Research Article

Business Intelligence Challenges for Independent Game Publishing

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With the continuous development of the game industry, research in the game field is also deepening. Many interdisciplinary areas of knowledge and theory have been used to promote the development of the game industry. Business intelligence technologies have been applied to game development for game design and game optimization. However, few systematic research efforts have focused on the field of game publishing, particularly with regard to independent (indie) game publishing. In this paper, we analyse data collected from a set of interviews with small indie game developers. The results indicate that most of the indie game developers have already used business intelligence for game self-publishing, although three main challenges have been identified: first, how to conduct marketing promotion and improve the return on investment (ROI); second, how to collect game publishing data; and third, how to analyse the data in order to guide game self-publishing. Our interviews also reveal that the business model applied to a game significantly impacts the role of game analytics. The study expands and advances the research on how game analytics can be used for game publishing, particularly for indie game self-publishing.

1. Introduction

Business intelligence (BI) has been applied to game development for game design and game optimization [1]. However, few systematic research efforts have focused on the field of game publishing, particularly with regard to independent game publishing. In essence, the field is in its infancy and the available knowledge is heavily fragmented [2]. We aim to identify and remedy the primary problems faced by indie game developers during their game publishing. This means that indie game developers have many tasks [3]; they must manage themselves. Also, as more and more mobile games appear, we see an increasing number of indie game studios. However, most indie game studios that are competent at game development lack experience of game publishing [4]. The studios are unfamiliar with how user acquisition works and how to transform users into loyal and paying players [5]. From the game business perspective, as shown in Figure 1, with the development of the game industry, the traditional game value chain has been complemented by the mobile value chain and online value chain [6]. The mobile

game value chain refers to a new situation in which game developers can publish games directly through distribution channels such as Google Play and the App Store. The online value chain allows developers to connect with players directly, for example, via their own websites. These new value chains enable game developer self-publishing; however, it is not known how indie game developers conduct their game self-publishing business. Further research is therefore warranted. Thus, our research focuses on the field of game publishing for indie game developers. The main research question is as follows: what are the main challenges relating to the indie game publishing business?

In order to answer the research question, we conducted a set of interviews with indie game developers. This paper is organized as follows: Section 2 discusses related work on BI technologies in the field of games and indie games. Section 3 describes the research methods used in our research and also details of the interview data collection and analysis. Section 4 summarizes all the results of our interviews on the indie game publishing business. Section 5 discusses the new findings and also the differences compared to previous
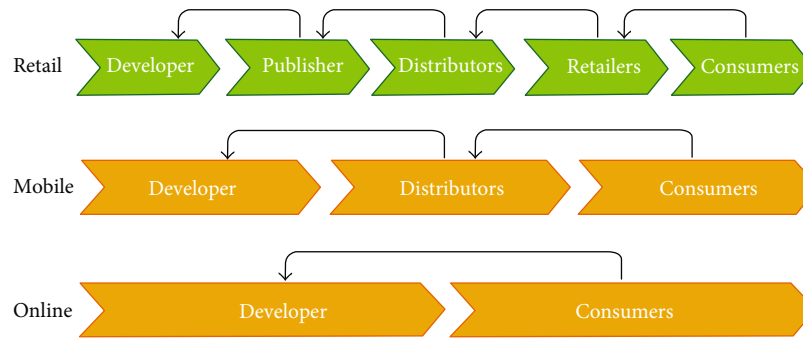
FIGURE 1: Comparison between different game value chains [6].

research. Finally, Section 6 presents our conclusions and further work.

2. Related Work

2.1. Game Business Model. From the business model perspective, with the emergence of new game value chains, game distribution channels play a significant role in challenging the Pay-to-Play (P2P) business model as additional business models, which provide additional ways of paying for a game experience and allow game companies to capture more consumer value [7]. For example, the free-to-play (F2P) model gives the user a free version and offers purchases and upgrades or new features through in-app purchases (IAP). The emergence of these new business models has further promoted the development of the game industry and brought more profits to small indie game developers.

