THE FUTURE OF E-SPORTS: FACTORS AFFECTING PERFORMANCE IN THAILAND

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Abstract

E-Sports or electronic sports is becoming famous throughout the world in this present day. When comparing with traditional sports, e-sports can be viewed as a growing industry due to the rise in the number of gamers and prize earnings. This study aims to (1) emphasize the importance of e-sports on a global scale, (2) study the differences between traditional sports and e-sports, and (3) analyze the e-sports performance based on economics factors in Thailand. The data set of e-sports performance consists of Thailand prizes awarded in e-sports tournaments from 2010-2019, a total of 10 years. The study is carried out using the descriptive statistics and regression model, Ordinary Least Square (OLS) approach, as analysis methods.

The results were divided into three parts. Firstly, gaming industry is growing rapidly which gives a new opportunity to emerging countries especially for SEA region. Secondly, traditional sports and e-sports have five main attributes differences, which are the cost of participation, professional training, award, contract, and government support. Lastly, in terms of economic factors, internet subscription is positive significant on the e-sport total prize winning. On the other hand, the factors of gross capital formation and high-technology export is insignificant for e-sports. From the result, focusing on the construction of internet broadband infrastructure can be one direction to position the country as a global leader in the e-sports sector, as well as attracting foreign players and investors to come and invest more in Thailand.

Keywords: E-sports, Traditional sports, Sports performance

Introduction

Electronic sports or E-sports is a form of sport activities that allows players to use Human-computer interfaces on electronic devices to experience competitions. There are both solo players and team players depending on the game (Hamari & Sjöblom, 2015). In the past, most of the computer game competitions were organized among amateurs but nowadays it is more professional (Tassi, 2012). E-sports competition is becoming more and more popular. It is organized in many countries around the world, including USA, Europe, and Asia. There are many kinds of games, such as Fighting game, Sports game, First person shooter: FPS, Multi-player online battle arena: MOBA, and Massive Multiplayer Online Role-Playing Game: MMORPG (Taylor, 2016; Wagner, 2006). The rise of popularity in e-sports has resulted through an increase in the number of players as well as the prizes awarded. E-sports industry is growing dramatically. Global e-sports revenue in 2020 is 947.1 million US dollars and expected to be 1,084.1 million US dollars in 2021. Number of people who watch e-sports competition in 2020 is approximately 436 million and is expected to reach 474 million in 2021 (Newzoo, 2021).

ASEAN is the fastest-growing region for e-sports. It was expected in 2019 that the number of e-sports fans would have increased by 36.1% while the average growth rate of all countries around the world increased only 19.1% (Newzoo, 2021). Moreover, the Olympic Council of Asia (OCA) listed

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e-sports in the 2018 Asian Games as a demonstration sport in Jakarta, Indonesia. OCA approved its place in the 2022 Asian Games to be a medal sport at Hangzhou, China. The Asian Electronic Sports Federation (AESF) oversees the competition at the next Asian Games, which will consist of six e-sports medal events.

In Thailand, the E-sports Association was founded for more than a decade and joined a global e-sports organization or International E-sports Federation (IESF). At that time, Thai e-sport players have been participating in international tournaments such as the E-sports World Championship under the member of IESF.

In 2017, it was officially registered as a sport under the Ministry of Tourism and Sports, called Thailand E-Sports Federation (TESF). The main purpose of TESF is to manage e-sports under the sports regulation which leads to the establishment of 23 associations; to organize e-sports competition, train players, and select the top ranked players as representatives of the Thai national team. Thailand were the 11th ranked country in e-sport earnings in 2020, with the total prize of 2,527,048 US dollars behind the USA, China, South Korea, France, Brazil, Russia, UK, Denmark, Germany, and Canada (esportsearnings, 2021).

Table 1. Top 11 highest earnings by country in 2020

Rank	Country	Total Prizes
1	United States	$21,816,030.35
2	China	$16,986,706.74
3	South Korea	$9,119,095.45
4	France	$4,484,826.57
5	Brazil	$4,359,546.64
6	Russian Federation	$4,289,099.24
7	United Kingdom	$3,939,324.37
8	Denmark	$3,805,800.29
9	Germany	$3,485,758.04
10	Canada	$3,205,524.69
11	Thailand	$2,527,047.57

Source: e-sportsearnings.com, 2021

Despite the fact that e-sports are growing and becoming more popular, there are studies about determinants of sports performance in a country level but a few studies analyze the impact of economic factors on e-sports performance. This study aimed to fill this gap. Following the study of Parshakov (2019), this research will be based on economic perspective of e-sports estimation. Features of e-sports will be analyzed regarding to widely researched of traditional sports. The question here is to find the success factors of traditional sports and compare them to e-sports.

