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PROCEEDING

**“Technology
4.0 for Smart
Ecosystem:
A New Way of
Doing Digital
Business”**



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PROCEEDINGS



2022 International Seminar on Application for
Technology of Information and Communication
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*Technology 4.0 for Smart Ecosystem: A New Way
of Doing Digital Business*

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Gaming Activities During the Covid-19 Pandemic Era: A Systematic Literature Review

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Abstract— The Covid-19 outbreak, which has been declared a pandemic since March 2020, has been causing problems worldwide. As a result, many countries have implemented lockdown policies to control the spread of the Covid-19 virus. In addition, time spent on gaming activity has increased by 52% since video game engagement was thought to be essential in improving players' vitality, reducing psychological suffering, and helping combat stress. This literature review was conducted as a systematic literature review based on the 15 primary studies between 2020 and March 2022. Analysis of the selected primary studies revealed that the authors conducted studies of gaming activities in the Covid-19 pandemic era for four reasons: to determine the factors of play intention, factors of purchase intention, factors of gaming disorder, and to investigate the impact of the gaming activities itself. Physical health issues, family interactions, social interactions, fear of missing out, psychological distress, and time and location flexibility are the six determinants for people to continue to play video games. Meanwhile, the expectation of performance and effort were the factors that influenced purchase intention in mobile games. And from these determinant factors, it seemed that psychological distress and fear of missing out were the causes of someone experiencing a gaming disorder. As for the method employed, Structural Equation Modeling (SEM) was the most extensively used statistical tool in conducting quantitative research. Six of the eleven quantitative research in the primary studies utilized SEM, and the others employed other statistical tools. Although, in the selected primary studies, we also have four studies conducted qualitative research using interviews and open-ended surveys. Ten different countries were identified as the origin country of the respondents for the primary studies, with Finland and the United States as the most research object. However, we also found three studies that did not specifically mention the origin countries of the respondents.

Keywords— video game, gaming activity, covid-19 pandemic

I. INTRODUCTION

The Covid-19 outbreak has been causing problems all over the world. The World Health Organization (WHO) declared the Covid-19 as a pandemic on March 11th, 2020. As a result, many countries have implemented lockdown policies to control the spread of the Covid-19 virus [1]. The government expected everyone to remain in their houses and work from there. Droit-Volet et al. [2] showed that the lockdown situation had increased boredom and sadness. Moreover, anxiety, stress, and depression were also experienced by those who encountered this lockdown situation [3], [4].

People would strive to engage in recreational activities to preserve their health and mental well-being under such conditions [5]. However, there were not many recreational activities that people could do from home. Li *et al.* [6] point out that mobile phones have become an escape from

loneliness during this pandemic. And playing games on a mobile phone, including a computer or game console, is a convenient option [7], [8]. During this pandemic period, video game engagement is believed to be essential in increasing players' vitality, reducing psychological suffering, and helping combat stress [9], [10].

People play games for fun. The fun is obtained when the user completes the challenges in the game [11], [12]. Then, the game must be initially downloaded to get the tools to achieve that fun. The game download activity reportedly experienced a spike during the Covid-19 pandemic [13], [14]. It applied to computer, console, and mobile video games.

Statista.com reported that time spent on gaming activity has increased by 52% worldwide [15]. Furthermore, as of January 2021, the average hours spent playing video games worldwide was 8.5 hours weekly [16]. The increase in gaming activity had also boosted revenue for the developers. At the end of 2020, International Data Corporation (IDC) recorded total revenue from the gaming industry jumped by 20% compared to the previous year [17].

Certain conditions must cause phenomena regarding human behavior related to gaming activities during the Covid-19 pandemic. As a result, several researchers have conducted investigations to determine the link between field facts and the Covid-19 pandemic condition. For example, Laato *et al.* [18] found that players of the location-based game genre remained loyal despite the game modifying to support the government's policy of not leaving home. Meanwhile, Kim [8] reported that video game players would become loyal if they find it can give psychological well-being during this very stressful Covid-19 era. Social features in the game were also known as beneficial and will be sought by players since players can no longer communicate directly due to the lockdown policy in their area. [19], [20]. Balhara *et al.* [10] explored the motives behind college students' gaming behavior and claimed that stress causes an increase in gaming activity. Claesdotter-Knutsson *et al.* [21] also conducted a cross-sectional study of two age groups to determine whether there was an increase in the duration of playing games and their causes. Ericiska *et al.* [22] researched the behavior of Freemium mobile game users in making purchases. Meanwhile, Volpe *et al.* [23] investigated whether the Covid-19 pandemic effects were responsible for problematic video gaming, i.e., addiction.