2.2. Indie Game. Garda and Grabarczyk [8] point out that three separate types of independence can be used to define the independent game (indie game): financial, creative, and publisher independence. Indie games usually lack sufficient resources compared to high-budget games so they are often developed and published by a single person or a small developer studio with limited resources [9]. Financial independence means that the developers typically fund the games themselves. Creative independence means that indie game developers have creative and artistic freedom. Publishing independence means self-publishing, where the developers publish the games themselves.

2.3. Game Publishing. Game publishing is an important part of game promotion and uses effective ways of connecting games with their target users. Peitz and Waldfogel [10] point out that the primary tasks for game publishing include advertising, marketing, and distribution. During the game publishing process, these tasks also include handling game community management, for example, game forums, official game websites, and Facebook fan pages, as well as maintaining the core players, running live version updates, releasing new content, and increasing revenue [3]. Traditionally, game publishing has been handled by separate actors in the market. However, with the emergence of new game value chains, it is now possible for developers to handle the publishing themselves. Thus, self-publishing means that game developers

handle all the publishing themselves instead of making a deal with a publisher [5]. Since many indie game studios are small- or medium-sized businesses, this may make sense from a resource perspective. However, one drawback is the lack of the publisher's expertise and experience.

2.4. Business Intelligence. Stackowiak et al. [11] define BI as the process of collecting data, analysing data, and presenting reports for decision making. It condenses the essence of data into business actions, enabling management to make business decisions. As a subset of BI, analytics refers to the extensive use of data, statistical and quantitative analysis, and explanatory and predictive models for driving decisions and actions [12]. Analytics can be recognized as a set of technologies and processes that use data to understand and analyse business performance [13]. Many industries use analytics to identify and segment their customers.

2.5. Game Analytics. For most companies, the role of BI is to help interpret data derived from metric gathering and turn them into actionable strategies [1]. Business analytics technologies have already been used by many game companies to guide their game development. Game analytics can be understood as the application of analytics to game development and research [1]. It has been used in game development and research for many years. Kim et al. [14] discuss how game analytics can be used to identify in-game balancing issues. Hullett et al. [15] use it to reduce game development costs and avoid risks in game development. Moura et al. [16] apply it to visualize players' movement paths on the map and identify the blocking points from the player side. Zoeller [17] also provides a solution to detect in-game bugs by game analytics. However, game analytics related to the indie game publishing business on the academic side is highly fragmented [2]. Moreira et al. [18] use the ARM (acquisition, retention, and monetization) funnel as a basis for analysis. This funnel model has been developed by Huang [19]. The ARM funnel model was originally designed for social games. It, therefore, ignores the distribution channels' attributes, the interaction between players, and the in-game system, as well as the players' changes in behavior during the game publishing process.

In brief, according to our literature review, with the emergence of new game value chains, it is possible for indie game developers to publish games themselves. However, it is still not very clear how they conduct game publishing. BI has

been used in game development to guide the game development process. However, few studies have focused on the field of game publishing, particularly indie game publishing. What kind of challenges do small and medium-sized indie studios face during the game publishing process? Further research in this area is both vital and valuable.

3. Research Method

Interviews are the most widely used method in qualitative research. Qualitative interviews have formed the basis of many important studies across a wide range of disciplines [20]. In order to understand the details of how indie game developers conduct their game publishing business, we interviewed five indie game studios from Sweden and China. Based on an analysis of these interview data, we have identified a set of challenges for indie game publishing.

3.1. Interview Design. In order to answer our research question, we designed ten interview questions that included game development information and details of the game publishing business. With the emergence of new game value chains, we wanted to establish how indie game developers conduct game publishing and the kind of challenges they face in the game publishing process. Thus, our interview questions had four subsections. First, we asked for some basic information about the indie game development studio, such as names and numbers of employees. Second, we asked about their game development, such as the numbers of games, game platforms, and the number of published games. Third, we asked about game publishing, such as how indie game developers publish their games, how they understand game publishing, and the most significant challenges of game publishing. Finally, if the indie game studio had the experience of collecting data during the game publishing process, we asked about what kind of tools they used for data collection and how they conducted the data analysis.