In this paper, there are six separated sections to present the whole study. First section mentioned on the objectives of the study. Review of literature and hypotheses development is in the second part. Third part will present on methods of the study which are data collection procedures and data analysis. In the fourth part shows result of the study. Discussions and recommendations are mentioned on the fifth and the last section respectively.

Objectives

This paper is aimed to

1. emphasize the importance of e-sports whose development has gained momentum on a global scale and has become widespread as a sports branch
2. study the differences between traditional sports and e-sports
3. analyze the e-sports performance based on economics factors in Thailand

Review of literature and Hypotheses Development

In this part, six concepts related to the study will be mentioned, which include of e-sports definition, e-sports history, e-sport industry, the different between e-sports and traditional sports, the country performance in traditional sports, and macroeconomic and e-sports indicators.

1. E-Sports Definition

E-Sports is a new medium, both as an economical and sportive field. Therefore, there are new and different approaches in defining e-sports. Although there is not yet a fully established definition of e-sports, it can be said that a framework is tried to be drawn in the literature. The definitions of e-sports in the current literature are

1.1 E-sports is a form of sport in which the primary features of sports are facilitated by digital infrastructure and electronic media (Hamari & Sjöblom, 2015).

1.2 E-sports is a sports branch based on online games. As professional acting, competitive acting is equated, e-sports is a virtual sports and competitive game (Brown & Dylan, 2014).

In parallel with the development of e-sports in our country, as in the whole world, TESF or Thailand e-sports Federation has organized many workshops to draw a framework for defining e-sports. According to these, electronic sports are the activities where player can relax from stress, and it can be a virtual competition platform where skills such as reflex, hand-eye coordination, rapid decision-making, team and resource management come to the fore in teams or as individuals in different content branches it is defined as activities covering all kinds of activities, both individually and as a team, online or offline via an electronic device.

2. E-Sports History

Like other aspects of e-sports, the past of e-sports has also proven as much of its past depends on the viewpoint of a person on video games, tournaments, and audience. However, the last two decades have led to an impressive growth of e-sports as an entertainment activity (Bányai, Griffiths, Demetrovics & Király, 2019a). Though 20 years is a significant timeline, compared to traditional sports, e-sports is relatively young. Its age could vary from 20 years to almost 70 years. For example, the first computer game, a Tic-Tac-Toe simulation called Noughts And Crosseses, was invented by Dr. A. S. Douglas in 1952 (Donovan, 2010).

In 1958, William Higginbotham created Tennis for Two, the first video game to demonstrate on-screen movement and allow player interaction through handheld game controllers at the same time (Nyitray, 2019).

In addition, when students gathered at Stanford University to play a newly invented game called Spacewar!, the first video game competition was held in 1972 (Li, 2016). While some of the concepts of e-sports met the requirements for these advances, the lack of continuity and cultural influence led many e-sports researchers to overlook these milestones.

Many scholars have proposed that with the advent of video arcade, online gaming, and high scores, e-sports were born in the 1980s (Borowy & Jin, 2013). While commercial video games were invented in the 1970s in the form of coin-operated machines (Burnham, 2001; Ward & Harmon, 2019), the video game arcades of the 1980s exploded in popularity, generating an annual revenue of $5 billion in 1980-1982 alone (Borowy & Jin, 2013). Kent (2001) estimated that by 1982 there were 1.5 million

arcade machines being played. In addition to the mass playing of video games, the rise of video game arcades offered the optimal environment and basis for encouraging competitive play and organized tournaments (Borowy & Jin, 2013). In addition, in 1980, Atari held the first commercial video game competition, and the players played Space Invaders (Borowy & Jin, 2013).