Regarding the Covid-19 pandemic situation itself, we never know when it will end. However, since this pandemic took place, humans have adopted a new lifestyle that may remain attached, both short and long term [24], [25]. Therefore, developers need to know their customers' behavior and take advantage of it [22]. However, as far as we know, no literature survey maps behavioral changes in gaming activities

related to the Covid-19 pandemic. As a result, this article presents a literature review on human behavior related to gaming activities between 2020 and 2022 during the Covid-19 pandemic. This work aims to provide academic researchers with fundamental knowledge and research directions related to gaming activity that is affected by the Covid-19 pandemic. As stated in the list below, the research questions were compiled based on the preceding reviews.

RQ1: What are the motivations of the researchers to conduct research regarding gaming activity during the Covid-19 pandemic?

RQ2: What are the findings from studies related to gaming activities during the Covid-19 pandemic?

RQ3: What methods do the researchers use to solve the problems specified in the studies related to gaming activities during the Covid-19 pandemic?

RQ4: What countries are the most research objects related to gaming activity during the Covid-19 pandemic?

The structure of the article is outlined below. The research methodology is described in section II. The findings and answers to the research questions are presented in section III. Finally, we present our final section summarizing the work of this study.

II. METHODOLOGY

A systematic literature review (SLR) is required to confirm the current state of a research field [26]. Therefore, this study is undertaken as an SLR which is a process for locating, evaluating, and interpreting all relevant research evidence to answer specific research questions [27]. The SLR in this study is based on the basic guidelines established by Kitchenham and Charters [27], which is performed in three main stages: planning, conducting, and reporting the literature review. All of the steps required to complete this systematic review are listed in Figure 1 below.

The search protocol was also established as part of the planning phase prior to conducting the literature review. This activity entails choosing a well-known literature database to maximize the chances of locating highly relevant articles. The search keyword that is used to search for the primary studies is “gaming AND (play OR intention OR purchase OR download OR adopt OR retention) AND covid AND NOT gamification”. In addition, there were two types of publications published in English included: journal papers and conference proceedings.

Scencedirect, Emerald, Wiley, SAGE Pub, and ProQuest are the five databases involved in searching the primary studies. As part of Step 3, the search process in those five databases used predefined search keywords by limiting the publishing period for articles from 2020 to March 2022 as this study was conducted in March 2022. The search results yielded 6,176 primary studies, and then the selection process will be continued in Step 4. The selection process was carried out by excluding inappropriate primary studies based on their titles and abstracts, leaving 37 articles.

This selection process was still going on by filtering it based on the full text. We excluded studies unrelated to gaming activities during the Covid-19 pandemic and also excluded studies that are not empirical research. In addition, primary studies, which are literature reviews, are also excluded. Figure 2 below shows the selection steps performed by leaving 15 primary studies. The fifteen studies only came

from four databases after eliminating the studies obtained from the Emerald database due to non-compliance with the criteria. Meanwhile, the list of the 15 primary studies can be seen in Table I below.