3.2. Interview Preparation. In order to conduct face-to-face interviews with a number of indie game developers, we made appointments with them beforehand and used recording devices for the interviews. The game studios were recruited through purposeful sampling and had to have experience of game publishing. Through purposeful sampling of such subjects, we were able to procure the right data for analysing the main challenges for indie game publishing.

3.3. Data Collection. The empirical data was collected through five interviews with indie game developers from the game industry. The indie game developers who participated in the interview study are from game studios based in Sweden and China. Regarding the professional backgrounds of interviewees, four of them are CEOs of game companies and one is a business manager. In terms of scale, most of the participating indie game studios have less than 10 employees. In the specific interviews, we adopted the semi-structured interview method [20] as this method makes the interview more flexible. Each interview was recorded and transcribed timely. After each interview, the transcription was sent to the interviewee for approval. Further details of the interviewees are summarized in Table 1.

As shown in Table 1, the indie game studios based in Sweden were interviewed on-site and in English. Regarding the Chinese studios, the interviews were via Skype in Chinese and were then translated into English by the first author. We chose these indie game studios from China and Sweden for the interviews for the following reasons: First, the Chinese game market is growing rapidly and has become the top game market globally. The number of independent game developers is huge and is also very representative. Second, the first author has worked in the game industry for many years and is familiar with Chinese game developers, particularly independent game developers. Third, we also chose Swedish independent game developers because the Swedish game market is very representative, with many independent and innovative game studios. Finally, our research cooperates with a Swedish game incubator, providing a lot of convenience for the interviews and research.

3.4. Data Analysis. During the data analysis process, researchers must be impartial and avoid being influenced by their own activities and experiences [20]. Regarding our interview data analysis, we chose the constant comparative method, which can identify the relationships between concepts and categories by constantly comparing them and formulating a theory [21]. First, we transcribed all interview records of the manuscripts and received approval from the indie game developers. Second, we created codes based on relevant BI concepts and observations regarding game publishing activities. Third, we coded all the manuscripts, sentence by sentence. Then, according to the similarities and differences, we clustered the compiled codes in order to create categories for indie game publishing. Lastly, when no new categories were generated, this meant that our conceptual saturation was reached. We were finally able to get the answer to our research question.

4. Results

Through the interview data analysis, similarities between different interviews are summarized based on the codes. The relationships between different interviews and different opinions have also been accurately recorded. During the interviews, we collected all the key sentences from the indie game studios about the challenges of their game publishing business. Through comparison and analysis of the codes and categories involved in the game publishing process, we finally identified the marketing, data analytics, data collection, and business model that appeared most frequently. Then, based on the data analysis, we summarized the main themes for indie game publishing. This included marketing challenges, data collection challenges, data analytics challenges, and the role of the business model. In Section 4, we organized the results according to these themes.

4.1. Marketing Challenges

4.1.1. Marketing Activities. Marketing can be a very generic term these days. It can be very hard to know exactly what

Table 1: Details of indie game developer interviews.

Index	Company	Position	Game publishing	Company size	Country
1	Indie game studio (C1)	CEO	Has developed two games, mainly focused on the PC platform and ported to mobile. Published its mobile game in the App Store and Google Play itself.	SME 6 employees	Sweden
2	Indie game studio (C2)	CEO	Developed for all platforms which include PC, console, and mobile, such as Nintendo Switch, PlayStation 4, Xbox, IOS, and Android. Published one game on all platforms itself.	SME 9 employees	Sweden
3	Indie game studio (C3)	Business manager	Developed for the mobile platform including Amazon, IOS, and Google. Published three games, two of them published itself.	SME 9 employees	Sweden
4	Indie game studio (C4)	CEO	Developed five mobile games and primarily focused on the App Store and Google Play. Conducts self-publishing and has a core team of talented people with over ten years' experience of development.	SME 14 employees	China
5	Indie game studio (C5)	CEO	Developed more than 30 mobile games and primarily focused on the IOS App Store and Google Play Store. Does self-publishing for IOS and Android, covering all global markets.	SME 4 employees	China