Although e-sports did not emerge in the 1990s, the decade contributed greatly to the world of e-sports. The home game console, which emerged in the 1980s claimed its dominance in the 1990s over the video arcade (Ward & Harmon, 2019). Gaming consoles, both cooperative and competitive, have further popularized multiplayer games (Ward & Harmon, 2019). In addition, many semi-professionals and competitive gaming leagues had been established by the late 1990s, such as the Cyberathlete Professional League, were still running tournaments recently (Seo, 2013). The Internet and PC cafés have also helped to popularize the home computer as a gaming platform (Tsai, 2016). The prevalence of gaming leagues and PC-based games will grow as Internet penetration grows over the next decade.

Academics such as Steinkuehler (2020) have proposed that e-sports originated in the early 2000s. Innovations such as universal high-speed Internet connections have facilitated remote multiplayer events or local networked tournaments, which have driven organizations to spend money on sponsorships, scholarships, bigger tournaments, and the financing of professional athletes and teams (Steinkuehler, 2020). Streaming and broadcasting for remote viewing in the early 2010s delivered the breakthrough that e-sports needed to progress to the next stage when the need to increase in e-sports viewership was generated by tournaments, matches, and private gaming broadcast over the Internet (Ward & Harmon, 2019). The growth of the audience in the 2010s solidified the economic feasibility of e-sports and expanded participant ads and prize money (Ward & Harmon, 2019).

3. E-Sports Industry

E-sports, which stands for "electronic sports," turns online gaming into a spectator sport. The experience is similar to watching a professional sporting event, however, fans watch video gamers compete against other players in a virtual setting instead of a physical event. To understand why someone would want to watch someone else play a video game, consider how entertaining it is to watch professional football league when top star players are on the field. Fans of top video gamers appreciate watching top players compete in the same way that traditional sports fans like watching top athletes perform at the top of their capability.

This industry includes games such as League of Legends, Counter-Strike, and Dota, as well as classic sports-related games like NBA2K and FIFA. Individual players may either broadcast themselves playing in order to earn money or join larger organizations in order to compete for cash prizes in a league competition. Players can interact with their fans through social media, live-streaming platforms, and in-person during events. Fans, on the other hand, may watch and follow their favourite teams participate in regional and international competitions. As the ecosystem expands, it is surrounded by a variety of technological platforms, services, events, analytics platforms, and huge investor capital.

According to Newzoo (2021), the most popular e-sports games are being watched on dominant streaming site like Twitch from all around the world. Top ten games are shown in table 2 below.

Table 2: Top 10 Most Watched Games on Twitch

Rank	Title	Total Hours	E-sport Hours
1	Grand Theft Auto V	239.5M	729.1K
2	League of Legends	157M	28.4M
3	Call of Duty: Modern Warfare/Warzone	111.5M	211.9K
4	Fortnite	94.1M	282.3K
5	Valorant	85.6M	8.8M
6	Minecraft	79.4M	30.3K
7	Counter-Strike: Global Offensive	70.1M	20.6M
8	Apex Legends	51.4M	164.1K
9	Dota 2	49.8M	20.7M
10	FIFA 21	32M	576.8K

Note: M represents million, K represents ten thousand.
Source: e-sportsearnings.com, 2021

Grand Theft Auto V is now the most-watched e-sport in the world. For those unfamiliar with e-sports, it's also worth emphasizing that the most popular games are not traditional sports-related video games, such as FIFA or NBA2K. Rather, prominent e-sports genres consist of multiplayer online battle arenas (in which a player controls a single character in a team that must attack the enemy team's main tower), real-time strategy (in which a player develops an army to seize control of a map), and first-person shooter games (where players take part in a firefight across a map).

E-sports is also unique in that a player's success is not related to their height, strength, thinness, or speed. Though there is an insight linking excellent physical health to improved gaming performance, however, whether the player is 5'2 or 6'8 tall is ultimately insignificant. They are both capable of performing at the highest levels in League of Legends, CS:GO, Dota 2, and any other game. E-sports may help to level the playing field by removing barriers such as gender, culture, and location. This democratization of participation adds to the attractiveness of e-sports and its ability to generate a globally engaged fan base.

