starts after the product is launched into the market and the focus is to optimize the performance of the products based on the pre-defined strategies. The actions include adjustments to the market in terms of e.g. product, price, promotion, distribution channels, working with cross-functional teams of customer service, finance, operations and marketing. (Haines, 2014)

2.1.3 New product development

Many researchers have argued that new products play a critical role in securing a company's competitive position in the market (e.g. Balachandra, 1997; Poolton et al., 1998; Lynn et al., 1999). According to Cooper et al. (2004), the number of NPD projects has a positive correlation with company's performance. They discovered in the benchmarking study that the best performing companies have more NPD projects than the average performing and the low performing companies. The best performers pay more

attention to innovation and technology strategies and invest 40% of product development capabilities for NPD and innovation. Moreover, after comparing types of NPD projects between best performers and low performers, it was clear that the former invests in a higher proportion of larger and truly innovative projects such as disruptive innovation. On the contrary, the latter has more small and incremental improvement projects and devotes only less than 30% of their capabilities to innovation. The best performers have double percentage of truly innovation projects, which is a success factor for their desired business performance. In line with Cooper's findings, Barczak et al. (2009) pointed out that a company's business performance drops when the share of totally new product development decreases. However, it is challenging to keep the number of new products with completely new innovation at an ideal level due to the reason that it is easier, safer and faster for companies to fulfil short term customer requirements with incremental new products. These types of new products are existing products upgraded to achieve cost reduction and functional improvement (Hänninen et al., 2013).

So why some companies are much more successful in NPD compared to others? In Cooper's (2018) research, he identifies several deciding factors for the success of NPD. The findings revealed that regardless of the type of products whether it is a physical product, software, or service product, the drivers of success at the business level are organizational and strategic factors which are depicted as follows: (Cooper, 2018)

- A product innovation and technology strategy. A firm needs to have a product innovation and technology strategy that maps the way for NPD. In addition to the strategy, clearly defined innovation goals and focused areas, a defined role as a linkage to the overall business goals and an existing product roadmap are necessary to include.
- Careful project selection decisions with resource allocation prioritization. It is essential for a firm to make its R&D projects investment decisions with focus on both resource allocation and the right projects in the development portfolio that are balanced, bring high values and align with company strategies. Product portfolio management approaches are used to help in project selection and resource allocation.
- A strong fit between NPD realization and existing resources and core competencies. The success rate of a new product project is higher when there is a strong fit between the development of new products and the capabilities of the

company regarding R&D resources, marketing and distribution resources, branding and customer support resources, as well as management capabilities.

- Market attractiveness. Because new products targeted at more attractive markets are more successful, what markets to choose in terms of market potential and competitive situation should be criteria for new product project selection and prioritization.
- Organizational factors include: dedicated cross-functional project teams with commitment and good communication; company culture and leadership that strongly encourage and support innovation with good level of entrepreneurial and risk-taking spirit; new product success reward system and time allowed for employees' unofficial side projects.

2.1.4 Product portfolio management

A product portfolio is considered to contain several products or product lines that are classified in different ways, for example, focused markets, types of products, functional categories, or development methods (Haines, 2014). However, in smaller organizations, a product portfolio could include all products the organizations produce. Product portfolios are seen as a vital factor for a company in seeking competitive and business success against competitors, due to the fact that more offering options to customers are a way to achieve sustainable economic success (Tolonen, 2016). Therefore, it is essential to construct the product portfolio in a way that it aligns with a company's strategic objectives (Haines, 2014).

Product portfolio management is a dynamic decision process, where new projects are evaluated, selected and prioritized; existing projects may be accelerated, killed or de-prioritized; based on prioritization resources are allocated and reallocated to the active projects. The portfolio decision process encompasses or overlaps a number of decision-making processes within the business, including periodic reviews of the total portfolio of all projects meaning looking at the entire set of projects and comparing all projects against each other; making Go/Kill decisions on individual projects with predefined criteria on a regular basis, along with developing a new product strategy for the business with strategic resource allocation decisions. (Cooper et al., 2001)

PPM is an executive-level tool to dynamically manage performance and make decisions (Tolonen et al., 2016), thus having an effective and systematic PPM process is essential

to reach better performance and strategic business targets. Projects in the portfolios should be strategically aligned, bringing the best economic values and having a good balance in terms of duration, risks, markets and technologies (Cooper et al., 2001). Continuously active PPM as a decision-making tool is beneficial for achieving strategic, market, financial and operational balance (Haines, 2014).

Multiple portfolio management methods should be used simultaneously in order to reach objectives. Cooper et al. (2001) argued that 2-3 portfolio methods together are sufficient for a company to achieve better results. Below are the most popular methods having been used in the companies according to the study:

Financial methods are the most commonly used in portfolio management and project selections. These methods include calculations based on multiple profitability and return metrics such as Expected Commercial Value (ECV), Return on Investment (ROI) and Net Present Value (NPV) among others. This method is more often used for ranking projects against each other in order to choose those that bring the best value. (Copper et al., 2001)

Aligning with business strategy is also one of the popular methods used. Based on the business objective, strategy and strategy priorities, resources and investment are allocated into various portfolios. After that projects will be sorted into different portfolios and further evaluated and ranked based on scores by using a scoring model in every portfolio until resources and investment spending limit are reached. This method is used to enforce R&D investments are aligned with business strategy. (Copper et al., 2001)

In the bubble diagram method, projects are plotted in an X-Y plot in a shape of bubble. For example, in a risk-reward bubble diagram, X-axis represents NPV and Y-axis represents the probability of technical success. Projects are grouped according to the quadrant they are in and the size of bubbles represents allocated annual resources. (Copper et al., 2001)

A scoring model is mostly used when making projects Go/Kill or prioritization decisions. Projects are rated based on various questions and each one with a certain scale for example 1-5. The total project score is obtained by summing up all the ratings either in a simple or a weighted manner meaning more important questions can be weighted more heavily. The most used scoring questions are related to strategy fit and financial reward. (Copper et al., 2001)

The check-lists method is a less popular used method by companies. Like the scoring model, it is also used for making Go/Kill or prioritization decisions. Each project is evaluated based on a group of Yes/No questions and will be processed only when a certain number of Yes answers are achieved. (Copper et al., 2001)

2.2 Product portfolio management targets and key performance indicators

Product portfolio management (PPM) targets and key performance indicators (KPIs) have a positive correlation with a company's business results. Cooper et al. (2004) found out that the outperforming companies take PPM targets and KPIs into use in a systematic way to actively analyze and adjust product portfolio in the NPD phase. An actively developed and renewed product portfolio is essential to explore new business opportunities and gain success (Tolonen et al., 2014).

2.2.1 Product portfolio management targets and KPIs

Cooper et al. (1999) listed in their study the targets of product portfolio management: the product portfolio strategic fit, value maximization, and the balance of the product portfolio, as well as the right number of projects. Strategic fit is to make sure the alignment of product or projects in the portfolio with company's strategic targets. Furthermore, the portfolio resource spending should reflect company's strategic priorities. Value maximization as a target aims to select the projects that bring the highest economic value with sub-targets of return on investment (ROI), profitability and business value among others. The balance of the product portfolio is reached through consideration of the duration of projects, risks, markets and technologies. (Cooper et al., 1999) Based on the earlier studies, the targets and KPIs can be summarized in the table below:

Table 1. Product portfolio management targets and KPIs (Cooper 2008, Cooper et al. 2001, O'Reilly et al. 2004, Griffin 1997, Cooper et al. 1997, Cooper et al. 1999, Porter 1996, Dickinson et al. 2001, Saaksvuori et al. 2008)

Strategic fit KPIs
Product development aligned with business strategy Resource and spending aligned with strategy Number of resources available for product development Number of resources used in product development Value of strategic R&D investment
Value maximization KPIs
Number of high-value and return projects Market attractiveness by product Size of financial opportunity Sales turnover Gross margin, net margin, net profit Cost of Goods Sold (COGS) Expected Commercial Value (ECV) Net Present Value (NPV) Internal Rate of Return (IRR)
Balanced and right size of the portfolio KPIs
Balance of long-term and short-term product projects Balance of high-risk and low-risk product projects Balance of technology: technical feasibility, technical gap Balance of demanded resources in product development and capacity of company Size of the portfolio, number of products Resource available for develop and maintain the portfolio

However, evidences have shown there are challenges between product portfolio management and its targets. The main challenge is nonalignment with company strategy (Cooper et al., 2001). Some companies fail to understand PPM as a process to connect company strategy with product activities and resource allocation.

2.2.2 Product portfolio management targets and KPIs alignment with company strategy

Strategy alignment is one of the most important factors that need to be taken into consideration for making business decisions, developing business processes, and designing performance management practices. A company's strategy and mission statement give direction for the performance management strategy (Haapasalo et al., 2006; Williams, 2008; King et al., 2010; Pinheiro de Lima et al., 2012). A mission statement can be product-, technology- and customer-wise, and it explains why a company exists, what it does, what is the competitive advantage and what are the overall goals (Wikipedia, accessed 3.12.2021). Moreover, the mission statement communicates the company's position in a value chain which shapes the products and product portfolio of the company (David, 2009; Kinnunen et al., 2013). When creating a mission statement, a company should include below 9 important elements (David, 1989): (1) Customer, (2) Product or Services, (3) Location, (4) Technology, (5) Concern of survival, (6) Philosophy, (7) Self-concept, (8) Concern for public image, (9) Concern for employees. In David's research (2009) it is found out that companies with high performance have a better focus on survival, the public image and employees among other elements. Especially in the public image element, sustainability-related issues have been paid more attention to in recent years with better awareness from companies. Those issues are communicated through social responsibility (David, 2009).

Tolonen et al. (2014) identified in their research that creation of PPM strategic targets and KPIs aligning with company strategy is one of the preconditions for a successful PPM process. Performance management framework was thus proposed as a tool to connect company strategic targets with PPM focus areas of strategic fit, value maximization and portfolio balance. In order to construct the framework, company business strategy objectives should be first defined based on the aforementioned nine elements of the mission statement. Next, portfolio key performance focus area targets and KPIs will be defined for each mission statement element. The last step is to define the criteria for all product life-cycle phases. Once the strategy is explained with objectives and measures, it can be clearly communicated. Below table 2 explains the integration between mission statement elements and PPM focus areas.

Table 2. Integration between mission statement elements and PPM targets (Mustonen et al., 2021)

	Strategic Fit	Value Maximization	Portfolio Balance
Market segments	What are the core capabilities and competences in each elements that can together make products' strategic fit realization successful	How the core capabilities and competences in each element can be used to maximize the value of product portfolio	How the core capabilities and competences in each element should be utilized to obtain the balance in the product portfolio
Customers			
Products			
Technology			
Economic success			
Compet. advantage			
Values			
Public image			
Employees			

Strategy fit explains how well the core capability and competencies in each mission statement element reflect the business strategy objects in PPM. Thus its target setting is to define what are the most important drivers in each element that can enable the overall capability to achieve the business strategy objectives via the PPM process. The resource allocation in all product-related activities needs to reflect the strategic priorities, which is also to ensure strategic fit. In order to measure resource spending, specific KPIs need to be set. (Mustonen et al., 2021)

Value maximization communicates the potential financial success of the business which is led by high value and profitable items in the portfolio. Therefore, its target setting is to specify how the core capabilities and competencies involved in each mission statement element will help maximize the product portfolio value. (Mustonen et al., 2021)

Portfolio balance describes what is the best combination of the product portfolio contents in terms of duration, risks, market and technologies. In its target setting then it is necessary to consider how the core capabilities and competencies related to each element will affect the product portfolio balance, and how to allocate resources to reach the ideal portfolio balance. Accordingly, specific KPIs for each target to measure progress need to be defined. (Mustonen et al., 2021)

2.3 Free-to-play mobile game business model

The Free-to-Play model (F2P) has attracted significant interest in the mobile game industry in recent years. As of Q1 2021, approximately 477,877 mobile gaming apps were available on Google Play Store, where quarter-on-quarter growth reached nearly 12% (statista.com, 2021). Under the condition of furious competition for attracting players, the majority of game developers have switched from premium pay upfront business model to F2P model in order to provide a free-access mobile game with the aim of gaining a larger player base (Flunger et al., 2017). The typical revenue sources of the F2P mobile games are in-game advertisement that are shown to players and in-game virtual goods that are offered to players for purchasing in order to enhance their game experience.

2.3.1 Game and influencing factors of users' in-game experience

A game, whether it is a computer game or a video game, or a mobile game, according to Juul (2005), is “a rule-based system with a variable and quantifiable outcome, where different outcomes are assigned different values, the player exerts effort in order to influence the outcome, the player feels emotionally attached to the outcome, and the consequences of the activity are negotiable.” Unlike other multimedia contents delivery activity, mobile gaming is a human-machine interaction entertaining activity, therefore the success of a game depends largely on user-perceived in-game quality of experience (QoE) (Möller et al., 2013). Factors such as the contents of a game, the backend platform that the game is implemented on, the user interface (mobile phones and software), involved transmission channels, as well as the characteristics of the players all may have a significant impact on user-perceived QoE. “Quality of Experience is the degree of delight or annoyance of the user who interacts with an application or service. It results from the fulfilment of his or her expectations with respect to the utility and / or enjoyment of the application or service in the light of the user's personality and current state.” (Le Callet et al., 2012) Therefore, based on the above definition, the influencing factors can be divided into three groups: user factors, technical system factors and context factors (Möller et al., 2013).