activities are included in marketing and marketing activities by themselves is also something that. If you are publishing a very large game such as a Triple A like Battlefield, you have the whole marketing team working on it. However, if you are publishing a fairly small game or if you are publishing a ten dollar indie game or a twenty dollar indie game, there is not always that much that a publisher can do to help you promote the game. So the biggest challenge is about breaking through. I mean, just getting your game seen, getting your name out there (CEO of Studio C2).

As the above quotation shows, one of the main concerns of this developer in the process of game publishing is marketing activities. The interviews made it clear that marketing activities determine the effect of game user acquisition. However, indie game developers may have insufficient funding to conduct marketing. So, how to make the player aware of their games and encourage them to download is very important.

4.1.2. Channel Problems. I think the biggest challenge is to be seen by the players. So… since the IOS and Google only feature about ten games every week and… on IOS it releases five thousand games a week, so it's very hard to be seen. So you have to… I think the hardest challenge is to… you have to try to get a feature. You have also to prepare for a situation do not get a feature, but you have to release the game anyway. So you have to prepare your marketing and everything and you have to prepare things… but if you do not get a feature you have to succeed anyway (Business Manager of Studio C3).

As cited above, one of the main challenges of indie game publishing is being seen by the players. Actually, few of the games can be featured by distribution channels such as App Store or Google Play. So with no feature, they must find other means of marketing and ensure it can be a success.

4.1.3. Return on Investment. It's hard to get people to know about your game or, in other words, the way that it now requires connections and money, tons of them. There are more ways of reaching the audience than before, but also make it more competitive and expensive. Be careful with all spending if you do not have the experience. So marketing is a very

important and challenging part for us. We need to keep the ROI fine and that means we need to control our marketing spend (CEO of Studio C4).

I believe most of the indie developers are facing the same or similar challenges. For [company name], although we are lack of marketing budget to invest, if we decide to do the marketing promotion, we need to ensure that the return on investment is fine (CEO of Studio C5).

Besides this, according to the above quotations, if without any feature from the distribution channel side, indie game developers may consider spending money to recruit players through advertisements. However, they need to consider the cost of each new player installation and also the revenue generated by each new player and ensure the return on investment (ROI) analysis is fine for them, which means the game revenue should be greater than the market cost.

4.1.4. Social Media Issues. We try to be as active as we can on social media. We really try to follow current trends and we also try to experiment as much as possible (CEO of Studio C2).

We keep contact with blogger or editor of review sites and keep in touch with fans or players through the social media, like Facebook Page and ask them to share the games with friends if they like it (CEO of Studio C5).

Through our interviews, the important role of social media was also emphasized by indie game developers. In order to save on marketing spend, indie game developers may rely on social media to attract players and encourage players to share with friends. However, it is hard to evaluate social media performance instantly, as the indie game developers only can track the data changes in user traffic and try to increase traffic through a variety of experiments.

4.1.5. Early Access Promotion. I mean it's definitely the marketing because I feel that's where everything either makes it or breaks it. That's like such a vast topic by itself like marking start when you decide on the game idea, like you need to make sure you make the proper design decision that fits your target audience, that you understand your target audience, that you are on the correct platform for your target audience and that

you price your product in order to monetize it properly, so it's attractive to the target audience (CEO of Studio C1).

As very super early access, I suppose like a prototype release, free to play, no ads, no restrictions, just gauging the interest… because if we can get an early prototype out there and people like it and play it and talk about it then we will get a good start and some good traction going and we know that this is a good idea that people want (CEO of Studio C1).

In addition, most indie game developers realized that marketing can start once they had decided on the game idea. It is not only about considering the players' requirements during the game design but also the correct platform for their target audiences. Some of them even used very early prototypes, which were made in only one to three weeks for marketing testing based on BI.