Furthermore, unlike traditional sports, which have physical and/or special limits, e-sports is more fast-paced and scalable due to its dependence on digital platforms. Basketball, for example, could not be made into a 100-versus-100 since a court could not accommodate 200 players. E-sports, on the other hand, allows for the creation of new games with infinitely scalable dynamics and variations. In addition, a new updated version of an existing game might have far-reaching consequences. For example, when Call of Duty: Ghosts was launched in 2013, players and spectators had to learn twelve new multiplayer maps in order to further proceed from the 2012 edition. When established games upgrades, it creates a large learning curve since game dynamics and techniques might dramatically change.

In the e-sport industry, there are major parties involved including players, organizations, leagues, publishers, and e-sports audiences that massively drive the growth of the industry.

For players, to become a top e-sports player, is no easy task. Players rise through the ranks by specializing in a certain games and improving their talents via extensive, competitive play. Some people practice for up to 14 hours a day to improve their reflexes and multitasking abilities. Talented players have mainly two options for furthering their e-sports careers, streaming and playing

professionally. Streamers are gamers who broadcast themselves while playing video games. This is most commonly seen in casual play. While streaming may be quite successful, many streamers must choose between broadcasting for a living and playing professionally, which may risk in making less money. It is said that, not all streamers are skilled enough to play professionally. Instead, others who have streaming personalities that make people entertain and like to follow, donate, and subscribe, can also create large earnings from steams. On the other hand, the players that make it to the professional level participate in tournaments against the best players from all around the world. During their journey, players frequently develop a fan base for themselves as well as the organizations for which they play. Successful professional gamers may make six-figure incomes or even a million. Top players often begin their professional careers at the age of 16 or 17, and typically retire at the age of 24. Of course, there are differences across games and publishers, but e-sports players often begin and conclude their careers far earlier than the average professional athlete. Retired e-sports professional may choose to broadcast themselves, coach e-sports teams, form their own team, work for publishers, or exit the industry entirely.

Organizations. The top e-sports teams are recruited to be a part of organizations that include teams that specialize in their respective video games but operate under the same name, similar to how college or institution competes in football or basketball, and all under the same college or university. Consider an organization to be an elite conglomeration of teams playing a range of video games. Some of the games are one-on-one, while others are team-based, with two squads fighting against each other.

League. E-sports teams will participate in their video game's respective league, which includes regular seasons, playoffs, and global finals, while representing their organization. E-sports teams compete in video game leagues in the same way that basketball teams play in the NBA. Companies such as Major League Gaming (MLG) and the Electronic Sports League (ELS) organize league competitions

Major League Gaming's events gained dozens of fans when it originally began in the early 2000s. The largest esports competitions are becoming nearly as big as traditional sports events. The League of Legends Championship filled out the 15,000-seat Staples Center in Los Angeles in an hour in 2016, then sold out the 40,000-seat World Cup Stadium in Seoul while generating a 27-million-strong online viewership. The Intel Extreme Masters competition, held earlier in 2016 in Katowice, Poland, drew 173,000 people to the stadium over two weekends. Other famous esports stadiums across the world include London's Wembley Arena (12,500 seats) and Seattle's KeyArena (10,000 fans). Unsurprisingly, the prize money for the largest events may be huge. The total prize money in 2019 was $167.4 million, an increase from $150.8 million in 2018 and a far from $5.2 million in 2010.

Publishers. Each game in esports is the intellectual property of the game developer, also known as publishers. Riot Games, Valve, Activision, and others are among these publishers. The publisher's role in the e-sports ecosystem might be described as all powerful. Unlike traditional sports, which may be played by anyone and everywhere, publishers create and develop their games and then hold all rights to them. This implies they have control over where the game is played, who organize game competitions, and other aspects. At the end of the day, publishers control each game's intellectual property, and other industry participants, such as tournament organizers, or players, are well aware of this fact.

E-sports audience. According to Newzoo (2021), the worldwide viewership for e-sports is projected to reach over 474 million people in 2021. From these number, 234 million of these people are e-sports enthusiasts, while 240 million are occasional viewers. The number of enthusiasts is expected to increase by 22% by 2024, reaching 285.7 million. In rising regions such as Latin America, the Middle East and Africa, and Southeast Asia, audience and awareness are growing. This is mostly due to urbanization and developments in IT infrastructure, as well as popular mobile games such as

PUBG Mobile and Garena Free Fire. Globally, the rising popularity of mobile gaming, as well as the continued appeal of the first-person shooter, battle royale, and MOBA genres, are key contributors. Furthermore, newer generations that have grown up with gaming and viewing video game content are continuing to enter the industry, pushing audience growth even further.