The user influencing factors include experience, playing styles, intrinsic motivation, as well as static and dynamic user characteristics. Experience is related to a player's average playing time per time period and skills. Playing styles is categorized into achiever, explorer, socializer and killer, according to Bartler (1996). Furthermore, based on the

playing style, a classification of intrinsic motivation is developed along three axes: achievement, social and immersion. A player's motivation has a combination of different values along the three axes, e.g. a player with a high value of achievement has a higher motivation of reaching goals in a game than others who have a lower value on the "achievement" axis (Aabom, 2014). The static characteristics of a player comprise age, gender, native language, etc., while dynamic ones include the current emotional status, boredom, distraction, curiosity and intended relaxation, and so on. (Möller et al., 2013)

The technical system factors include game genre, game structure, game mechanics and rules, technical system set-up, as well as design characteristics (Möller et al., 2013). Game genres could influence the effect of a technical platform has on the user perceived QoE. For example, network speed caused delay has bigger impact to some genres than to others. A mobile game genre is a classification of games based on its core gameplay (Wikipedia, 2022). Before starting game development, it has to be decided what type of game will be made for its audience. Games belonging to the same genre share many core game mechanics and compete for players with similar demographic characteristics (GameRefinery, 2022a). However, a game may belong to several genres due to the fact that core gameplay or types of interaction is open to one's subjective interpretation (Möller et al., 2013). For marketing purpose, 13 higher-level genres are common, i.e. puzzle, lifestyle, augmented reality/location based, arcade, hyper casual, simulation, role-playing games (RPG), strategy, shooter, card games, sports, driving and casino. A full list of the higher-level genres and their definitions is presented in table 3 (GameRefinery, 2022b)

Table 3. 13 high-level genres and their definitions (GameRefinery, 2022b)

Genres	Definition
Puzzle	Focusing on puzzle solving, trivia or traditional board game mechanics
Lifestyle	Games revolving around lifestyle themes, such as décor, fashion and customization of looks and styles
AR/Location based	Utilize augmented reality (AR) elements and location technology (GPS) in the core gameplay.
Arcade	Streamlined games with straightforward controls & mechanics for short, casual playing sessions
Hyper Casual	With very simple controls, gameplay is straightforward and easy to learn. These games usually have only core gameplay without meta-game elements and are designed for short playing sessions
Simulation	Casual games focusing on constructing and developing farms, cities, worlds or other entities while completing various smaller tasks to progress in the game.
RPG	Role-playing games (RPG) where you control and develop your character (or party of characters) and defeat enemies to progress in the game's world or storyline
Strategy	Games where management of resources, buildings and troops is combined with waging war against your enemies in a strategic setting
Shooter	Focused on shooting targets from either a first- or third-person perspective, and often feature player-against-player gameplay
Card Games	Adaptations of existing card games, or games that are primarily card-based
Sports	Games about sports or sport-themed action
Driving	Games about racing or racing-themed action
Casino	Traditional casino and gambling games

Game structures are categorised as e.g. single player against the game (player versus environment PvE), player against player (player versus player PvP), multiplayer against the game, multiplayer against each other (massively multiplayer online MMO), cooperative game, etc. (Fullerton, 2008) Game mechanics and rules guide players through the game and they are different in every game, thus they have a big impact on game outcomes. Technical system set-ups include user's device characteristics, interface software characteristics, involved transmission systems, and server characteristics. The design of a game is done by game designers and developers with the game specification. Most technical system factors are specified by game developers, or by the provider of technical platform. (Möller et al., 2013)

Context factors include physical environmental factors, social context, extrinsic motivation, and service factors. Physical environment means the environment where a player carries out the gameplay. Its factors include room characteristics such as lighting and acoustics, and usage situation whether in-house or on the move. Social context relates to relationship to other players in the game, potential activities of the player, privacy and security issues. Extrinsic motivation means a financial or social reward or something similar, depending on the user group. Service factors include access restrictions, availability of the system, etc. Context factors are specified by game developers, technical platforms, and service providers. (Möller et al., 2013)

2.3.2 Definition and history of F2P business model

A Free-to-Play model is characterized as providing a product or service at no cost with only a basic set of functions available (Teece, 2010). It provides possibilities with offers to users for purchasing more functions or services later. The additional purchase is aimed to improve the user experience with the core product (Teece, 2010). In the mobile game industry, on the contrary to the traditional premium model which requires players to invest an upfront payment before they are allowed to play the games, the F2P model provides players free access to the game but with restrictions on the gameplay at some level, for instance, limited time to play or limited actions inside the game (Alha et al., 2014). Alternatively, players are offered a variety of virtual goods to select and purchase, which aims to have enhanced players' experience in the game (Novak et al., 2014).

The emergence of F2P model can be regarded as an incremental evolution due to the increased use of information communication technology and mobile device. Mobile

gaming became extremely popular which led to fast-growing revenues and effective business models that are tailored for the competitive industry (Novak et al., 2014).

Before the birth of F2P model, Real-Money Trades (RMT) are the first micro-transactions used in the video game industry. RMT are those trades that players use real money to trade virtual items outside of the game, which are out of control of game developers (Huhh, 2008). As of 1999 RMT of virtual items became rather popular especially in Massively Multiplayer Online (MMO) games. The virtual items being traded are typically in-game avatars or rare items that are obtained by players through time- and labor-consuming in-game activities. Although RMT brings positive effects to the economics of the game by enabling new players to start the game more easily and financing low-income players' play by doing trades with high-income players to improve the in-game experience, there are also related many negative sides. RMT itself changes the nature of virtual economics (Constantiou et al., 2012) and raises fairness issues among players (Lin et al., 2011). Furthermore, RMT may degrade game experience for those players not engaged in RMT, which results in low retention of the game. In addition, RMT often infringes the intellectual property rights of the game developer as defined by the End-User License Agreement (Davidovici, 2013). By the early 2000s, developers realized a change to the business model is needed to internalize and secure those trades to gain profit while fighting against privacy and cheating. As a result, dedicated trade platforms with virtual currency outside the game were created. Later, some game studios gradually started having in-game trades for real money.

Before the year 2010, internalized micro-transaction managed by game developers started emerging in the video game industry. Some virtual social spaces like Habbo by Sulake a Finnish game studio provided players entries with no cost and encouraged players to spend real money on virtual items while visiting such spaces to meet other players. The intention is to customize and enhance their experience in the spaces. Meanwhile, many MMO games also changed from premium model to F2P model to acquire a large number of players in a short time period and to widen players base, as well as to capture financial gain from already successful game titles. (Davidovici, 2013)

In the last few years, F2P model has been widely used across different game genres. The reason behind the surge of F2P, according to Hamari et al. (2010), is the inexpensiveness and accessibility of mobile game development along with a constantly growing number

of game developers. All these factors have led the furious competition in the mobile game industry nowadays.

The core characteristics of the F2P model are summed up based on gameplay, in-game goods and players as such: most of the gameplay doesn't have an ending point so players can play endlessly; the offered in-game virtual goods can be priced flexibly based on players' segmentation as different players are willing to pay different prices; a wider segmentation of players and virtual goods offered can be tailor-made for different players; a large player base creating a network effect which increases visibility and attracts more players; a larger player base potentially means better conversion of paying users thus gaining a higher revenue. For the F2P model, a large player base is extremely important because the conversion rate from non-paying to paying users in a game is as low as 1% and rarely is higher than 5%. (Davidovici, 2013)

2.3.3 Components of the F2P business model

In line with the aforementioned characteristics, some patterns have been drawn from the F2P business model. The first pattern is about how appealing a game is. The broader entertainment appeal a game has, the higher ability it has to reach more potential players. The second pattern is about the amount of paying users. Due to the understanding that no more than 5% of players will ever spend money in a game, a large potential scale is necessary for the success of a game. A small percentage of monetizing users within a very large total user base may mean an adequate amount of people. The third pattern is about the spectrum of amount of money spent by players within a game. It is observed that total money spent by players in a game varies a lot in value, for example a very small amount of highly engaged users spend considerable amounts of money. Thus the larger the minority of highly engaged players, the more revenue the game generates in total. Furthermore, the more offered opportunities in monetization, the more users tend to spend money. (Seufert, 2013) Four important components of the F2P model can be identified from the above patterns: the scale of user base, insight of user behavior, monetization, and optimization.

The scale of user base

In order to reach a massive scale and acquire a very large number of players in a short period of time, two prerequisite conditions must be fulfilled: low marginal distribution

and production cost. Unlike physical products' marginal cost of distribution decreasing through the economics of scales, F2P digital products' those costs can be nearly nothing. The distribution cost of digital products is mainly platform and hosting fees. Although the expenses in total can be a large amount, however, at the marginal level the cost can be neglected. Production costs are also structured differently for digital products whose per-unit material and assembly costs don't occur like physical products. Digital goods can be replicated for nearly no cost. F2P games are mostly distributed and discovered through various platforms, for example, Google Play Store or iOS App Store. Platforms add their values by providing retail functionalities such as promotion placements for developers, possibilities to comment, rate and search products for users. Platforms usually charge a percentage from product-generated revenue as their service fee. Typically, the percentage may vary in the range of 15% - 50%. (Seufert, 2013)

The development of F2P games generally uses an iteration method because of its dynamic characteristic. Those products are often released under the model of game as a service (GaaS), which means the game will have an indefinite stream of new contents over time, based on user preferences or observed behaviors. Therefore, the production cost occurred in development cycles sometimes may last as long as the lifetime of a product. However, the total amount of production cost should be limited by the size of whole potential user base. When building a revenue structure, it should be kept in mind that only an extremely small percentage of players monetize in F2P games. Thus, the scale requirement of the F2P model is that the larger the total user base, the more meaningful is the minority amount of users who monetize. (Seufert, 2013)

Insight of user behavior

Insight is an analytical method used in the F2P model to understand user behavior within a game. It describes a process of data collection, data analytics, and making sense of collected data in order to optimize the game. Insight is achieved through a set of tools and procedures which aim to collect how users interact with a game. By doing so the goal is to optimize the performance of a game against certain metrics. (Seufert, 2013)

F2P games are equipped with data collection mechanisms to track the interaction between users and a game, then the collected data are analyzed to gain a valuable understanding of what are users preferences and what improvements can be made to the game to better server users' needs. The process of data collection, data analytics, and making sense of

data for game optimization can be divided into two equally integral parts. The first part is data collection and analytics. Developers use various tools including software and hardware to have user interaction data tracked, stored, analyzed, and made available for business users or data consumers. The second part is to make the findings of data easily understandable in order to improve the game. Business intelligence tools are usually used to obtain a report of key metrics or an analysis of a specific process of a game feature, with the aim to understand the performance. (Seufert, 2013)

User segmentation is one of the most important parts of insight in the F2P model, which divides all users into several segments based on the characteristics and commonalities of their behaviors within a game. The purpose of user segmentation is to find out opportunities for revenue optimization derived from understanding the similar payment behavior exhibited within a user segment. Because it is essential to provide paying users the best possible user experience in order to reach better engagement and gain more revenue. The knowledge of what those users pay for, when and why they pay is essential in user segmentation. (Seufert, 2013)

To best serve the most passionate users, insight into the user base about how they interact with the game, what drives them to make purchases and why they abandon the game is required to best leverage the advantages of the F2P model. All the data provided by users including non-paying ones are valuable and these data can be useful to optimize the game. The larger volume of the data, the better knowledge it provides. Scale and insight are therefore two elements that support and reinforce each other. (Seufert, 2013)

Monetization

Although it might not be obvious with a free access price, monetization is one of the essential focal points in the F2P model. In contrast to the paid access model providing users admission to a feature set environment upon an access transaction, the F2P model delivers an enhanced experience to users in a game upon a transaction. Therefore, most of the features in a game are built around monetization being the core. (Seufert, 2013)

Monetization in the F2P model especially effectively captures value from two groups of users who otherwise will not adopt a game with an access fee. The first group of users are those who do not have enough disposable income that matches the access price. The other group is those who don't think the perceived value delivered by a game equals its price.

Unlike the paid access model is only for the group of users who not only have great interest in the game but also have enough disposable income to spend on, the F2P model provides free access to all types of users. These users later are invited to purchase opportunities to spend money on an enhanced experience within a game that they have already familiarized themselves with. (Seufert, 2013)

Optimization

The goal of the F2P model is to optimize for monetizing users and allow them to extract the excitement from the game to the utmost. Once the goal is reached, the advantages of the F2P model are realized, which enables to capture the most total revenue from its users. Optimization is the process of converting data of user behaviors into improvements of a game that increase certain performance metrics. The improvements are incremental and will not impact the game to a great extent. Implementation of improvements should be often and quickly done with careful studies and measurements. The purpose is to result expected performance boost in a short period of time. (Seufert, 2013)

However, optimization should be balanced with both short- and long-term targets. As F2P games are often designed as platforms which will evolve over years, it is necessary to understand that small, iterative process improvements over a long time frame allow a game to better adapt to its users' needs and tastes. The ultimate goal of optimization is to achieve long-term performance improvements. (Seufert, 2013)

2.4 User lifecycle and metrics of Free-to-Play model

F2P model has a unique economic logic due to the free access to a gameplay. A user acquisition will first take place. After the acquisition, a player will start playing the game and might make a purchase later only if the player enjoys the game and wants to keep playing. Thus the economic process can be considered a 3-stage framework: Engagement – Retention - Monetization (Teece, 2010).