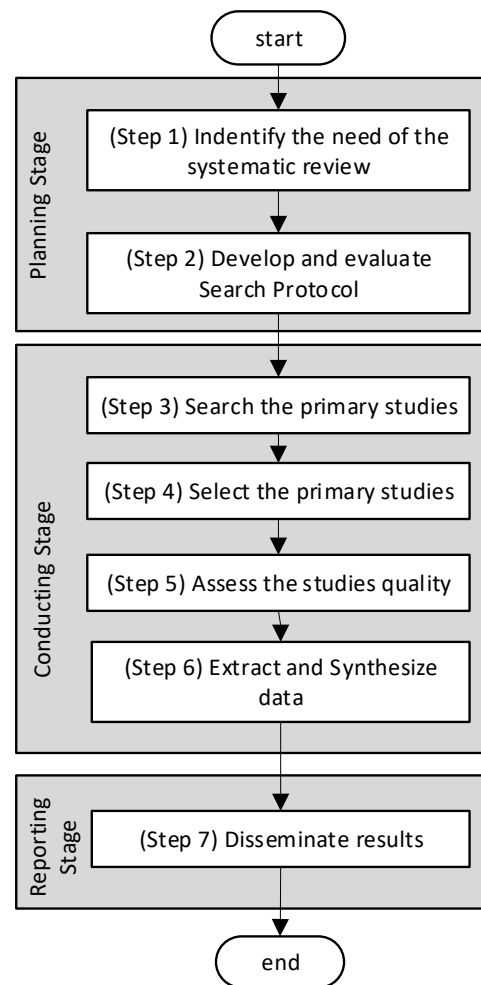


Fig. 1. Systematic Literature Review Steps

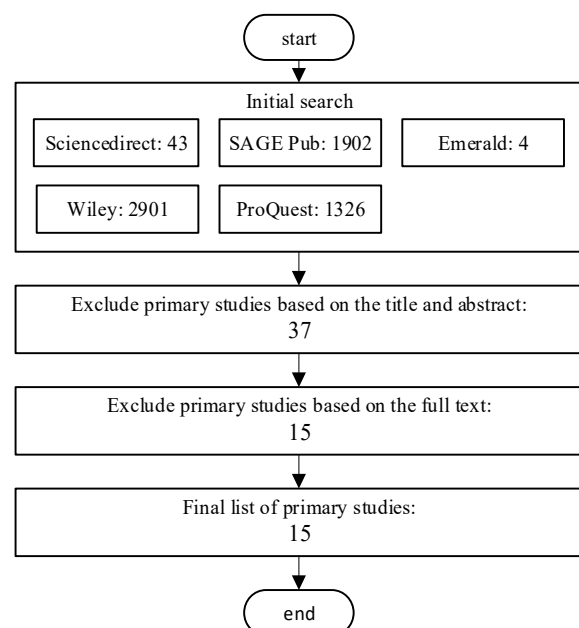


Fig. 2. Primary Studies Selection

TABLE I. DISTRIBUTION OF PRIMARY STUDIES

Database	Authors	Year	Source
Scencedirect	Laato et al.	2020	[18]
	Fazeli et al.	2020	[33]
	Kim	2021	[8]
	Elsayed	2021	[7]
	Ericaska et al.	2022	[22]
	Formosa et al.	2022	[9]
SAGE Pub	Hong et al.	2022	[28]
	Bengtsson et al.	2021	[32]
	Pearce et al.	2021	[29]
	Nilsson et al.	2022	[35]
	Meriläinen	2022	[31]
Wiley	Barr and Copeland-Stewart	2022	[36]
	Elhai et al.	2020	[34]
ProQuest	Liu et al.	2020	[30]
	Volpe et al.	2022	[23]

Having left 15 primary studies, in Step 5, we assessed the quality of the studies. Quality testing of primary studies evidence is carried out on the research protocol as well as the data used. Finally, the quality assessment results may assist in interpreting synthetic data and establish the strength of extended inferences. And the next step we took was extracting data from existing primary studies and then synthesizing it. This data extraction and synthesizing step was taken to contribute to answering the research questions. Finally, any needed data from the primary studies were recorded and plotted using a spreadsheet tool. We present the results of this step in the next section of this paper.

III. RESEARCH RESULT

All the primary studies began by observing phenomena related to the COVID-19 pandemic. According to the authors, the occurrence of the Covid-19 pandemic has resulted in an upsurge in gaming activity. However, the motivations of these authors for the studies they conduct, on the other hand, differ. Four primary studies have been undertaken to determine why people prefer to play a specific genre of game [18], [28]–[30]. The genres are Location-Based Games (LBG), Sports Games, Simulation Games, and Motion-Sensing Games. In addition, three of these four studies explicitly cited the game's title, namely *Animal Crossing: New Horizons*, *River Survival*, and *Pokémon GO* [18], [28], [29]. On the other hand, the other did not identify the game's title. Furthermore, three studies solely examined the determinant factors why individuals play games during the pandemic without saying which genres they were playing [9], [31], [32].