4.2. Data Collection Challenges

4.2.1. Basic Data Collection. I have to admit that we are not very good at using data overall. I mean, like we do it we have Unity analytics tracking how many are playing and stuff like that. We also use data in terms of evaluating where the people drop off, where they stop playing and stuff like that. But we usually tend to look at store data, in terms of how much did we sell today? How much traffic was there? Where did that traffic come from? Try to understand trends (CEO of Studio C1).

As the above quotation shows, indie game developers have used data for their game publishing. These data are collected from third-party tools such as the Unity Analytics tool provided by the Unity game engine. With these tools, analytics components can be integrated into the game for data collection. However, thus far, they only focus on the basic game metrics collection, which includes retention, revenue, and traffic.

So in game wise… we did for our game we did on early access and using basic metrics, where we did metrics on retention and revenue and daily active users and to see if the game was viable and we can see if we have a good retention day thirty we know that this game could be a long-term game. So, with the basic analytics, we can see that… we could plan the launch better, the real launch better from the early access so… (Business Manager of Studio C3).

We also observed an interesting phenomenon regarding the interviewees' views on the role of game analytics for game publishing. Some of the interviewees have already used it to evaluate game quality through early access to establish whether the game is really suitable for long-term publishing.

4.2.2. Data Definition Problem. It's been like a learning experience and tried to read articles and trying to figure out: what is stickiness even? What is retention? We had to start from there and learn and try to figure out like as a premium game, what type of metrics are important to us? (CEO of Studio C1).

We are not very clear about what the kind of data we need to collect before a game launch. We only use third-party analytics tools and to see what kind of data they can provide and even we can see the data, we do not clearly understand the relationships between different data (CEO of Studio C4).

Besides this, through our interviews, we also found another interesting phenomenon. Although most of the indie game developers lack experiences of game data analysis for game self-publishing, they still think that data analysis is useful as it can help them guide the game publishing process. They are willing to learn the metrics definition. They try to understand what kind of data needs to be collected and also how to measure it using different metrics.

4.3. Data Analytics Challenges

4.3.1. Game Evaluation Issues. We could keep improving the game after data analysis. Meanwhile, we are able to check the ARPU, retention, etc. However, it is challenging for us to evaluate the value behind these data and improve the game (CEO of Studio C5).

As the above quotation shows, some of the indie game studios in our research had already started using data analytics for their game publishing with basic metrics such as ARPU (average revenue per user) and retention. However, the key issues for data analytics still exist, particularly regarding how to optimize their games during the game self-publishing process, according to data analytics.

4.3.2. Lack of Dedicated Analysts. We do not have dedicated analysts so we cannot do deep analysis of these data. All we do is simply collect the data using third-party game analytics tools and compared with the benchmark if we meet the requirement. Sometimes when we find a large gap between the targets we realize this may be the issue, but we do not know how to improve it and how to find the solution behind the data (CEO of Studio C4).

So before releasing the game, we had no insight into game analytics and I think we are still struggling with analytics… I think we can collect the data. But it's hard to understand the data. That's one of the biggest challenges as an indie game publisher… because if you install a third-party tool, you can see the data but you have to convert the data to work with your game and with the players. I think one of the big challenges we are facing right now, a year after we launch the game, is to understand the data and make decisions for future updates based on this data (Business Manager of Studio C3).

According to our findings, none of the studios in our research has a dedicated analyst. They cannot perform deep analysis and find out the solutions behind the data. This is a major issue for them. All they do is compare the data with benchmarks to see if they are meeting the target. How to analyse data and make decisions based on the data is still a major challenge.

4.3.3. Lack of In-Depth Analysis. So we use Facebook Analytics, Game Analytics and… as our prior tools if that was the question you are asking… and we also use the tools that the App Store and Google Store supplied us with, such as… also App Annie of course (Business Manager of Studio C3).

We used game analytics to conduct the basic analysis and sometimes we also use Flurry and TalkingData. But the key issue is that we have these data from third-party tools. We cannot conduct the analysis and find out the main reason

for guiding our game publishing and development (CEO of Studio C4).