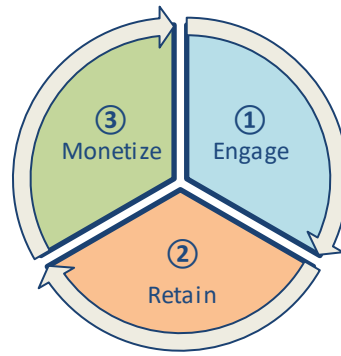


Figure 3. User lifecycle of Free-to-Play model

2.4.1 Engagement

Effective engagement is the key to prolong players' lifetime in a game. Engagement metrics capture players' behaviors on how they interact with a game. F2P games aim to encourage players to interact on a daily basis, and the most ambitious ones attract players with rewards to interact more than once in a day. The more interaction a player has with a game, the more excitement can be gained from it, therefore the more likely the player will spend money on it. Engagement metrics, especially the session metrics, including session length and session frequency measure and show the extent to which players interact with a game. Developers should use engagement metrics in their iterative development loop to measure and maximize players' satisfaction with the game. (Seufert, 2013)

User onboarding funnel

Once a game is installed and opened for the first time, early engagement is an essential factor which affects whether a player will stay and play or leave a game. In many cases, the first play session determines the length of players' lifetime in a game. A new player is introduced to a game in the first session and is equipped with needed knowledge for proper interaction with the most important features. The first session also gives players some ideas of compatibility between their expectation and the joy that the game provides. In F2P games, a percentage of players will abandon the game during the first session once their expectation is not met. A user onboarding funnel is used to describe player fall-off percentage based on various events during the first interaction session. An example is illustrated in figure 4. (Seufert, 2013)

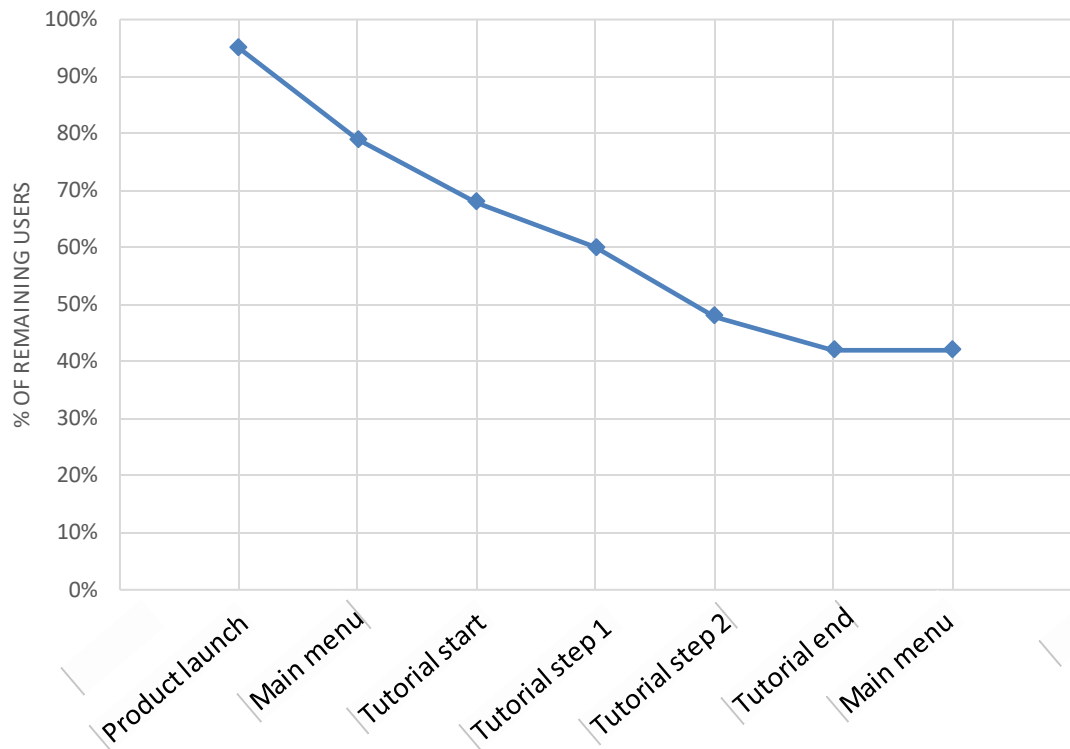


Figure 4. An example of a user onboarding funnel (adapted from Seufert 2013)

Session metrics

Session length and session frequency are the most used metrics to provide insights into how well players interact with a game. Average session length is usually calculated daily and is to evaluate average session length of a group of players within a specific time period. Average sessions per day communicates how many average sessions do a unique player interact with the game each day. (Seufert, 2013)

2.4.2 Retention

Retention is the most significant performance metric category for F2P games because it communicates the extent to which players engage in a game and how successfully a game brings players delight. Higher retention means better in-game experience, greater personal investment, and a higher level of satisfaction. Strong retention is a prerequisite in the F2P model and it lays the foundation for monetization. (Seufert, 2013)

Retention is calculated retrospectively and presented for a specific day for a segment of the user base. It communicates how big a percentage of players return to a game some specific days after first-time interaction. The most commonly used metrics are day 1, day

3, day 7, day 14 and day 28 retention, which respectively communicate the percentage of users returning to the game one, three, seven, fourteen and twenty-eight days after interacting with it for the first time. When calculating retention, it is crucial to have those player cohorts (a group of players who share certain similar characteristics) who started with the same version of the game because the updates in a game will probably affect players' behavior. Figure 5 illustrates an example of retention rate on day 1 (D1), day 2 (D2), day3 (D3), day7 (D7), day 14 (D14) and day28 (D28) over a certain time period (last 30 days). (Seufert, 2013)

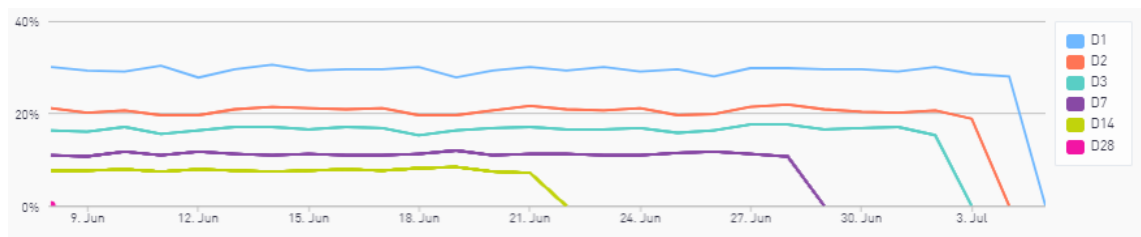


Figure 5. An example of retention rate on D1, D2, D3, D7, D14 and D28 over last 30 days

Daily new users (DNU) and daily active users (DAU) are the most used retention metrics. A new user is defined as a player interacting with the game for the first time. The activities that represent interaction should be defined in advance and depends on the platforms. DNU is a sum of all users who interact with the game for the first time on a given day. DAU means the number of players who interact with the game on a specific day. The interaction is commonly defined as an activity in which the user opens the app. Churn measures the opposite as retention and it is defined as a user who abandons a game and is not expected to return. Like retention, churn is also calculated retrospectively. (Seufert, 2013)

For F2P mobile games, retention rate over 40% on Day 1, meaning over 40% of players coming back to the game on the next day, is an indication for a game with effective engagement (Elitegame Developers, 2022).

2.4.3 Monetization

The revenue of F2P mobile games is typically realized through two sources: in-game advertisement and in-app purchase of virtual goods. Monetization metrics communicate both the amount of revenue and the shifts in spending patterns over time, as well as the degree to which the F2P model is being leveraged to produce monetizing users. Only a

F2P mobile game with strong retention will be able to monetize from highly engaged players to an extent that utilizes the advantage provided by the F2P model. (Seufert, 2013)

As one source of F2P model monetization, virtual goods are a large number of various items that are implemented in the game by developers and are used by players' characters to fulfill certain purposes, for example, to express themselves with customization goods like outfits and decoration items, or to empower themselves with functional goods like weapons or boosters. Virtual goods offered by a F2P mobile game are bound by the context of the game and cannot be used across different platforms. In order to obtain virtual goods, players can make a purchase or watch an in-game advertisement, or be rewarded for playing. (Flunger et al., 2017)

Conversion metrics

Conversion metrics are used to measure the percentage of players, among the entire user base, who convert from non-paying users to revenue producers through in-app purchases. In the F2P model, the conversion rate is rather low, as earlier mentioned, only 5% or less of the entire user base will ever make purchases and contribute to revenue. Those players who belong to the group of revenue contributors are called converted users. When conversion rate is tracked over a period of time, it provides valuable information on how well the value of offerings in a game is perceived by the players. (Seufert, 2013)

Players who never make purchases in a game are non-paying users. They are segmented into the user group that will be monetized through advertisement. Non-paying users bring their values to a game by providing not only advertisement revenue but also a large quantity of user behavior data, as well as possibilities of contributing to recruiting future highly engaged players via various channels for example social media platforms and physical channels. (Seufert, 2013)

Revenue metrics

The basic revenue metrics are average revenue per user (ARPU) and average revenue per paying user (ARPPU), which is an average measure of revenue of in-app purchases on a per-user and per-paying-user basis, respectively. ARPU and ARPPU can be measured over any period of time and they give insights into the habits of certain user segments in a game. Both ARPU and ARPPU can also be measured on a daily basis. Daily ARPU

tracks the average revenue of in-app purchases contributed per user who interacts with the game on a given day. Daily ARPU is usually named as average revenue per daily active user ARPDau and it can be used to communicate the quality of users entering the game's user base. A declining ARPDau over time can mean a fading players' perceived value of offerings. Figure 6 shows an example of daily ARPU and daily ARPPU. (Seufert, 2013)

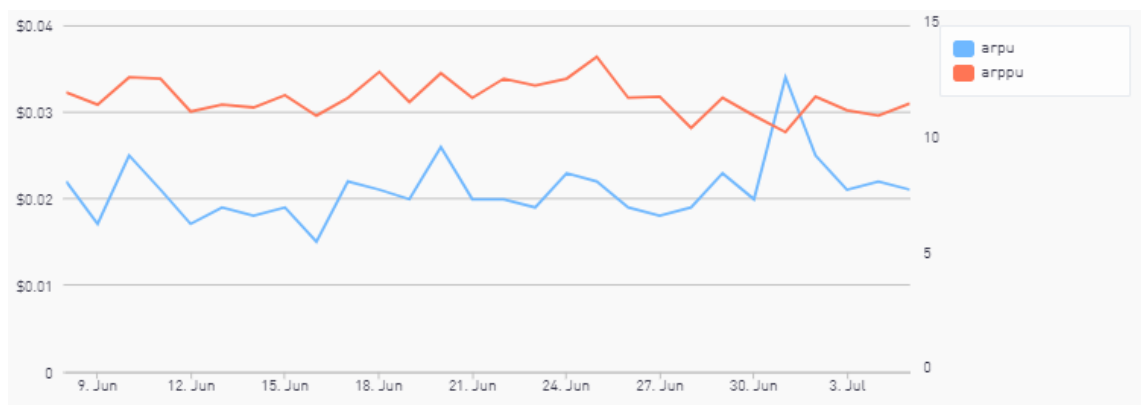


Figure 6. An example of ARPU & ARPPU daily

A mobile game is considered to be successful when it generates positive return on investment (ROI) and positive return of ad spending (ROAS) for its marketing campaigns that aim to acquire users. Life-time value (LTV) is used as a primary revenue metric to measure a user acquisition campaign's success. It tells about the financial value of the game and how much revenue every user will generate during the entire lifetime span that the user plays the game. The easiest way to calculate LTV is to multiply ARPDau by per user's average lifespan. (Appodeal, 2021)

2.5 Synthesis of literature review

According to Cooper et al. (2004), the number of NPD projects has a positive correlation with the company's performance. They discovered that the best performing companies have more NPD projects than the average performing and low-performing companies. To achieve business performance success, a company therefore needs to focus on NPD performance. Moreover, after comparing types of NPD projects between best performers and low performers, it was clear that the former invests in a higher proportion of larger and more innovative projects e.g. fundamental changes in technologies and in business models. On the contrary, the latter has more small and incremental improvement projects.

With double the percentage of truly innovative projects, best-performing companies undoubtedly have a stronger position in the market. Furthermore, Wan et al. (2012) points out in their study that a diverse product portfolio with the right product mix has a positive effect on a company's business performance. Hence, to achieve better revenue, a mobile game company needs to develop high-quality innovative games with a variety of genres that will entertain a wider spectrum of players, as well as effective engagement and monetization mechanics to obtain a larger user base, with an ultimate goal for a higher percentage of monetizing players.

In addition, effective product portfolio management (PPM) plays a key role in achieving the goal of product innovation success, which contains both strategic and operational stages (Cooper et al. 1999). In the strategic stage, PPM helps company make strategic choices about market, products and technologies that the company will invest in. In the operational stage, it guides company to allocate scarce resources and to select right projects among various opportunities; it also makes company keep balance between the number of invested projects and the capacity of resources as well as capabilities available in the company.

When considering how does new product portfolio management facilitate a F2P mobile game company to reach the success of new product development, it can also be analyzed from both strategic and operational perspectives. The first step is to focus on finding out all possible game genres that resonate with company's current resource and competences, with a purpose to increase potential scale of user base. The performance metrics used in this step are engagement metrics, retention metrics and monetization metrics. The second step is to select the most probable game genres that the company will invest in. The aim is to smartly achieve productivity according company's strategic objectives. PPM target and KPI, PPM methods e.g. strategic buckets method and scoring model will be used to help company analyze and make decisions on the selection of genres that bring the best value and are strategically fit according to company's business goals. PPM targets and KPI also help company adjust allocation of resources and competences to new product projects in order to ensure adequate focus will be put on both innovative products and to keep balance of projects in terms of risk level and duration of project. An actively analyzed and developed product portfolio will help the company to explore new business opportunities and thus gain success.

The output is a strategic market expansion opportunities mapping, which charts out the prioritization of new genre opportunities based on financial value and risk level for the company. The output will aid in decision making and ensuring the resources and competencies are in place when needed.

Below figure 7 collects the aforementioned points and presents the genre-selection process facilitated by market research and product portfolio management.