In particular, a study conducted by Ericaska et al. [22] investigated the determinant factors of purchase intention of Freemium mobile games amid the Covid-19 pandemic. The authors found that the number of active mobile game players in Indonesia was increasing but the penetration rate was still low. And they sought to figure out what motivates these players to make in-app purchases during the pandemic.

The study conducted by Ericaska et al. [22] was the only one that examined the reasons mobile game players want to make an in-app purchase. Performance and effort expectancy are the two main significant reasons presented in the study as determinant factors for mobile game players to purchase. Therefore, this study suggested game developers can develop their freemium strategy model effectively to suit the Indonesian market, considering that this study was conducted in Indonesia according to the characteristics of the people there.

Among these primary studies, we have four studies related to gaming disorders. That four studies considered gaming disorder to be a fascinating phenomenon to investigate. Three of them investigated whether psychological problems caused by the Covid-19 pandemic triggered gaming disorders [23], [33], [34]. Meanwhile, Elsayed [7] investigated the gaming disorders issue from a different perspective. The author was only looking for confirmation whether gaming activities during the pandemic among children and adolescents had progressed to addiction.

We also have four studies that did not conduct a study to determine the causes of the phenomenon of gaming activity during the Covid-19 pandemic. Those studies looked at the impact of these gaming activities [7], [8], [35], [36]. The studies wanted to confirm whether playing this game might truly affected the user's well-being or had negative consequences. The authors felt that there was always the risk of adverse outcomes from situations in which gamers spend more time than regular playing games. The distribution of the authors' motives for doing the study can be seen in Table II.

TABLE II. DISTRIBUTION OF AUTHOR'S MOTIVES

Motives	# Articles	Source
To Determine the Factors of Purchase Intention	1	[22]
To Determine the Factors of Play Intention	7	[9], [18], [28]–[32]
To Determine the Factors of Gaming Disorder	3	[23], [33], [34]
To Investigate the Impact of Gaming Activities	4	[7], [8], [35], [36]

Psychological and health issues are highlighted in a lockdown situation due to the Covid-19 pandemic. If restricted possibilities for social interaction generate numerous psychological problems, then physical health problems are linked to a person's diminished activity when compelled to stay inside for lengthy periods. Unfortunately, we only identified one study that cited physical health concerns as a reason for individuals to continue playing a game like Motion-Sensing Game [30]. The game was in high demand as a replacement for physical activity, which was severely restricted at the time. In comparison, others focus more on psychological problems.

Family interaction was mentioned in three studies as a reason for someone to play video games during the Covid-19 pandemic. The existence of the game was thought to be beneficial in terms of creating activities with the family at home. However, others highlighted the necessity to socialize without addressing the importance of family. Furthermore, those findings excluded the fear of missing out (FOMO), which was identified in two studies as a moderator for people to keep playing the game [18], [34]. On the other hand, many of these studies stated that people need entertainment such as playing games to relieve psychological distress (i.e., depression, anxiety, and stress). Table III below displays a list of factors that determine the intention to play video games during the Covid-19 pandemic.

The Covid-19 pandemic creates psychological distress, particularly in those subjected to a locked-down environment. And people that spend more of their time at home during this condition are suspected of experiencing gaming disorder (i.e., addiction). This condition was measured by Elsayed [7], who proposed that parents should restrict the amount of time their children spend playing video games. The suggestion was

TABLE III. DETERMINANT FACTORS OF VIDEO GAME PLAY INTENTION

Factors	# Articles	Sources
Physical Health Issue	1	[30]
Family Interaction	3	[28], [29], [31]
Social Interaction	2	[30], [32]
Fear Of Missing Out	2	[18], [34]
Psychological Distress	5	[9], [29]–[32]
Time and place flexibility	1	[30]

based on the findings that the most severe impact on children during the Covid-19 pandemic was “Behavior Risk”. Psychological distress was allegedly a significant factor in encouraging someone to continue playing games to the point of addiction. This is due to the fact that many believe that games can give them the necessary enjoyment. And based on the other three studies we have found, two of them agreed that psychological distress (depression, anxiety, and stress) was the primary cause of gaming disorder [23], [33].

In addition, FOMO was also confirmed as a mediator of gaming disorder [34]. As a result, players will attempt to form social bonds by playing games with one another on a regular basis. Studies on users of LBG, like Pokémon GO, have shown that FOMO has influenced people to continue playing to satisfy their demand for social interaction [18]. However, it has repercussions for the player’s propensity to disregard notifications concerning the Covid-19 virus’s spread.