E-sports is a booming industry in a global scale. Global games market in 2020 is 159.3 billion US dollars and expected to be 200.8 billion US dollars in 2023 (Newzoo, 2020). However, from global games market report by Newzoo (2020), the region generated the biggest part of the revenue is in Southeast Asia (SEA). In 2019, SEA generated $4.4 billion in game revenue, which representing a 16 percent year-on-year increase. Mobile contributed for $3.1 billion of 2019 sales, or slightly more than 70% of the market. The reasons behind are that SEA has the highest mobile internet users in the world, because of the changes in consumer behavior in the e-commerce, online travel, ride-hailing, and online media sectors. Between 2015 and 2019, the number of Southeast Asian e-Sports Enthusiasts increased at a Compound Annual Growth Rate of 36.1 percent, reaching 19.8 million. This helps with monetization in advertising and tickets. Major tournaments succeed in influencing trends that are also driving the games market in Southeast Asia, which might be related with the phenomena of the Leisure Economy, which is seen as a key factor driving the rise of the e-Sports industry.

Thailand, moreover, is now the 19th largest market for video games, with an annual revenue of USD 667 million. While traditional video game sales contributed the majority of the revenue, which resulted for increased demand of e-sports in Thailand. There are approximately 27 million Thai gamers, while Garena stated that online views of Arena of Valor's Season 3 tournament play had reached over 51 million in 2019.

E-sport in Thailand has tendency to grow but has a major “achilles heel” of lacking specialist and skilled labor. In this field it can be an obstacle for the industry’s growth. There was a relatively low number of information and communication technology (ICT) employees in 2019, which was similar to unemployment in all industries. While looking at the proportion of ICT employment classified in 2019, software and applications developers and analysts were found to be rather low, approximately 11.1 percent of total ICT employees (2019, National Statistical Office). As a result, Thailand still faces a lack of specialist and skilled labor in the gaming industry.

However, this problem can also be seen as an opportunity for gaming companies to invest in Thailand's gaming industry along the supply chain. Training and skill development for laborers from gaming companies will be a driven force in resolving a lack of software and application developers and analysts in ICT. Gaming firms may find it advantageous to develop key essential skills for laborers. These key talents for producing gaming products might be considered with game industry job classification, such as a job of production, animation, programming, art, design, quality assurance, and audio. As a result, these companies may profit from having skilled laborers in their organizations as well as lowering the expense of searching for skilled labor or specialists

Apart from gaming companies investing in skilled labor development, the companies can take an investment opportunity by establishing a digital content institute. The institution may expand its business model to provide educational and training support for the digital content industry, generate more revenue stream, and recruit foreign gaming professionals, such as game designer or game developer, to teach Thai laborers. Moreover, to reduce the cost of establishment, the company may collaborate with government organizations to jointly invest in the game creation to bring out the world standard games to the global market.

Furthermore, the government may help the gaming business by forming a marketing agency in collaboration with private companies. This agency can play a significant role in promoting the gaming industry both domestically and globally. Then, using various strategies such as advertising, promotional activities, and online and offline event planning, to boost up the sales.

4. The Different between E-Sports and Traditional Sports

Though a definition gives a theoretical knowledge of e-sports, a comparison between e-sports and traditional sports gives the required context. Sports, according to Behnke, Kosakowski, and Kaczmarek (2020), must have seven characteristics: (1) need voluntary participation, (2) state rules, (3) requires competition, (4) employ skill rather than chance to win, (5) have certain physical requirements, (6) have an audience, and (7) attain institutional stability and control of activities. E-sports had, arguably, fulfilled all of the requirements (Behnke et al., 2020). E-sports, like traditional sports, features: multiple sporting events (video game); each sport has different rules; players formed teams; teams have joined multiple competitive leagues; teams have established for casual play, school-based play, and professional competition (Jenny et al., 2018); teams and players have had scholarships (Schaeperkoetter et al., 2017); events have occurred in large event arenas (Jenny et al., 2017); games, teams, and players have had fans, spectators, and merchandise; people gamble on matches (Chung, Sum, Chan, Lai, & Cheng, 2019); players have used performance-enhancing substances (Stivers, 2017); match-fixing and other forms of cheating have occurred (Hughes & Orr, 2019); and gender and race inequality have existed in e-sports (Ruvalcaba et al., 2018). Though it appears that traditional sports and e-sports share many characteristics, the primary argument for the separation of traditional sports and e-sports has been e-sports athletes' lack of physical exercise (Parry, 2018).