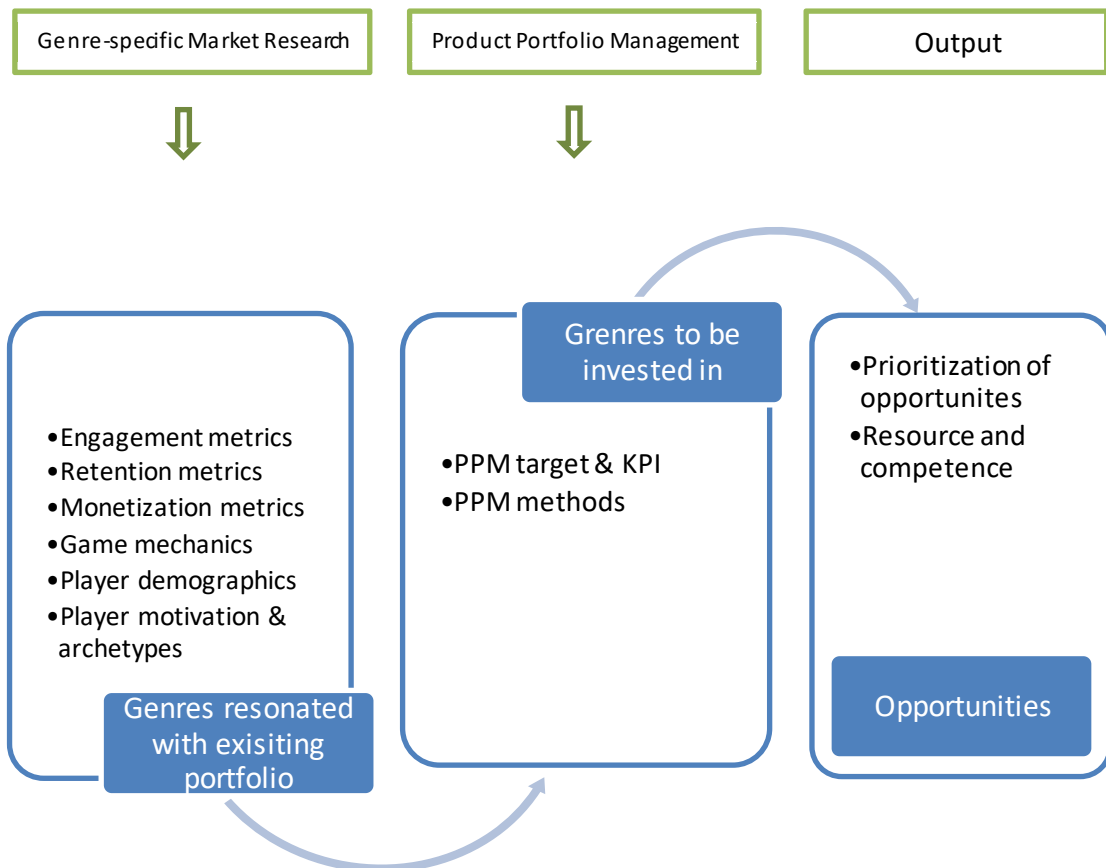


Figure 7. Process of market expansion opportunity mapping in terms of game genres

3 CURRENT STATE ANALYSIS OF THE CASE COMPANY

3.1 Research process

This study is conducted as a single case study (Yin, 2014). Research subject receives a deeper understanding and richer description when the single-case study method is adopted. The current state analysis process is depicted below in figure 8. The goal of the current status analysis is to recognize existing challenges and improvement possibilities by comparing the case company's current processes and practices with the findings from the literature review. The company analysis was focused on key aspects influencing the connection between new product development (NPD) and product portfolio management (PPM). The key aspects comprise new product development process, product portfolio management process, as well as product portfolio objectives and metrics.

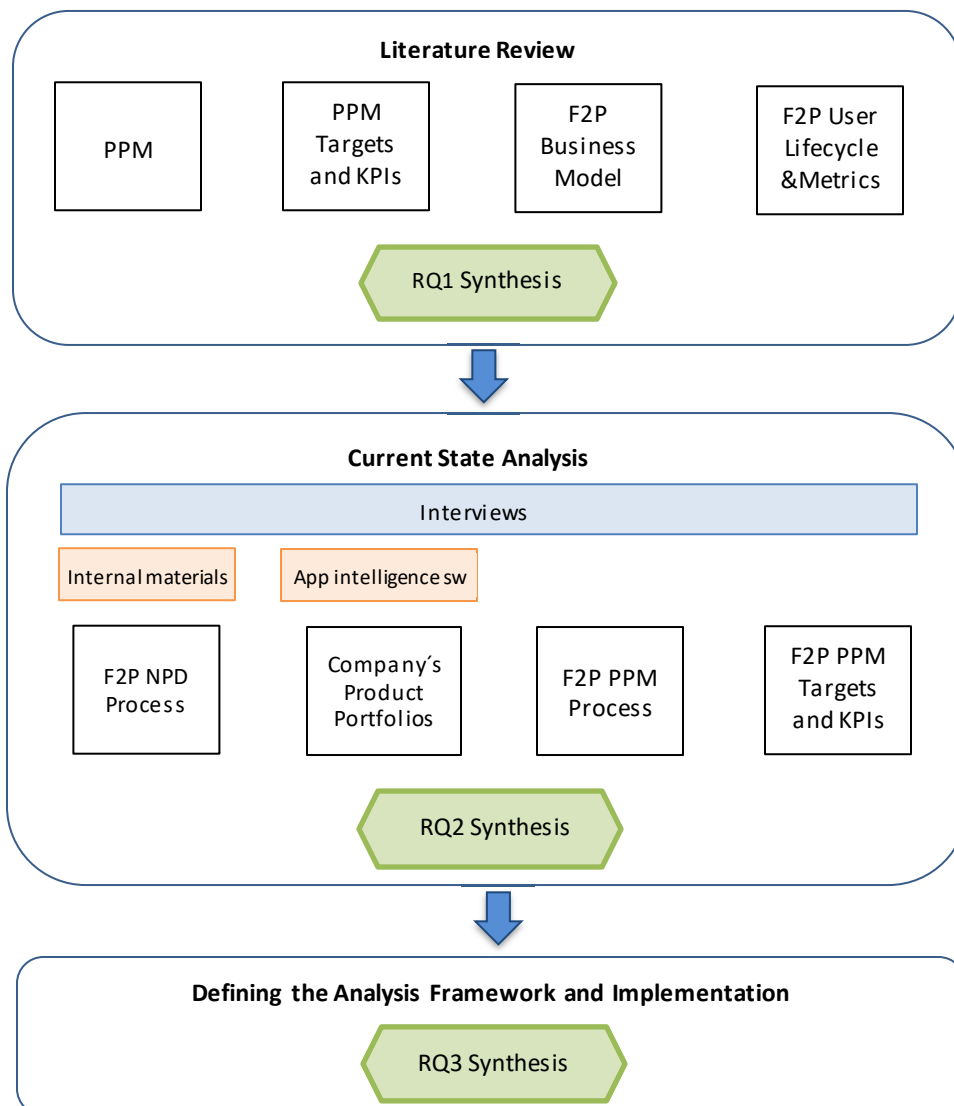


Figure 8. Current state analysis framework

Existing literature was first reviewed to give an understanding to the phenomenon under study by bringing to light the connections between new product development and product portfolio management. The review is intended to help construct a foundation for answering research question 1 and for the creation of current state analysis interview questions. Data for the current state analysis was gathered by the means of semi-structured interviews of the case company's chief operation officer (COO), business development director, brand director and creative director, and by utilizing mobile app intelligence software as well as the case company's internal materials of NPD vision and process. Before the interviews, questions and related information such as new product development, product portfolio management and its focused areas and metrics were sent to interviewees to understand the context. All the sessions were recorded and transcribed for a reliable analysis of gathered data. Based on the company's current state analysis and literature review, an approach for defining product portfolio diversity strategy with PPM strategic targets and KPIs was constructed.

The case company is a game development company and it is worldwide known for its Free-to-Play mobile game franchise in the racing genre. However, the company is yet to seek success with new game titles in other game genres to boost growth. In this part, the current state of the case company will be analyzed based on the findings of literature review, with the goal of finding out challenges and improvement possibilities related to the theme of the thesis. The findings of the current state analysis will be a foundation for constructing solutions for the case company later.

3.2 Current new product development process

The case company has put focus on the new game development thus the game development vision, development process and principles are well thought out. High level documents are shared with all employees and detailed ones are mostly shared with developers.

A game development funnel is created and in use to encourage developers to generate new game concepts, based on which later to design and execute. In the funnel, the developers are allowed to do side projects for a certain number of days in a year, along with their daily work. In case any help is needed, they can ask from cross-functional colleagues. As part of the strategy, developers have the freedom to produce new game

concepts without organizational top-down limitations, as long as the new concept follows the game development vision. Overall, the game development process is divided into five stages: tinkering, game concept, minimum viable product (MVP), soft launch product, post-launch product management, as illustrated in figure 9.

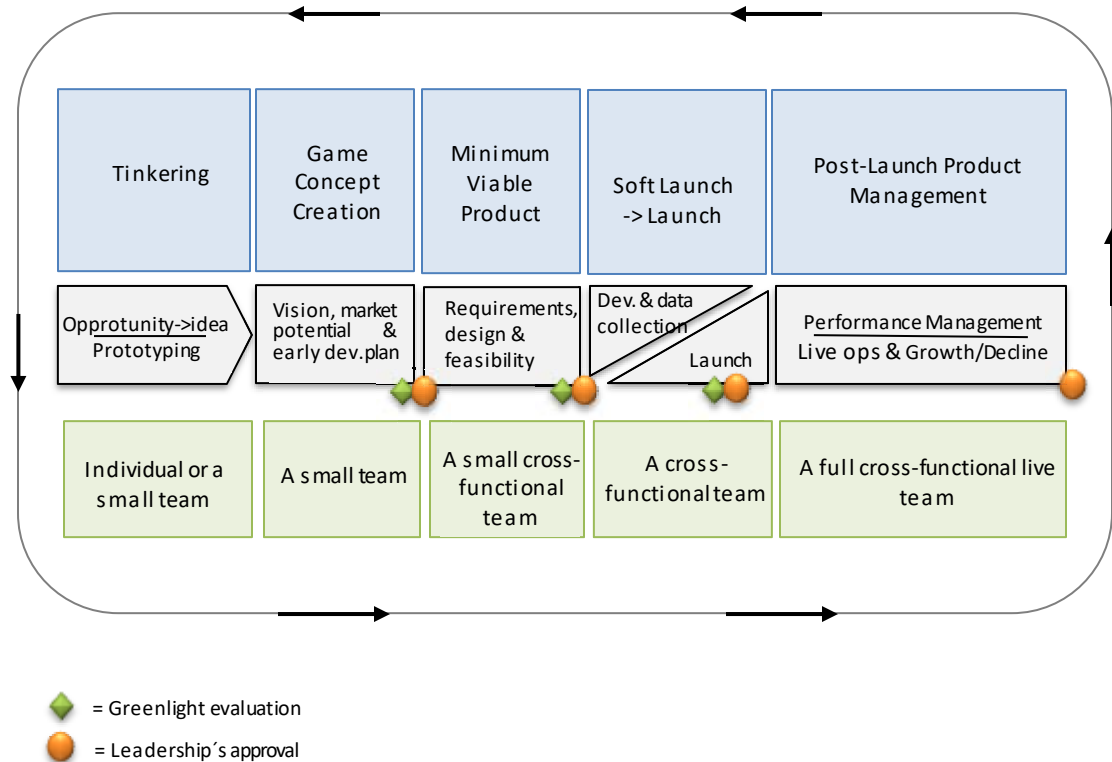


Figure 9. Case company's new product development process

The tinkering stage is to discover opportunities, formulate ideas and make early prototypes. Activities are carried out mostly by one or a small group of developers. Current industry trends and competitors' products are being analyzed in this stage to help formulate ideas.

The game concept stage is to generate the concept and the vision, where the market potential is also assessed. The output of the stage is a presentation about the game vision, the game idea, background information, gameplay design elements, market research of opportunities and competitors, together with an early development plan. The game concept provides an understanding of what the game will be like once finished, its targeted audience and market potential. Developers are also encouraged to make demos to prove the game concept. At the end of the stage, a gate is reached where an evaluation by the greenlight group and a final approval decision by leadership will take place. Only those concepts that pass the gate will continue to the next stage.

In the minimum viable product (MVP) stage, a small cross-functional development team will be formed to start working on product requirements and game design. With an early version of a game at near-final quality, the team is to collect as much as possible amount of data about both the game and players' reactions via internal and external tests to see if it has the potential to become a full product. The aim of this stage is to prove the entertainment of the game. An evaluation is required to assess the feasibility of MVP. Based on the evaluation, the leadership's approval decision is made on R&D investment and full resource allocation for those products which will move forward.

The soft launch product stage is the last stage before global launch of a new game, and generally takes up to 2 years to reach it. When a game is in soft launch phase, the version has most of the features implemented and it is tested in selected markets i.e. countries. As game development is iterative, game design can further be changed and new features can be added in this stage. The aim of this stage is to prove profitability of the game, thus more time and resources are devoted than in previous stages. A cross-functional development team with various ramping-up activities is dedicated to finalizing the game and collecting data from real players to improve players' experience and game profitability. By using data analytics and mobile app intelligence software, it is possible to access player retention and monetization metrics for market approval. Before the global launch, greenlight evaluation will be done to assess the game's performance and the leadership team will perform financial check. The soft launch phase lasts from 6 months up to one year. Only those games hitting KPI targets and with profitable user acquisition and will be globally launched and become live products.

In the post-launch product management phase, games that are proven profitable in the previous stage will evolve into live operations and the growth phase. A full cross-functional live team is reserved to serve the global players and evolution of the game. Updates and new contents are being continuously added to the game to enhance players' experiences and thus reach better profitability. However, most of the games will be ramped down after the global launch due to poor performance. A post-mortem process will be applied to collect lessons learned for improvement of future projects.

Among the five-stage game development process, the first four stages tinkering, game concept, MVP and soft launch belong to the NPD process. It is discovered in the interviews that the game development funnel has been created and in use for couple of

years, but the greenlight evaluation and approval process is just being developed recently. The aim is to facilitate the success of new game development and help better decision-making on the selection of the most promising projects, as well as resource allocation based on the strategic prioritization of the projects. Regarding the NPD process, interviewees highlighted that the company encourages out-of-the-box ideation by not having organizational top-down limitations. Additionally, employees are allowed to use working time for their unofficial game projects, and cross-functional project teams are formed to ensure multi-dimensional thinking and skills. Most importantly, leadership and the company's culture support innovation and proper level of risk-taking spirit. These are all in line with the literature regarding the success factors for NPD. However, the case company has not set an innovation focus or goal and one interviewee pointed out that the organizational level strategic product roadmap doesn't exist, either. Interviewees explained the reason for not having an innovation focus or goal, it is because in the game development the contents and design that can create great experiences for players are the primary things. The focus is more on the contents and design rather than innovation.