In addition to the problem of gaming disorder caused by the effects of playing games during the Covid-19 pandemic, we also have studies investigating the impact the players felt when playing games. Most research participants reported that playing games make them feel positive emotions since playing games could relieve stress and give them chances for social and cognitive stimulation [36], [37]. And apparently, the game was indeed used as a tool to escape from the lockdown effects. However, Nilsson [35] found that adolescents who spent an excessive amount of time gaming and, as a result, suffered from a decrease in their mental health and well-being.

According to Kim [8], the quality of the game was something that creators should consider. Because, in this stressful circumstance, players expected better physiological well-being when consuming electronic products such as games. This conclusion backed up prior research suggesting that the digital product’s quality or any untouchable product impacted its consumers’ positive emotions [38], [39].

The authors’ preferred method in order to solve their research problems seemed to be statistical analysis using Structural Equation Modeling (SEM) as the tool. Six of the existing primary studies employed SEM for their research. ANOVA, Quasi-Poisson Regression, Path Analysis, and the PROCESS macro were some additional statistical tools employed in other primary studies. However, quantitative research utilizing statistical tools was not the only method employed by the authors. We discovered four studies that used qualitative approaches, including interviews and open-ended question surveys. Table IV below shows the distribution of the methods found in primary studies.

We also mapped the methods used to support the findings on various factors that keep someone playing games. Table V, which follows, shows how the researchers attempted to identify solutions during their investigation. Table V shows that many researchers employed various methods to confirm the same factor. For instance, the researchers employed SEM,

TABLE IV. DISTRIBUTION OF THE METHODS

Methods	# Articles
SEM	6
Anova	2
Quasi-Poisson Regression	1
Path Analysis	1
PROCESS macro	1
Interview	2
Open-ended Question Survey	2

TABLE V. DISTRIBUTION METHODS USED TO DETERMINE FACTORS OF VIDEO GAME PLAY INTENTION

Factors	Sources	Methods
Physical Health Issue	[30]	SEM
Family Interaction	[28], [29], [31]	SEM, interview, open-ended survey questions
Social Interaction	[30], [32]	SEM, interview
Fear Of Missing Out	[18], [34]	SEM
Psychological Distress	[9], [29]–[32]	Path Analysis, interview, SEM, open-ended survey questions, interview
Time and place flexibility	[30]	SEM

interviews, and open-ended survey questions as their methods to confirm the family interaction factor.

The authors collect data from a variety of respondents to conduct the analysis. The authors mention a few of them, including the origin country of the respondents. However, three studies performed surveys without disclosing the respondents’ countries of origin. For example, Barr and Copeland-Stewart [36] and Formosa et al. [9] distributed their questionnaire through social media and a Reddit community and made it available to users worldwide. The respondents appeared to come from a variety of countries at the same time. Therefore, it was impossible to determine which country the respondents came from in those three studies.

On the other hand, the countries from North America, such as Canada and the United States, were detected in the primary studies. Denmark, Finland, Italy, and Sweden, all of which are European regions, were also included. The others were Asian countries, including China, Indonesia, Iran, and the United Arab Emirates.

Table VI below shows the distribution of ten different countries that became the research object. Finland and the United States were the two countries that appeared the most in primary studies, according to the list of countries below. In each of the two primary studies, Finland and the United States were chosen as the research objects. And in addition to Table VI, we also laid out the game genres that were the subject of their investigation. However, it does not necessarily mean that the genre was the most well-liked ones in the country.

TABLE VI. DISTRIBUTION OF THE ORIGIN COUNTRY OF THE RESPONDENTS

Country	# Articles	Genre
Canada	1	-
China	1	Motion Sensing
Denmark	1	-
Finland	2	LBG
Indonesia	1	-
Iran	1	-
Italia	1	-
Sweden	1	-
The United States	2	Simulation
UAE	1	-
Unspecified	3	Sports

Only the United States, China, and Canada appeared on the list of the top 10 countries with the highest gaming revenue in 2021 [40]. On the other hand, other countries were absent from the top ten. Finland was not included in the list, despite it being the object of two primary studies. As the Covid-19 pandemic has worldwide economic ramifications, similar research should also be possible in countries with significant revenue potential.