In terms of the adoption of data collection and analysis tools, most developers in our research rely on existing data statistics tools, such as Facebook Analytics, Flurry, Unity Analytics, and App Annie. These tools help game developers collect game data such as retention and revenue data. However, even though they can get these data from third-party tools, they still have challenges with data analysis, especially for abstracting the information, knowledge. and wise from the data.

4.4. Role of the Business Model. Regarding different business models, particularly for P2P model games, one indie game developer also mentioned the difference compared to F2P games:

So because we make premium games, we like we do not make any free to play games, so we do not track retention. We do not track monetization, because you know that as soon as people buy our game they monetized already (CEO of Studio C2).

Different from F2P games, they do not track retention and monetization for P2P games as the monetization already exists.

We make a game and we try to make it as unique as possible. We try to get out there. But the upside of working with premium games is that there is no use after the game has been launched. There's not much we can do. This can be negative for some people. But for us, it's a positive thing because it just lets us start working on the next game (CEO of Studio C2).

We also observed special phenomena for the P2P business model game publishing. The indie game developer stated that it just launched the game without any data collection and analysis. Furthermore, it does not keep working on the game for an extended period in order to maintain players after it has been launched.

4.5. Main Challenges—Summary. According to our interviews' data collection and data analysis, the main challenges for indie game studios are summarized in Table 2.

5. Discussion

According to previous research, with the emergence of new game value chains, it has become possible for game developers to handle publishing themselves [6]. Our interview results show that with the emergence of new value chains, some indie game developers have started handling all of the publishing work themselves, including marketing, online activities, and social media promotion. The value chain changes actually bring new phenomena and the game industry has moved towards a new situation in which indie game developers can conduct self-publishing without sharing the revenue with publishers. Besides this, different from previous research, in which game analytics is used for game development and game research [1], our interviews show that game analytics has also been used in indie game self-publishing by indie game developers. However, the interviewees high-light a number of major challenges during their indie game self-publishing. Our results indicate the main challenges for indie game developers in publishing their games. These challenges mainly relate to marketing, data collection, and data analysis. We also found that the performance of game analytics is influenced by the business models used for different games.

Regarding marketing promotion, we noted a difference from previous research [5]. Indie game developers are eager to keep a good relationship with distribution channels such as the App Store or Google Play for the benefit of market promotion. Before launching a game, they will try to contact an editor to get a feature from the distribution channel side. This should be a good way of acquiring new users with no marketing budget. However, distribution channels have their own ideas and promotion standards about featured games. It is therefore impossible to ensure that each indie game can be featured after launch. Although most of the indie games have limited resources [9] without a feature, they have to put some budget for the marketing promotion themselves. So reaching potential players with a limited marketing budget is the key to their marketing promotion. It should be based on ROI analysis during the publishing process, which is emphasized by many indie game developers. Besides this, social media also plays a very important role for indie studios in the promotion of their games.

Regarding data collection, we also found that some indie game developers have already tried using data analysis to guide their game self-publishing process. However, as they lack game publishing experience [4], most of them are not very clear about what kind of data should be collected. Thus far, they have only focused on basic metrics collection such as retention, revenue, and daily users as a basis for analysis. Besides this, what is most important is that understanding the meaning behind the data is challenging for indie game developers.

Regarding data analytics, most indie game developers in our research use existing data analytics tools to perform basic analysis, such as retention and revenue analysis [2]. However, they still lack systematic and detailed analysis to identify potential problems hidden behind the data. According to our research, another issue for indie game self-publishing is that many indie game studios have no dedicated analyst. The indie game studios in our interviews have few employees and most of them are focused on game development. Game analytics work is often handled by their CEO or other staff members as a part-time job. Thus, providing them with easy learning and effective data analysis methods or visualized publishing models is crucial for guiding their game self-publishing. Besides this, game analytics can be used to guide the direction of game development [1]. According to our interviews, it can also guide the indie game developer early game access. During early access, they will acquire a few players to conduct the testing. If the retention is not very good, they may stop the game development, abandon the game, and start a new game project.