3.3 Current product portfolio analysis

Two different ways for constructing portfolios are identified in the interviews. One method is to construct portfolios based on whether the game is live. By using that method all games can be divided into two portfolios: live game portfolio and new game development portfolio. The other method to construct is whether the game is an intellectual property (IP)-based game. In that case, games can be categorized into IP-based game portfolio and non-IP-based game portfolio. Both live game and new game development portfolios contain respectively IP-based and non-IP-based games, and vice versa. In addition, as all of the current live games and IP-based games belong to the racing genre, portfolio of racing game is seen as the case company's live game and IP-based game portfolio. The case company's game portfolios and the number of games in every portfolio are illustrated in the below table 4.

Table 4. The case company's game portfolios

Product portfolios	New game development	Live game
IP-based game	2 game titles (racing)	2 game titles (racing)
Non-IP-based game	3 game titles (1 racing and 2 non-racing)	1 game title (racing)

The case company released the first racing game title 10 years ago. The game soon acquired a large user base and became a worldwide successful IP-based game because of its physics game niche and fun core gameplay. However, it was not a strategic decision to start with the racing genre, the reason was simply that the founder has always been highly enthusiastic about cars.

After 4 years of the first game release, the second part of the game series was launched in 2016. Because of the already well-known IP and high quality of the game, as well as effective cross-promotion and user acquisition, the second part has also become a hit in the racing genre. To date, the game series has been continually evolving, gaining new players and generating more revenues. As a result, two billion downloads were achieved in April 2022 for both game titles globally across all platforms.

Currently, all the live games and IP-based titles reside in the racing genre. After the enormous success brought by the racing game series, the case company, as a young company, developed only racing games before 2019. Along with the growth, the rule was later removed and now there is no longer a limit on genres, providing the game development vision is followed. The new strategy is to develop games that the developers are enthusiastic about and have competence in, with good market potential. In view of seeking further growth, a brand strategy has been also under development recently. It is expected to yield plenty of opportunities for new IP-based games, such as expanding to other genres than racing. Developers will be provided with all the necessary information to generate new game concepts.

Although the IP-based racing games have brought financial success to the case company, the revenue for the racing genre in the market is rather limited; with a 4,18% downloads share among all the apps worldwide, the revenue share is a mere 0,82% (data.ai, 2022).

To further improve business performance, the case company is looking for opportunities to expand market share by developing new game titles also in other genres.

Racing genre overview

In general, the racing genre consists of simulated driving with vehicles, often with the goal of scoring a better time than other players or defeating other players in any manner. The racing genre can be divided into two sub-categories: Arcade Racing and Realistic Racing.

Arcade Racing is virtually a simulation of driving in real-time within a cartoony/non-realistic environment with a direct feedback (break/gas/drift etc.), often presented in 2D graphics. The case company's games are a fitting example of Arcade Racing games as the game titles have 2D graphics and a cartoony art style. Realistic Racing games, on the other hand, are often a simulation of driving necessarily without direct control of the vehicle that the player is racing with. The art style of Realistic Racing games is often 3D with chrome polish as the intention is to simulate real-world vehicles and racing. This can also be seen with IP presentations and real-life car brands such as Porsche, Mitsubishi, etc. being available to drive in realistic racing game titles.

The core distinction between Arcade Racing and Realistic Racing is that Arcade Racing aims to give players a more casual and direct approach to racing, whereas Realistic Racing targets to simulate driving luxury or other high-class vehicles. In general, this distinction makes Arcade Racing more casual as there is usually no real-world relation to the gameplay, providing the feeling of escapism and simple gameplay with direct button feedback. Realistic Racing game titles are considered more niche since the target player is often a car/vehicle/racing fan that is prone to follow real-world competitions and tournaments such as a rally or F1 series.

In the list of data.ai worldwide top-grossing racing game apps, the case company's game title ranked No. 11 with 17,9 million downloads, \$6,02 million revenue and revenue per download (RPD) \$0.24 in the time period of last 6 months from 8.2021 to 1.2022. The No.1 game title is QQ Speed by the Chinese company Tencent with 6,11 million downloads, \$48,10 million revenue and RPD \$8,91. Comparing the game's engagement, the case company's game title has 6,66 million average active weekly users (WAU), with the average number of sessions per daily active user (DAU) of 56 and an average duration per session of 4 minutes 17 seconds. QQ speed has 3,61 million average WAU, with the

average number of sessions per DAU of 50 and the average duration per session of 7 minutes 49 seconds. In comparison, the case company has the advantage of a large user base but does not perform very well with revenue generated by in-app purchases (IAP). Furthermore, the duration per session is the shortest among all the top 11 racing games by revenue.

Taking a closer look at the game mechanics of racing games that have the most impact on IAP revenue. According to GameRefinery, the top features are synchronous PvP, user-generated content, recurring live events, battle pass plan and special rewards from limited-time live events. Synchronous PvP means a player plays against other actual human players in a real-time setting, which brings more excitement to the players. The user-generated content feature allows players to generate their own playable content e.g. new levels in a game and to share with other players. The generated content will affect the game's world and players' gaming experience. The implementation of the feature is to boost player engagement and socialization. Recurring live events let players participate in recurring limited-time events which last only a certain amount of time and have a special theme or mechanics. Special rewards from limited-time live events encourage players to participate in limited-time events by giving them opportunities to earn special exclusive rewards. The aim of these two features is to improve user retention. With a battle pass, players will obtain rewards by progressing through various thresholds in the plan e.g. completing a set of tasks. This season-based monetization mechanic has both free and premium tiers. The free tier is for all players, whereas the premium one with better rewards can only be unlocked with purchase. These social, retention and monetization features affect the quality of users' experience thus further impacting heavily on IAP revenue.

In order to make commercial success, it is important to understand who the players are and what they prefer. Because of data availability and the USA is the world's second biggest mobile game market with a revenue of 36,92 billion U.S. dollars in 2020 (Statista, 2022), next we will look at the American players' demographics and motivation for the racing genre.

It is commonly thought that the majority of mobile game players are men. While the idea might be misleading for some genres, it is true for racing games. During the time period from 8.2021 to 1.2022, the monthly average percentage of female players is about 33% and male players 67%. As mobile games have become available on almost everybody's

mobile phone, the age spectrum of players has grown. During the same time period, on average 45% of monthly players are between the ages of 16 and 24, 37% of players are 25 to 44 years old, and 18% of players are over 45 years old. When looking at the players' motivation for playing racing games, the number one reason is entertainment and escapism from reality (4.9 out of 5). Other biggest motivations for playing include improving skills (4.2) and competition (3.5).

3.4 Current product portfolio management practices

Unlike other products, every mobile game requires its own design and development. The development duration can be up to 2 years in the case company. Because of that characteristic, the number of games doesn't grow quickly. Therefore, the case company has emphasized portfolio management on the new game development portfolio. For other portfolios the management is more on the individual products rather than on the portfolio level.

3.4.1 Product portfolio management process

It is discovered from the interviews that the case company applies different portfolio management processes according to the contents and goals of portfolios. The current main goal for IP-based game portfolio management is to reach an as wide as possible player base by targeting different user groups with different game design and modes, whereas the target for new game development portfolio is to develop new games that are based on innovative ideas, have the best gameplay in their specific genre, provide smooth and immersive experience to players, as well as bring adequate revenue to the company.

To seek further growth, the case company has increased emphasis on new game development. A new game development evaluation and approval process is being defined. The process consists of gates at the end of every development stage, greenlight metrics and evaluation group, together with approvals by the leadership team. Greenlight evaluation group is formed by a cross-functional team of experts inside the company. Based on the group's recommendation, the leadership team makes decisions regarding continuation of new game development. More importantly, R&D investment and resources allocation decisions are made by the leadership team after approval.

A new game development portfolio management process is needed mainly when making

decisions on R&D investments and resource allocation. Strategy alignment and scoring model methods are being applied in the process. New game development is guided by the game development vision and strategy through the development process. Scoring model is first applied to assess every new game project from various aspects such as concept, gameplay, business potential, and players' experience. Based on the comparison of the score results, as well as consideration points such as level of user engagement, scale of market potential and return on investment at a later stage, a pool of R&D spending and resources will be divided and allocated to approved projects in stages until the budget and resource reach their limits.

3.4.2 Product portfolio targets and key performance indicators

Although the product portfolio targets are not explicitly specified, according to the description of interviewees, three identified product portfolio targets i.e. strategy alignment, value maximization, and balanced portfolio are taken into consideration to some extent.

The case company has set vision and strategy for new game development, which act as guidance for development work. The greenlight and gate process will make sure only those games that are strategically aligned and have the biggest market potential will be carried out to the live phase and receive full resource allocation.

Resource allocation is planned based on the success potential forecast. By using that principle, new IP based-games are prioritized for R&D spending and resource allocation. Live IP-based games have proven that they provide superb experience for players, thus bringing the best return on investment for the case company.

By having different general goals for portfolio of IP-based game and portfolio of new game development, the case company aims to achieve business objectives with securing financial income with the highly recognizable IP-based racing games, while simultaneously continually developing new game titles with the out-of-the-box ideas and without limitation to the racing genre. Furthermore, the new IP-based games' targeted players will ideally belong to other player groups than the existing ones of current live IP-based games. The goal is to expand the player base with new game titles thus to increase the possibility of financial success.

The industrial standard KPIs of user engagement, user retention and monetization for individual products are being utilized to evaluate the product portfolio performance. The values can be conveniently obtained from mobile app intelligence software for strategy alignment and financial performance KPIs. However, they are mainly used to assess individual product performance. Based on the interviews, a summary of each portfolio's targets and KPIs are described in the following table 5.

Table 5. Targets and KPIs of the case company's each game portfolio

	Strategic alignment	Value maximization	Balanced portfolio
New game development portfolio	Evaluation and approval process in use to guide development and reflect resource allocation prioritization. Strategy approach and scoring model are used.	Industrial standard KPIs are used to measure users' behavior and monetization.	Development of IP-based games to secure financial performance. Development of non-IP-based games to try innovative ideas.
Live products portfolio	No specific KPIs are set, because products succeed and come from the development phase.	Industrial standard KPIs are followed to make decisions on how to increase revenue. Products bringing poor revenue will be removed from the market.	No specific KPIs are set, because products succeed and come from the development phase.
IP-based games portfolio	New IP-based game development aligns with game development vision and strategy. Brand strategy is under development. The new game development process is followed. Otherwise management on individual product level	All IP-based games reside in the racing genre. Future brand strategy will provide possibilities for further growth, including having new games in other genres. Otherwise management on individual product level	Every IP-based game has a different targeted player group to enlarge the whole player base
Non-IP-based games portfolio	New game development process is followed. Otherwise management on individual product level	Industrial standard KPIs are followed for individual product	Management on individual product level

3.5 Current state synthesis

Based on the current state analysis, the evidence has shown that the case company has emphasized on the new game development and its portfolio management. Game development vision and strategy, evaluation and approval process have been created to guide and facilitate the successful development of new games. Product portfolio management (PPM) practices like processes, targets and metrics, together with decision points and criteria, are well planned and gradually taken into use. Product portfolio management process as an executive-level decision-making process of performance management is used mainly on new game development portfolio to help make decisions on selection of new game projects with the highest potential. Moreover, the used portfolio method in PPM of strategic approach and scoring model facilitate resource allocation based on the strategically prioritized new game projects. Portfolio performance is measured mostly using the industrial standard KPIs of user engagement, user retention and monetization to ensure the fulfilment of strategic fit and value maximization. As for other portfolios, the current focus is rather on individual product performance management. The reason behind is that for creative products like mobile games, resource management such as the formation of a development team is rather challenging and largely depends on the passion and interest of developers, instead of organizational top-down decision making.

Even though the overall situation with the NPD and its PPM is good, some problems are identified in the interviews. Despite the enormous success with racing games, the case company is looking for market expansion opportunities with other game genres for further business growth. However, there is no organizational level strategic roadmap to describe what are the most important genres or target player groups. In what genres the new games will be developed in the future is currently solely based on the proposals from developers, because of the earlier mentioned reason. Thus they cannot be systematically analysed to achieve new product objectives. Moreover, when game development doesn't have a strategic roadmap and is solely based on developers' enthusiasm and passion, the case company is not able to foresee how the new game development will affect resource allocation of other portfolios, neither to form concrete long-term business objectives and make resource forecasting. Thus, challenges of having a strong fit between realization of NPD with existing competencies and capabilities will also rise.

4 DEFINING THE ANALYSIS FRAMEWORK FOR MARKET EXPANSION

The aim of market expansion for the case company is to release game titles in other genres in addition to the racing genre, hence enlarging player base and improving revenue. With the existing capabilities and competence, the selected genres should resonate with the racing game portfolio yet bring new market opportunities. However, according to the current game development strategy, developers will propose new game concepts based on their interests. As a result, the case company is not able to foresee how the new game development will affect resource allocation of other portfolios, nor to make resource forecasting or form concrete long-term business objectives. To tackle the challenge, a framework with product portfolio management (PPM) targets and key performance indicators (KPIs) for analyzing genre portfolio expansion opportunities is proposed to help the case company provide the direction of market expansion to developers. This is not to set limitations but rather to provide additional information to developers about genre opportunities of the company. When information and directions are available and visible, developers will come up with game concepts that are not only favourable for the company, but also have good market potential yet they are passionate about.

4.1 Genre portfolio expansion analysis framework

The portfolio expansion analysis framework describes a high-level analysis process to discover game genre diversity in terms of market expansion. The purpose of the framework is to identify game genres that are strategically aligned, are possible to be developed with the company's existing capabilities and competence, and balance the portfolio's game genre mix to maximize return on investment. A prioritization matrix as the output provides market expansion directions and emphasizes the prioritization to ensure focusing on high-value and lower-risk genres first. Figure 10 illustrates the proposed analysis framework, which is followed by the output matrix in figure 11.