IV. CONCLUSION

This literature review examined the primary studies on gaming activities during the Covid-19 pandemic. The studies that were utilized to perform this literature review were conducted between 2020 and March 2022. The findings of this literature review include responses to particular research questions, such as information about the authors' reasons for conducting their studies, the study findings, the methodologies utilized, and the country of origin that was the object of the primary studies.

To respond to the first research question, which is the researchers' motivations for conducting research on gaming activity during the Covid-19 pandemic, we have analyzed the selected primary studies and found four main reasons. The reasons are to determine the play intention factors, purchase intention factors, gaming disorder factors, and gaming activities' impact. As a consequence, in response to the second research question, there were six key reasons why people continue to play video games: physical health issues, family interactions, social interactions, fear of missing out, psychological distress, as well as time and location flexibility. Meanwhile, the expectation of performance and effort were the factors that influenced purchase intention.

Still, as part of responding to the second research question, we found that psychological distress and the FOMO were the determinants for children to play video games for an extended time and lead to a behavior risk, i.e., addiction. And finally, gaming activities might bring beneficial effects such as social and cognitive stimulation, and stress relief during the Covid-19 pandemic. However, there was one condition to gain this benefit: people should not excessively spend time playing games.

Regarding the third research question, the authors employed various methods in their study. However, qualitative research employing interview methods or open-ended surveys lost ground to quantitative research using statistical tools such as SEM, ANOVA, Quasi-Poisson Regression, Path Analysis, and PROCESS macro. SEM was the most extensively employed statistical tool among the names used. SEM was employed by six of eleven studies that conducted quantitative research.

The number of respondents who provided data for these primary studies was likewise restricted to ten countries. However, three studies did not specify the respondents' places of origin. And the answer to the fourth research question regarding the countries that are the most research objects was Finland and the United States, where these two countries were listed in two different articles. On the other hand, other countries are only the research object in one article.

We could not define the precise year limitations of the literature cited as the primary studies since we do not know when the Covid-19 pandemic will be over. Therefore, we only utilized literature from the start of the pandemic in 2020 to the

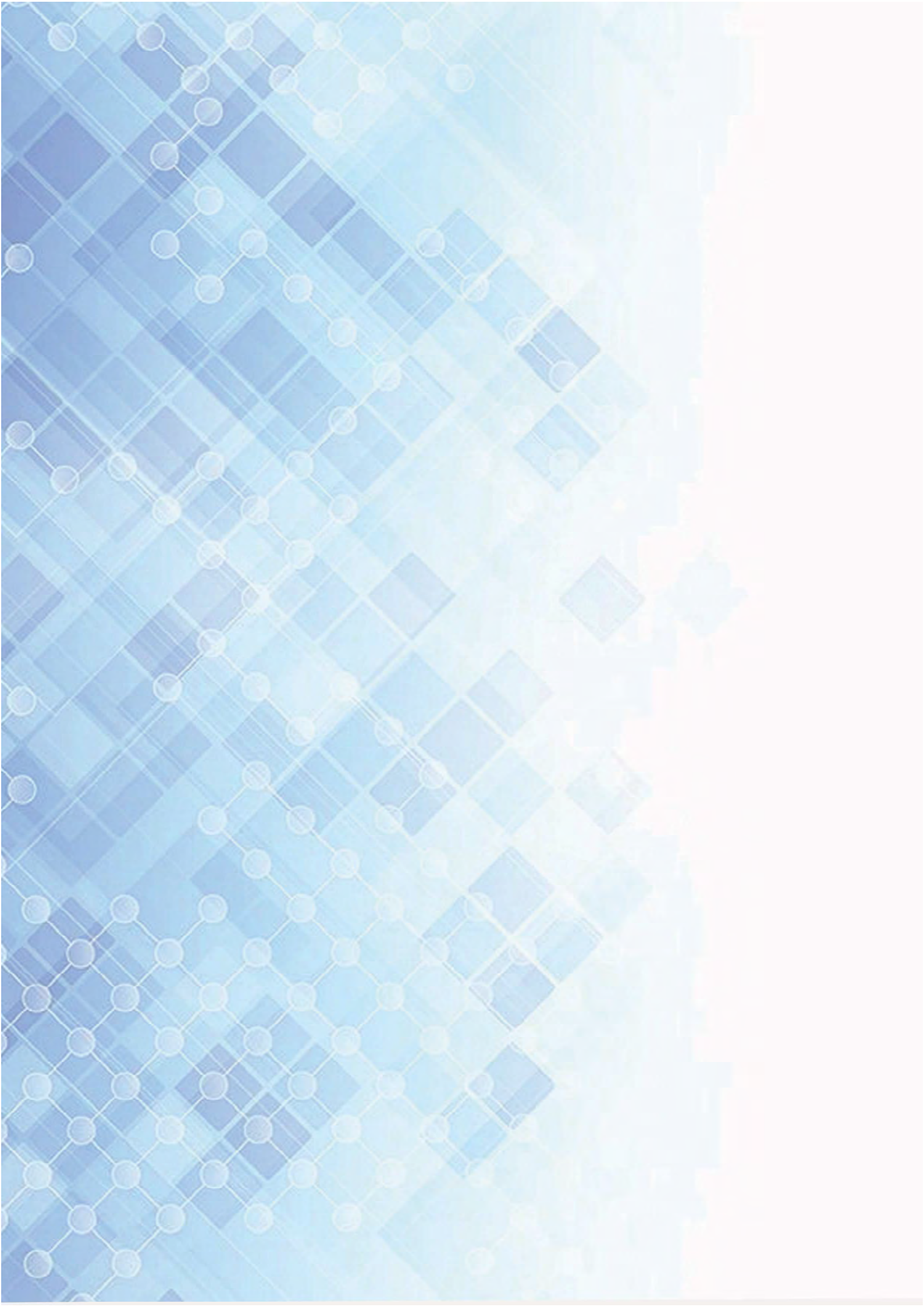
end of this literature review study conducted in March 2022. All of the findings from this literature review study are variables that may be augmented if the Covid-19 pandemic is still thought to be significant in the coming years.