Regarding game analytics tools, most of the studios in this study prefer to use the basic analytics tools provided by distribution channels, for example, iTunes Connect and

TABLE 2: Main challenges for indie game publishing.

Main challenges	Feedback from indie game developers
Publishing challenge 1: marketing	(i) Marketing is tricky because it's hard to get people to know about your game. (ii) Marketing can be a very generic term. It can be very hard to know exactly what activities should be included in marketing. (iii) Few of the games can be featured by IOS and Android channels. (iv) Effective marketing promotion for user acquisition should be based on ROI data analysis. (v) In order to save on marketing costs, most indie game developers rely on social media to attract players. It's hard to instantly evaluate social media performance.
Publishing challenge 2: data collection	(i) Focus on the basic game metrics collection, which includes retention, revenue, daily users and lack the experiences in the selection of monitoring data (ii) Only use basic metrics and current data collection is relatively fragmented. (iii) Not very clear about the kind of data that should be collected.
Publishing challenge 3: data analytics	(i) Difficult to clearly understand the meaning behind the data and improve the game. (ii) None of the studios in our research have a dedicated analyst. (iii) Indie game developers lack the experience to conduct in-depth analysis and rely on third-party tools.

App analytics. These tools provide the basic functions for game self-publishing analysis, such as impressions, in-app purchases, paying users, and installations. Some of the studios prefer to use third-party analytics tools such as Unity Analytics, Facebook Analytics, and Flurry. However, most indie game developers cannot provide insight analytics combined with the game itself because they do not know how to convert users into loyal and paying players [5]. According to our research, it is really hard for indie game developers to find out the solution behind the data. It is also hard for them to make the right decision for game optimization and guide their game publishing process more effectively.

Previous literature shows that additional business models that provide various ways of paying for a game experience will allow game companies to capture more consumer value [7]. According to our research, as far as F2P games are concerned, indie game developers have already tracked some data and conducted a basic analysis. However, for P2P games, the indie game developers in our research did not track retention and monetization as they only calculated the consumer value by downloads. They do not keep working on the game for a very long time after launched to maintain players and increase consumer value. As the probability of failure is too high, they abandon the old games and start new projects. So how to help them with the P2P game self-publishing and make success based on game analytics is very valuable.

6. Conclusion and Future Research

Our research is based on interviews with different indie game studios to identify the potential research gaps for indie game publishing. Although game value chain changes make indie game self-publishing possible, how indie game developers do the game self-publishing business is still unclear. We conducted a set of interviews with indie game developers to find out the main challenges for indie game publishing. Our interview study shows that with the emergence of new game value chains, indie game developers can handle the publishing business themselves. They have already used BI technologies for game self-publishing, but there are still challenges. The main challenges include how to conduct market promotion based on ROI data analysis, how to collect useful and valuable game data, and how to analyse these data and guide their game optimization and game self-publishing process.

The discovered main themes for our research include marketing challenges, data collection challenges, data analytics challenges, and the role of the business model. Our study advances research on business intelligence used in the game industry. In fact, BI can not only be used for supporting game development but also can be used for guiding game publishing. In brief, our research expands the application of game analytics in the field of game publishing and digs out the challenges faced by indie game developers during their game self-publishing. It provides a solid basis for solving these challenges through further research.

To date, the interview data that have been collected is from Swedish and Chinese indie game developers only. Thus, in future research, we plan to include more indie game developers from other countries and regions to further validate our findings. During the interviews, we noted that game analytics were closely related to the game business model. Therefore, identifying better BI solutions for games with different business models, particularly P2P games, requires further research. Besides this, at present, we did not distinguish between different platforms, such as PC platforms and mobile platforms, during the interviews as many indie game developers are engaged in both PC and mobile game self-publishing. When diving into the details because of the differences in the game platform itself, indie game self-publishing may turn out to be even more complex.

Data Availability

The interview data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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