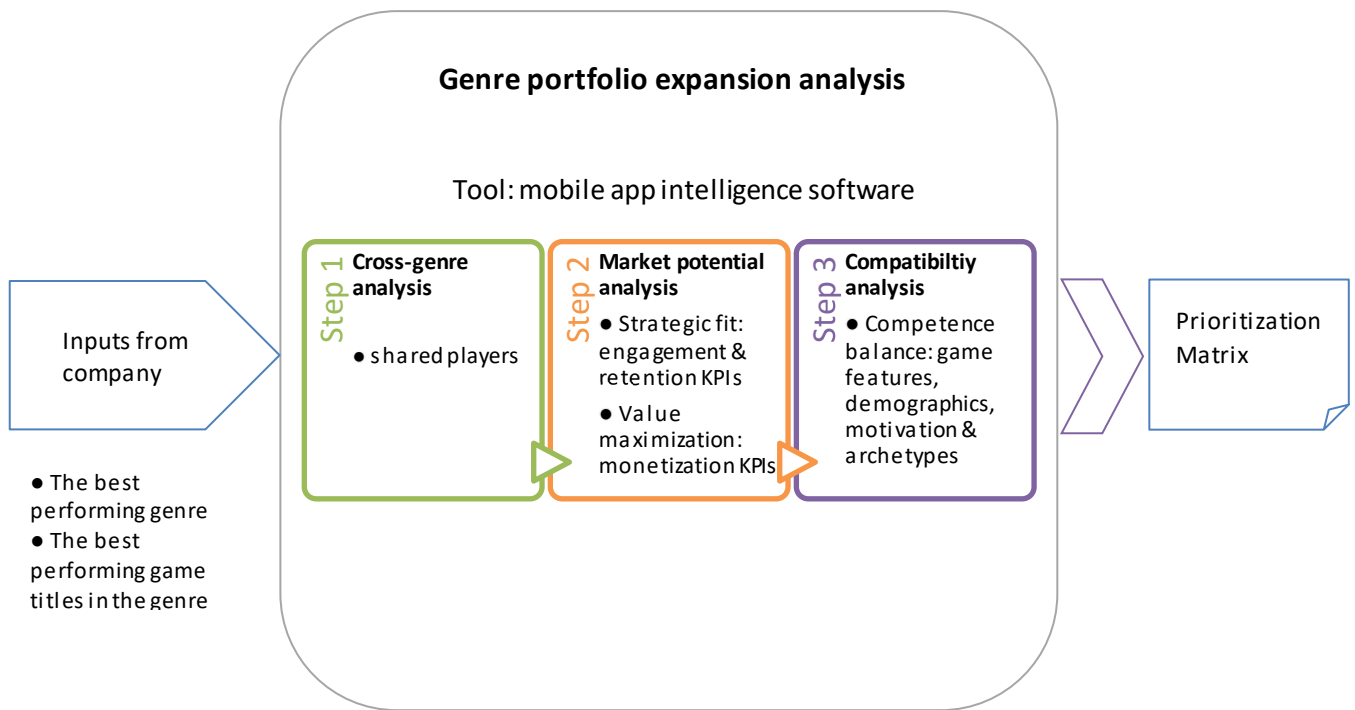


Figure 10: Genre portfolio expansion analysis framework

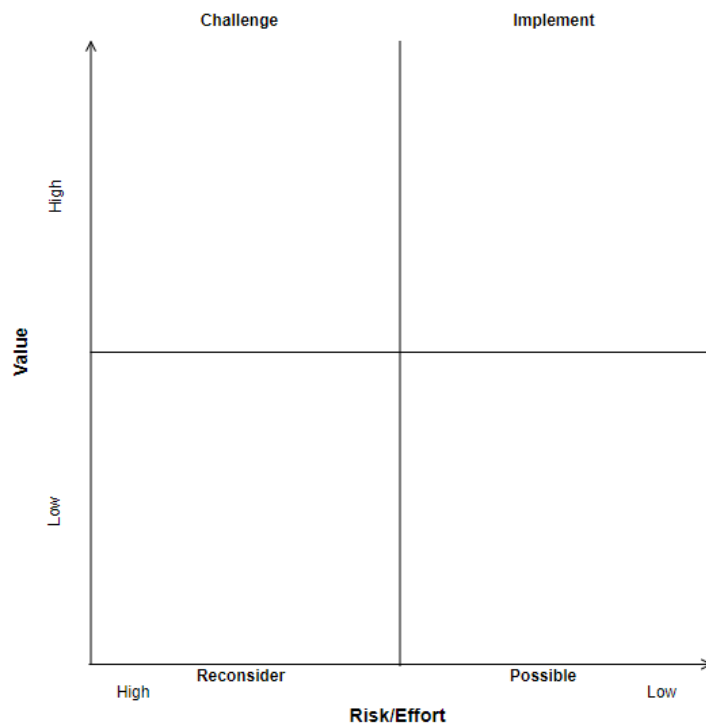


Figure 11: A prioritization matrix as the output of the genre portfolio expansion analysis

The analysis process starts with input. The input comprises the company's best performing genre and the most successful game titles in the genre. Every time when a

change happens in the input, the process should be revisited to ensure the accuracy of the output. The analysis process's output is a prioritization matrix which plots all the resonated genres in a four-square matrix, with the y-axis representing the financial value the genre could bring and the x-axis representing risk/effort taking into account related experience and existing competence and capabilities. The required tool needed for performing the analysis is the mobile app intelligence software, from where the industrial standard KPIs are obtained and the analytics are done. The pre-requisite is the company's existing PPM for new game development.

The Mobile app intelligence software provides analytical data of all mobile apps that are available on Android and iOS app publishing platforms including case company's. The software can be used to discover growth opportunities by observing the industry leaders' performance and tracking the industry trends, by understanding app users' behaviors and demographics, and by gaining deep knowledge of the market. By using the software in the analysis, all available game genres on the market can be compared to each other and then be selected based on the PPM targets and KPIs.

Best performing genre and game titles as inputs provide foremost the possibility of benchmarking with other genres and industrial trends in the market. Upon doing so, the compatible genres which resonate with the company's existing capability and competence for example in game development and user acquisition can be discovered. In this way, the probability of success is improved.

The prerequisite is the company's existing PPM for new game development. When analysing what game genres to expand, the new opportunities are connected to new product development and the findings should be possible to fit in the new product development portfolio at a later stage. Therefore, the same PPM focus areas should be followed during the analysis process, thus strategic fit, value maximization and portfolio balance are being used. However, the game genres for market expansion purpose are of different nature and thus KPIs should be dedicated for genre-level portfolio in terms of product portfolio management.

The strategic fit target and related KPIs are used to ensure the selected genres are aligned with the new game development vision. Player engagement describes the extent how deeply players are immersed and how much value they perceive. The KPIs used to measure player engagement are for example session data of average how often and how

long players play, as well as retention data depicting how many players return to play again after first-time app launch in their devices. Stickiness tells about how many days in a month an active player engages in a game.

The value maximization target and related monetization KPIs are used to ensure the best return on investment from the selected genres and thus maximize the portfolio value. Market size and revenue give a general picture of each genre's market potential. Specific KPIs explain in detail about revenue from players. ARPPU tells about the average revenue per user spend and ARPDAU illustrates the average return from each player in a single day. Conversion data tells about the percentage of players who made an in-app purchase that day.

The purpose of portfolio balance target and KPIs is to keep balance of development competence and capability related risks. Similarity of game features is used to ensure low risk in game design by aiming for more combinability in key features. Possibility of using existing user acquisition (UA) channels such as in-game cross promotion ensures to effectively gain a large player base. Similarity of players' motivation and archetypes is suggested to ensure better acceptance from players. Table 6 lists the three targets of genre portfolio management and categorizes the KPIs for each target.

Table 6: Genre portfolio focus areas and KPIs

Strategic fit KPIs
<p>Strategic prioritization based on the vision statement</p> <p>If game genres aligned with game development vision</p> <p>Level of user engagement:</p> <p>Day 1 retention (target 35-40% / actual%)</p> <p>Day 7 retention (target 15-20% / actual%)</p> <p>Average session length (min)</p> <p>Average number of session/DAU</p> <p>Stickiness: DAU/MAU (target 18% / actual%)</p>
Value maximization KPIs
<p>Market potential and performance</p> <p>Monetization:</p> <p>Downloads</p> <p>Downloads share (%)</p> <p>Revenue (\$)</p> <p>Revenue share (%)</p> <p>ARPU (\$)/ARPPU (\$)/ARPPDAU (\$)</p> <p>Conversion (%)</p>
Balanced portfolio KPIs
<p>Compatibility with current genre, existing competence and capability, in order to reduce risks</p> <p>Proportion of shared players with the current genre</p> <p>If any related experience</p> <p>If existing user acquisition (UA) channels can be used, e.g. in-game cross-promotion</p> <p>Number of same game features/mechanism</p> <p>Players demographics</p> <p>Players motivation</p> <p>Players archetypes</p>

As the output of the analysis process, a prioritization matrix displays the results visually based on the financial value that they could bring to the company and compatibility with existing capabilities. Each genre will be plotted in one of the quadrants which helps to determine the priority of its investment. The position of the genre in the matrix illustrate its prioritization in relation to all others'. The four quadrants in figure 11 are named Implement, Possible, Reconsider and Challenge (clockwise from top right).

4.2 Implementation of the genre portfolio expansion analysis

The analysis was performed as a part of the thesis to demonstrate the utilization of the framework. As mentioned earlier, the purpose of the genre portfolio expansion analysis is to provide information for game development about market expansion opportunities with other game genres than racing which is the best performing genre of the case company. The analysis is performed with a few selected KPIs at a high level i.e. on genre level not including sub-genres due to the time constraint. The selected KPIs are from each portfolio focused area.

The mobile app intelligence software used in the analysis is data.ai and GameRefinery. Most of the values of KPIs can be found in data.ai and the rest of them i.e. game features and player motivation are from GameRefinery. The chosen data range used in the analysis is last six months from 10.2021 to 3.2022 at the time when this part is under progress. The analysis is performed in 3 steps. In the first step, the input for the analysis is racing, the best-performing genre of the case company and the most successful game titles under the genre. The analysis starts with finding out game genres that have shared players with racing. This step is to ensure that the case company can use existing user acquisition channels to effectively acquire players for those genres. Those completely unrelated genres are filtered out in this step. Other used criteria are whether the genre aligns with game development vision and whether it belongs to global market top grossing genres. It is also taken into consideration that what are the game genres that the players of the case company's top grossing racing game titles are mostly like to play. The findings of the first step are shooting genre, sports genre, action genre, strategy genre, simulation genre and role-playing game (RPG) genre. The result is illustrated in below figure 12:

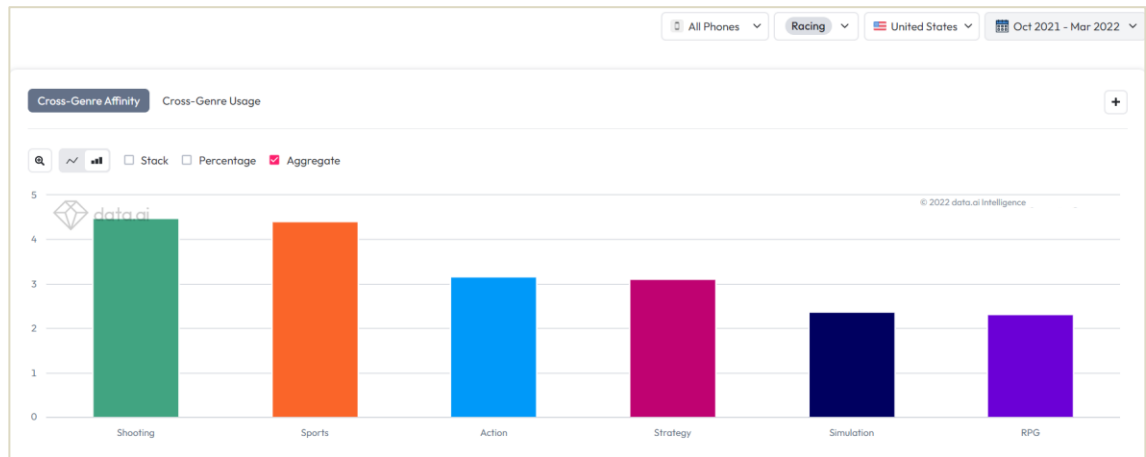


Figure 12: The proportions of shared players from game genre shooting, sports, action, strategy, simulation and role-playing game (RPG)

















The output of the first step is then used as input of the second step. In this step, the selected genres are both compared with each other and benchmarked with the racing genre in terms of market share and performance, player engagement. The goal is to understand their performance, current market positions and the market trends. Table 7 shows the market position and market performance of RPG, strategy simulation, shooting, action, sports and racing genre. The genres are listed in a descending order based on the revenue. Although RPG's downloads and revenue have dropped, its revenue share is still nearly half of the total revenue of the mobile gaming market at 42.02%. On the contrary, the revenue share of the racing genre is only 1.08%. In the list, action is the only genre whose revenue has grown during the last 6 months from 10.2021 to 3.2022.