In any event, the findings from this analysis of the literature can be used by future researchers to decide on their path of study whether the global circumstances surrounding the pandemic have changed or have not. Furthermore, researchers can take a position to generate contributions for developers to gain a competitive advantage from this situation [22]. Since, as previously stated, the behavior formed by the players during the Covid-19 pandemic might persist for a short or long time [24], [25].

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Gaming Activities During the Covid-19 Pandemic Era: A Systematic Literature Review

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Abstract

Document Sections

I. Introduction

II. Methodology

III. Research Result

IV. Conclusion

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Keywords

Abstract:

The Covid-19 outbreak, which has been declared a pandemic since March 2020, has been causing problems worldwide. As a result, many countries have implemented lockdown policies to control the spread of the Covid-19 virus. In addition, time spent on gaming activity has increased by 52% since video game engagement was thought to be essential in improving players' vitality, reducing psychological suffering, and helping combat stress. This literature review was conducted as a systematic literature review based on the 15 primary studies between 2020 and March 2022. Analysis of the selected primary studies revealed that the authors conducted studies of gaming activities in the Covid-19 pandemic era for four reasons: to determine the factors of play intention, factors of purchase intention, factors of gaming disorder, and to investigate the impact of the gaming activities itself. Physical health issues, family interactions, social interactions, fear of missing out, psychological distress, and time and location flexibility are the six determinants for people to continue to play video games. Meanwhile, the expectation of performance and effort were the factors that influenced purchase intention in mobile games. And from these determinant factors, it seemed that psychological distress and fear of missing out were the causes of someone experiencing a gaming disorder. As for the method employed, Structural Equation Modeling (SEM) was the most extensively used statistical tool in conducting quantitative research. Six of the eleven quantitative research in the primary studies utilized SEM, and the others employed other statistical tools. Although, in the selected primary studies, we also have four studies conducted qualitative research using interviews and open-ended surveys. Ten different countries were identified as the origin country of the respondents for the primary studies, with Finland and the United States as the most research object. However, we also found three studies t...

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I. Introduction

The Covid-19 outbreak has been causing problems all over the world. The World Health Organization (WHO) declared the Covid-19 as a pandemic on March 11th, 2020. As a result, many countries have implemented lockdown policies to control the spread of their houses and work from there. Droit-Vc ment expected everyone to remain in own situation had increased boredom

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