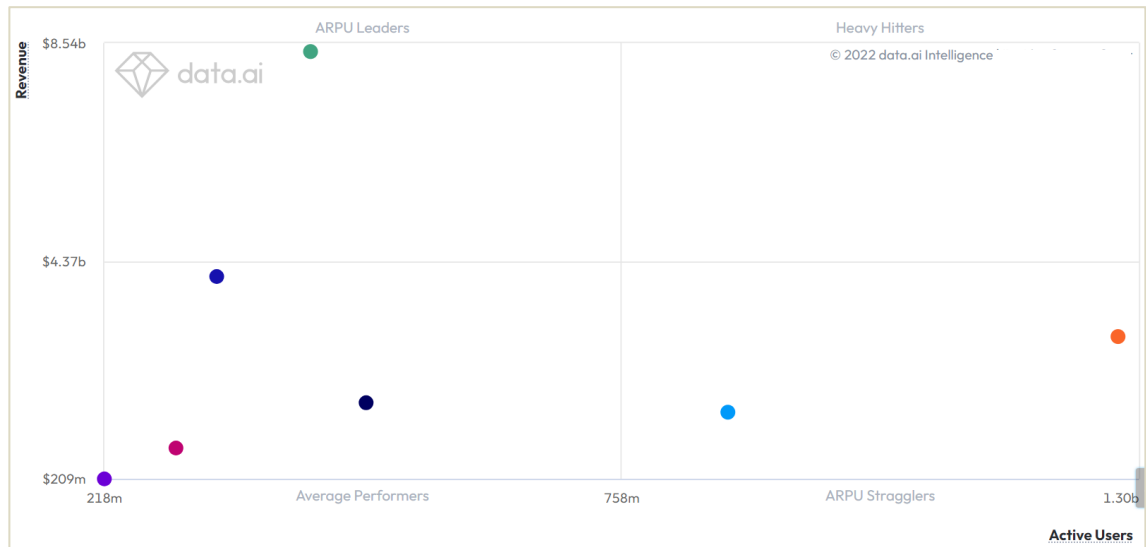
Table 7: market position and performance of game genre RPG, strategy, simulation, shooting, action, sports and racing (10.2021 – 3.2022)

#	Classification	Downloads	Downloads Share	Revenue	Revenue Share
1	RPG	595m ▼ 13%	5.71%	\$8.87b ▼ 8%	42.02%
2	Strategy	580m ▲ 6%	5.57%	\$4.41b ▼ 5%	20.88%
3	Simulation	3.82b ▲ 6%	36.66%	\$3.30b ▼ 9%	15.66%
4	Shooting	1.17b ▲ 6%	11.18%	\$1.85b ▼ 3%	8.78%
5	Action	2.50b ▲ 6%	24.00%	\$1.59b ▲ 5%	7.53%
6	Sports	775m ▲ 10%	7.43%	\$853m ▼ 12%	4.04%
7	Racing	986m ▲ 0.81%	9.46%	\$227m ▼ 18%	1.08%

The below table 8 shows the revenue and number of active users of each selected genre. Genres are listed in a descending order based on the revenue. Based on those numbers, average revenue per user (ARPU) values are calculated and plotted in the X-Y graphic, where X-axis is number of active users and Y-axis is revenue. The software tool further categorised the genres into 4 categories based on their ARPU performance to describe each genre's user monetization performance: average performers, ARPU stragglers, ARPU leaders, and heavy hitters. The plot in figure 13 illustrates that racing, sports, strategy and shooting are average performers, meaning their ARPU is relatively low comparing to other genres. It is easy to notice that the racing genre has the lowest ARPU. Action and simulation each has a large user base but monetization of existing users are low thus they belong to ARPU stragglers. RPG has successfully monetized a relatively smaller user base resulting in high ARPU, so it belongs to ARPU leaders category. However, none of those genres are in the heavy hitters category, where a large user base is successfully monetized.

Table 8: Active users and revenue of game genre RPG, strategy, simulation, shooting, action, sports and racing (10.2021 – 3.2022)

<input checked="" type="checkbox"/>	#	Classification	Active Users 	Revenue 
<input checked="" type="checkbox"/>	1	RPG	433m  48m	\$8.37b  \$805m
<input checked="" type="checkbox"/>	2	Strategy	336m  60m	\$4.07b  \$190m
<input checked="" type="checkbox"/>	3	Simulation	1.27b  129m	\$2.93b  \$312m
<input checked="" type="checkbox"/>	4	Shooting	491m  12m	\$1.66b  \$34m
<input checked="" type="checkbox"/>	5	Action	868m  109m	\$1.49b  \$90m
<input checked="" type="checkbox"/>	6	Sports	294m  47m	\$790m  \$112m
<input checked="" type="checkbox"/>	7	Racing	218m  14m	\$207m  \$46m



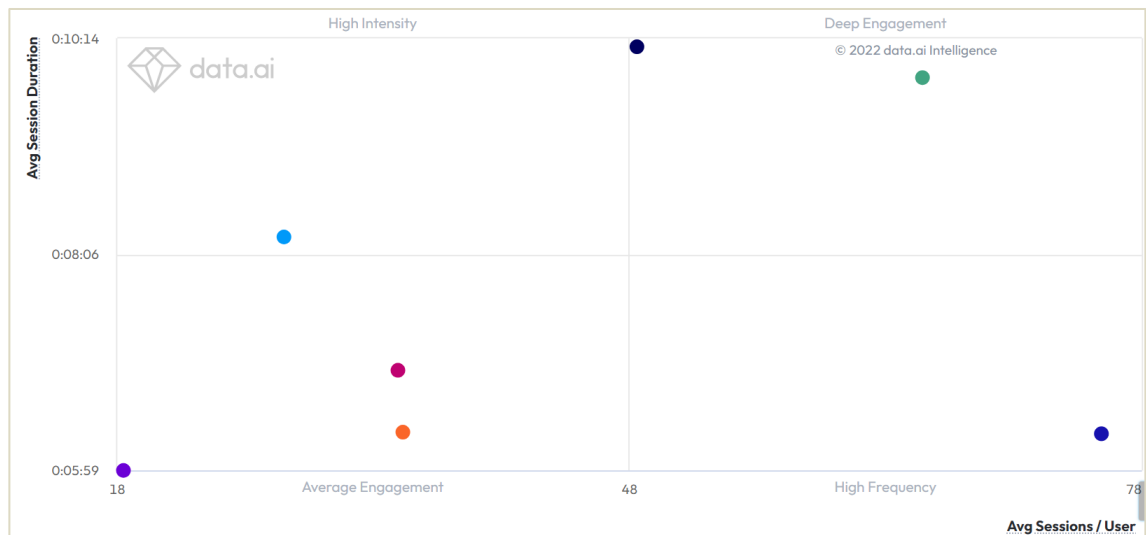
● Racing ● Strategy ● Simulation ● Sports ● Action ● RPG ● Shooting

Figure 13: User monetization performance of game genre RPG, strategy, simulation, shooting, action, sports and racing (10.2021 – 3.2022)

The below table 9 shows the user engagement session data of each selected genre. The used KPI is average session duration per user, and based on which genres are listed in a descending order. The shooting has the longest average session length per user whilst racing has the shortest. The performance of each genre's user engagement is also plotted in a X-Y axis graph to illustrate their performance position in four categories: average engagement, high intensity, high frequency and deep engagement. The X axis stands for average number of sessions/user per month for the last 6 months from 10.2021 to 3.2022, and Y axis is average session duration per user for the last 6 month. Racing, simulation and sports are classified as the average engagement, which means improvement needed in increasing usage with new engaging features. Action is classified as high intensity and that means less frequent usage but with a longer period of time. Strategy games are played more frequently but with a shorter period of time so it is plotted in high frequency category. Among all these genres, shooting and RPG have the best user engagement thus are plotted in deep engagement category; their games are played frequently and for a relatively longer period of time.

Table 9: Session data of game genre RPG, strategy, simulation, shooting, action, sports and racing (10.2021 – 3.2022)

✓	#	Classification	Avg Sessions / User ↕	Avg Session Duration ↕
✓	1	Shooting	48.49 ↓12	0:10:09 ↓0:00:12
✓	2	RPG	65.19 ↓7	0:09:51 ↑0:00:20
✓	3	Action	27.77 ↓4	0:08:17 ↑0:00:21
✓	4	Sports	34.48 ↓0.4	0:06:58 ↓0:00:08
✓	5	Simulation	34.75 ↓2	0:06:21 ↓0:00:07
✓	6	Strategy	75.66 ↑5	0:06:21 ↓0:00:35
✓	7	Racing	18.37 ↓2	0:05:59 ↑0:00:49



● Racing ● Strategy ● Simulation ● Sports ● Action ● RPG ● Shooting

Figure 14: User engagement performance of game genre RPG, strategy, simulation, shooting, action, sports and racing (10.2021 – 3.2022)

In the third step, the focus is on finding out the compatibility of selected genres with the racing genre. The mobile app intelligence software used for analysis is GameRefinery. The compatibility of the player motivations is analysed here as a demonstration. Similar analysis should be performed as well based on other KPIs for balanced portfolio target. Player motivations explain reasons why players play the game and keep coming back, which is rather important for game developers to understand when they want to create games that people really want to play. The top 3 motivation drivers for racing genre are escapism - excitement & thrill, mastery - improving skills, and social - competing against

others. Below figures 15a to 15f are screenshots from GameRefinery about comparisons of each selected genre's player motivations with the racing genre.

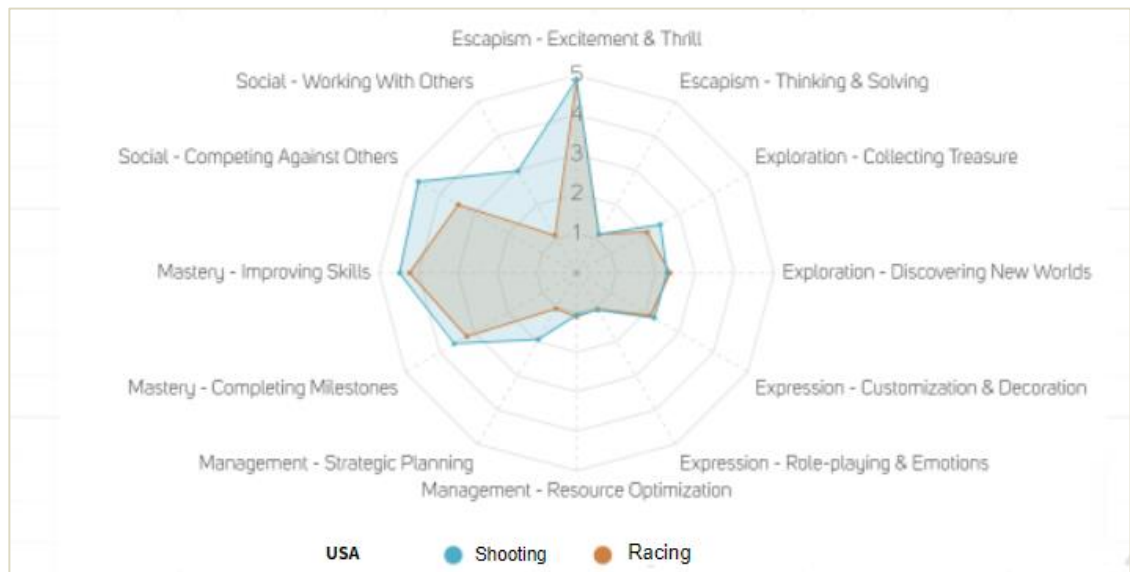


Figure 15a: Player motivations comparison between genre shooting and racing



Figure 15b: Player motivations comparison between genre sports and racing



Figure 15c: Player motivations comparison between genre action and racing

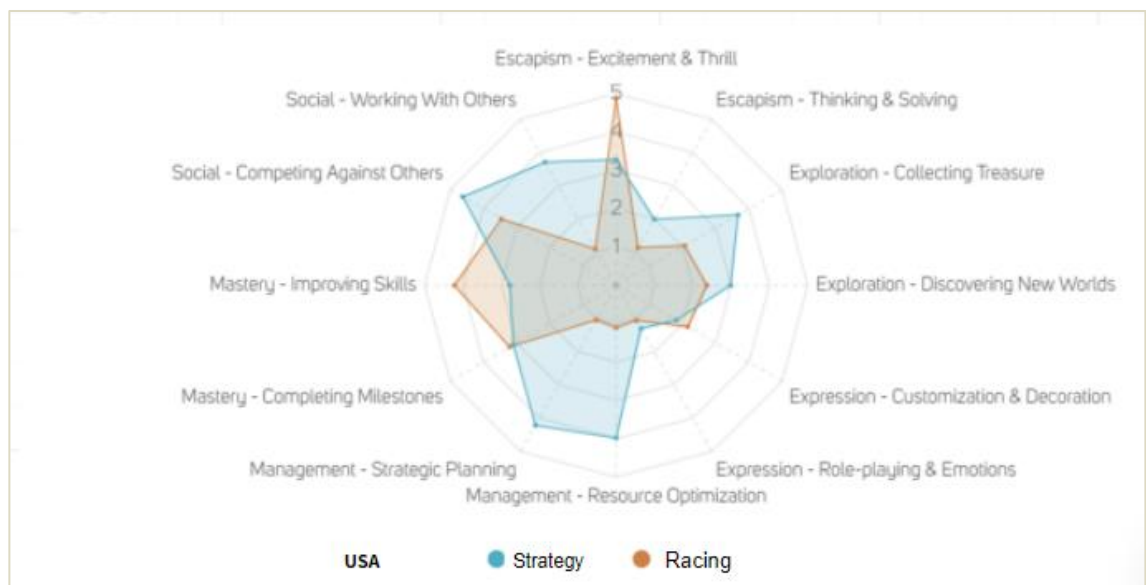


Figure 15d: Player motivations comparison between genre strategy and racing

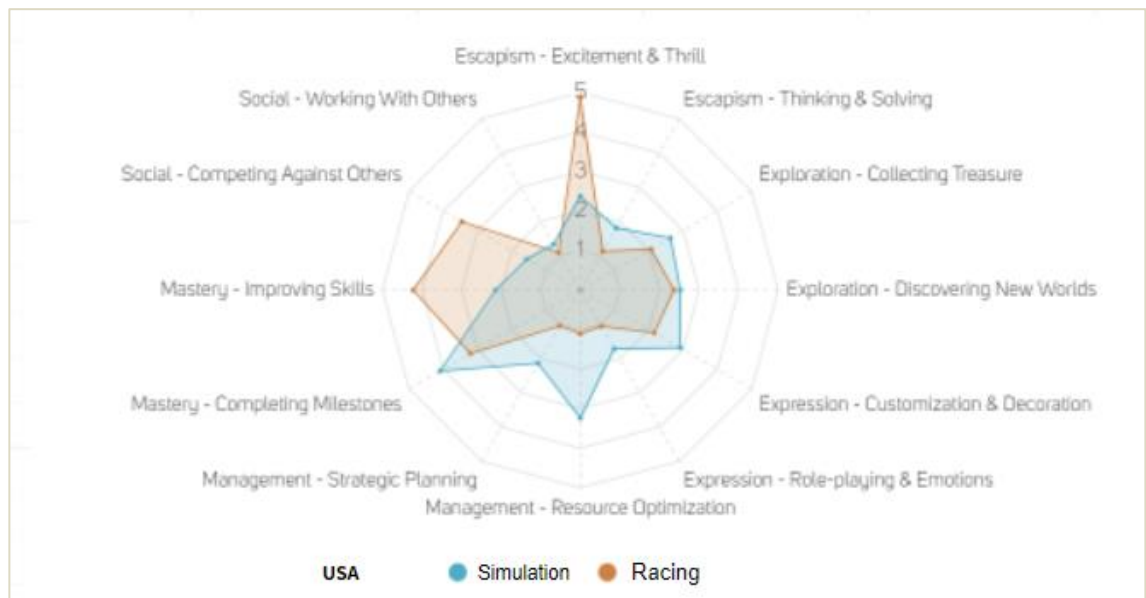


Figure 15e: Player motivations comparison between genre simulation and racing



Figure 15f: Player motivations comparison between genre RPG and racing

The compatibility of the player motivation of selected genres with racing genre is summarised in the below table 10. The three most important motivation of each genres are selected to conduct the benchmarking. The results show that players of shooting and sports games play for almost the same reasons compared to racing games. They share the top 3 motivational drivers: escapism - excitement & thrill, mastery - improving skills, and social - competing against others. Players of action and RPG games share two out of three

most important motivations with the racing games. However, the similarity can be hardly found in strategy and simulation.

Table 10: Compatibility of the player motivation between game genre shooting, sports, action, strategy, simulation, RPG and racing

	Motivation driver no.1	Motivation driver no.2	Motivation driver no.3
Racing	Escapism: Excitement & thrill 4.9	Mastery: Improving skills 4.2	Social: Competing against others 3.5
Shooting	Escapism: Excitement & thrill 4.9	Social: Competing against others 4.6	Mastery: Improving skills 4.5
Sports	Escapism: Excitement & thrill 4.6	Social: Competing against others 4.5	Mastery: Improving skills 4.3
Action	Escapism: Excitement & thrill 4.7	Mastery: Improving skills 4.2	Mastery: Completing milestones 3.6
Strategy	Social: Competing against others 4.6	Management: Strategy planning 4.2	Management: Resource optimization 4.0
Simulation	Mastery: Completing milestones 4.1	Management: Resource optimization 3.2	Expression: Customization & decoration 2.9
RPG	Exploration: Collecting treasures 4.0	Escapism: Excitement & thrill 3.6	Mastery: Improving skills 3.4

After completing the 3-step analysis, a high-level conclusion can be drawn based on the findings. The favourable genres for the case company to develop games in terms of market expansion should be strategically aligned, could bring the best financial value and have a high possibility of success with existing competence and capabilities. Among the selected six genres, although sports and shooting genres resonate the best with the racing genre in terms of development capabilities, action and RPG genres have better opportunities in monetization success. Simulation and strategy genres, on the other hand,

hold more risks in comparison to others due to lack of experience in the case company. To plot these selected genres on the prioritization matrix, having X-axis defined as financial value the genre could potentially bring and Y-axis as related experience and compatibility with existing capabilities, the output is shown in below figure 16. According to the matrix, RPG, shooting and action genres should gain higher prioritization in investment than sports, strategy and simulation genres.



Figure 16. A prioritization matrix of genre portfolio expansion opportunities

5 CONCLUSIONS

5.1 Key findings

The goal of the study is to find out the mobile gaming industry market expansion opportunities in terms of game genre diversity for the case company. A framework of genre portfolio expansion analysis was constructed. The core of the framework is the usage of product portfolio management (PPM) approach with product portfolio management targets and key performance indicators. The analysis framework is to help make wise decisions on market expansion opportunities with game genres, which should resonate with a company's existing competences and resources.

The thesis examined the importance of PPM approach in new product development process through existing literature and current state analysis of the case company. The case company being a market-leading mobile game development company, with a product portfolio of globally launched and successful racing games, gives a good opportunity to study the relationship between PPM and new product development.

The first research question was *“How does product portfolio management facilitate a F2P mobile game company to achieve its business performance success?”* To answer the question, a literature review was conducted with a focus on new product development, PPM and F2P mobile game business model. The finding shows that in order to achieve business success, a mobile game company needs to not only reach a larger player base, but also to acquire a higher percentage of monetizing players by developing and offering engaging and high-quality innovative games in a variety of game genres. PPM is essential for reaching the object because it helps make strategic choices on which game genres to invest in. The selected genres should resonate with the company's current resources and competencies, be strategically aligned, and bring the highest economic value. PPM targets and KPIs also help company adjust the allocation of resources and competencies to ensure enough focus will be put on the most promising products. An actively analyzed and developed product profile will help the company to explore new market opportunities and gain success.

The second research question was *“What is the current state of product portfolio management and market expansion challenges in the case company?”* To answer the

question, a current state analysis was conducted based on the interviews of key executive level persons who are related to product development, branding and business. The findings show that the case company has realized the importance of new product development in achieving sustainable business success. Game development vision, strategy and process together with game project evaluation and approval process have been created to facilitate the successful development of new games. New game portfolio management is in use to help make decisions on project selection and resource allocation. The portfolio methods used are strategic alignment and scoring model. Those new game projects that have the best market potential, for example IP-based racing games, will be prioritized for resource allocation. The product portfolio performance was evaluated with the gaming industry standard KPIs of user engagement, user retention and monetization to ensure the strategic fit and value maximization of individual products. But for other product portfolios, the current focus is rather on individual product performance management.

The challenge is found in market expansion opportunities with other game genres than the racing genre. Well known IP-based racing game series have brought success to the case company, but at the same time also make it difficult to expand to other genres. Currently there is no organisational level strategic roadmap to describe what are the genres that the company would like to expand to. In what genres the new games will be developed in the future is solely based on the proposals from developers. The reason behind this is that for creative products like mobile games, resource management such as the formation of a development team is rather challenging with only organizational top-down decisions. The passion and interest of developers play a key role in game development. Although it is part of the case company's current new product development practices, some problems have resulted from that. The case company is not able to foresee how the new game development will have an effect on resource allocation of other portfolios, neither to form concrete long-term business objectives or make resource forecasting. It is also challenging to systematically analyse how to have a strong fit between the realization of new game development with existing competencies and capabilities regarding market expansion to achieve new product objectives.

The third research question was “*What kind of product portfolio management analysis framework would expedite market expansion?*” To answer the question, a genre portfolio expansion analysis framework was proposed in figure 10. The aim of using the framework

is to identify game genres in market expansion that are strategic fit, bring the best economic value, and are resonated with company's existing capabilities and competence. Accordingly, the related PPM targets and KPIs are presented in table 6. The same PPM targets come from the new game development portfolio management as the new genre opportunities are connected to new product development and the findings should be possible to fit in the new product development portfolio at a later stage. As an important part of the framework, the analysis cannot be performed without the mobile app intelligence software, because it provides mobile gaming industry analytical data for most of the KPIs needed in the analysis process.

The high-level analysis process is divided into 3 steps. In the first step, the input for the analysis consists of the company's best-performing genre and the most successful game titles in the genre. The analysis starts with finding out game genres that have shared players with the best-performing genre, which is to ensure the compatibility with the company's existing capability and competence can be discovered. Those game genres that the players of company's top-grossing game titles in the best performing genre are mostly like to play are also investigated. In the second step, the output of the first step is then used as input. In this step, the selected genres are both compared with each other and benchmarked with the best-performing genre using KPIs of PPM focused areas strategic alignment and value maximization. The goal is to understand their performance, current market positions and market trends. In the third step, the focus is on finding out the compatibility of selected genres with the best-performing genre. Used KPIs are from PPM balanced portfolio focus area regarding competence and capability balance. As a result, the genres meeting the defined PPM criteria are to be identified. The output of the analysis process is a prioritization matrix that plots the genres in a four-quadrant matrix. It is to provide market expansion directions with the prioritization on high-value and lower-risk genres.

5.2 Theoretical contribution

The theoretical contribution of this study involves connecting product portfolio management with the mobile gaming industry in discovering the market expansion opportunities that resonate with core competencies and capabilities of a company. Given the relative youth of the industry, this is one of the first attempts to apply PPM approach with targets and KPIs on mobile game development. The application utilized previous

research discoveries in a practical context, thus providing empirical evidence to support the studies of Copper et al. (1997, 1999, 2001, 2004, 2008, 2018). Moreover, the study brings a new perspective by proposing a genre portfolio expansion analysis framework that combines the PPM approach with mobile app intelligence tools. The framework provides an addition to the implementation PPM targets and KPIs in the initial stage of product development process in discoveries and innovation stage. Thus, this study extends the application of PPM approach over the life cycle. The recognized challenges support the importance of the concept, although more practical evidence is still needed.

5.3 Managerial implications

For a mobile game development company, the financial success of the company largely depends on the resource and capabilities, besides the company's game development strategy. This study offers a framework utilizing PPM approach to analyze market expansion opportunities in terms of game genre diversity with PPM targets and related KPIs. More effective decision-making can be achieved when mobile app intelligence software is used as a tool in the analysis framework. In addition to the framework, the PPM targets are described and each target's related KPIs are proposed. So for companies with similar challenges related to the topic, it is possible to take the analysis framework into use.

Applying PPM process to NPD portfolio is an essential way to ensure long-term success and proper resource allocation. It is not enough to only focus on the financial targets, PPM targets and KPIs should also include portfolio's strategic fit and balance. Market expansion opportunities discovery, as an initial stage of NPD, should be analyzed as a portfolio and follow the same PPM targets in NPD to ensure strategic alignment, economic value maximization, and compatibility with existing capabilities.

The analysis framework was implemented with a few selected PPM KPIs for the case company as a part of the thesis. The first step of the analysis process is to find out within what other specific genres the current input genre's players are mostly like to play games. This step is to help company explore before expanding to new genres, what are those genres that mostly connect to the company's areas of expertise, so that the competence from past best-performing games can be leveraged to innovate in the new genres. By

doing so, the risk of launching a new game title can be reduced as the success in past games can be leveraged into the next project.

5.4 Reliability and validity

A qualitative research method is adopted in this research to explore and bring deep insights into the research topic. The main objective of the qualitative element is to explore and understand the participants' experiences and perceptions associated with the PPM in the context of F2P mobile games. To evaluate the reliability and validity of the research, the four-dimension criteria created by Lincon and Guba (1985) is used. They rely on credibility, dependability, confirmability and transferability in their approach to assess the concept of trustworthiness in qualitative research.

Credibility is to establish confidence that the results are true, credible and believable (Lincon et al., 1985). In this research, credibility is ensured by collecting data from various sources, such as semi-structured interviews, case company internal documents and mobile app intelligence software. Interviewees are from four different functions of the case company, which brings versatile insights regarding the research topic and avoids observation bias. To improve credibility, the results of the research are discussed with the company supervisor.

Dependability refers to ensuring the findings of the research are repeatable within the same group of participants and context (Lincon et al., 1985). However, in qualitative research, the findings largely depend on the researcher's subjective understanding of the problem setting and collected data, thus making repeatability challenging. To achieve dependability in this study, the research method and data collection process are described in detail. While doing the interviews, a questionnaire is prepared in advance and then used in every interview. All the interviews are recorded and transcribed.

Confirmability deals with being confident in getting as close to objective reality as qualitative research can (Lincon et al., 1985). This study acknowledges confirmability by having various sources in the data collecting process and interviewees from different functions of the case company. The researcher tries to be as objective as possible by studying multiple aspects, and avoiding being influenced by prior experience, assumptions and beliefs.

Transferability seeks to expand the understanding by generalizing findings and results to other contexts or settings (Lincon et al., 1985). The results of this research can be seen as applicable to mobile game companies with similar new product development process. The contextual information of the research, influential elements and data collection process are carefully described in the study. All these factors influence the degree to which the findings of current research may have an application to another similar context.

5.5 Further research

This study analyzes the process and practices of a single company thus the construction of the analysis framework is based on those findings along with literature. Further study on more companies and validate the construction would be valuable. Also, future studies could analyze how challenging it would be to find game genre portfolio diversity on the sub-genre level instead of the current higher-level genres. As each higher-level genre contains several sub-genres, studying at the sub-genre level will give a company a clearer picture of market expansion opportunities by having a more precise resonance with the company's existing resources and capabilities. In addition, it would be interesting to test the analysis framework with all proposed KPIs on other companies within the same industry to see how it would fit there.

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Appendix 1. Interview themes and questions

New product development process

1. What kind of product portfolio does the company have at the moment?
2. Because new product development targets should be aligned with company strategy, does the company have strategic business objectives? What are they?
3. How do you plan resource allocation for new product development at the moment?
4. How do you decide the prioritization of new product development?
5. What genres were decided to develop new games in the past? How the chosen genre was decided?
6. Have been any game titles other than racing genre released in the past? How successful it was e.g. in terms of revenue and downloads?
7. Does company have a strategy/roadmap concerning developing new games in other genres than racing games?
8. How do you plan for new products being introduced in the future?
9. Does the company have a focus on product/technology innovation in new product development? What is the focus?

Product portfolio management process

1. What kind of processes does company have for managing new products/new product portfolio?
2. What decision points do you have in these processes for new product/new product portfolio?
3. What methods are in use to help make decisions?
4. What kind of requirements and criteria these decision points have?

Product portfolio management targets and key performance indicators (KPIs)

1. What are the targets of new product management/new product portfolio management?
2. How do you create targets for new product management/new product portfolio management?

3. What KPIs do you use in new product management/new product portfolio management?
4. How do you create KPIs for new product management/new product portfolio management?
5. How often these KPIs are followed?

Challenges related to topics

1. What are the main challenges related to new product development?
2. What are the main challenges related to product portfolio management?
3. Suggestions and ideas for new product portfolio management targets and KPIs?