The argument over whether e-sports is a sport or not has been frequently discussed in the e-sports academic literature. Many scholars claim that e-sports cannot be considered a sport since the athlete does not demonstrate physical skill (Hallmann & Giel, 2018; Jenny et al., 2017; Kane & Spradley, 2017; Parry, 2018). Gawrysiak (2016) defined e-sports and other contests, such as the Drone Racing League, as a non-traditional sport since the competitor participates through a proxy (a digital avatar or a drone) yet these events share many of the characteristics of a sport. Pluss et al. (2019), on the other hand, argued that an e-sports athlete must combine their perceptual-cognitive skills (e.g., anticipation, visual search behaviour, pattern memory, and decision-making) with domain-specific skills (e.g., keyboard and mouse motions) to accomplish a successful performance. E-sports have fundamentally needed athletes to utilize their bodies and minds strategically and expertly to win (Behnke et al., 2020). Many e-sports activities, according to Hallmann and Giel (2018), are comparable to traditional sports such as shooting and archery since they all require a high level of dexterity for quick reactions, coordination, visual acuity, and attention. Furthermore, studies have shown that e-sports players' physical abilities (typing, mouse-clicking, and button-mashing) are a different display of physical effort, which can have the same long-term impacts on the human body as physical exertions in traditional sports (DiFrancisco-Donoghue, Balentine, Schmidt, & Zwibel, 2019; Ferrari, 2013).

Depending on the tournament, an e-sports athlete will engage in a variety of physical activities. According to observations, amateur e-sports athletes perform about 50 action moves per minute (press a button, pull a trigger, move a joystick, or move a mouse), whereas professional e-sports athletes may make over ten actions per second, which corresponds to around 500 action actions per minute (DiFrancisco-Donoghue et al., 2019). E-sports athletes' physical activity has been linked to eye fatigue, neck and back pain, carpal tunnel and other wrist pain, and hand and finger pain (DiFrancisco-Donoghue et al., 2019, Ferrari, 2013). According to DiFrancisco-Donoghue et al. (2019), further study on the physical impact of e-sports on athletes is needed so that healthcare professionals may develop treatment models to prevent or minimize physical pain. Similar in traditional sports, the management techniques have help traditional athletes for years.

Not only physical characteristics described the different of e-sports and traditional sports, based on the previous study of Parshakov (2019), features differences between e-sports and traditional sports can also be explained in an economics context as follow

4.1 The participation cost of e-sports is much lower than traditional sports because it does not need lots of investment in sport facilities. The investment for e-sports player is also low. A player can be on professional level in multiple games.

4.2 Gaming industry is quite young. There are a few professional schools for training e-sports player

4.3 E-sport tournament has only 2 types, offline and online. No competition awarded on country-level

4.4 Rewards and prize won are player's performance -base. Fixed contracts are rarely existed

4.5 Governments play an important role in traditional sports, such as the investment in sport stadium and facilities, but less investment in e-sports

5. The Country performance in Traditional Sports

Several academic papers study the country-level success factors in traditional sports. Bernard and Busse (2004) had studied the data of Olympic Games from 1960 - 1996 and identified the important factors that influence country-level performance, as well as made the prediction of the likelihood of success for the Sydney Olympics. The common factors used to determine a national team success are

5.1 Economic situation: the most common used factors to indicate the country's economic situation are GDP (Bernard & Busse, 2004), GNP (Lozano et al. 2002), income per capita (Johnson & Ali, 2004), export or import, capital formation, and inflation (Gásquez & Royuela 2014).

5.2 Human resources: population size, life expectancy, child survival, literacy rate, or education level are used as country's population characteristic indicators (Churilov and Flitman, 2006)

5.3 Political situation and religion: political stability (Johnson & Ali, 2004), communist (Bernard & Busse, 2004), colonial heritage (Leeds and Marikova Leeds, 2009), or different religion among countries (Trivedi & Zimmer, 2014)

5.4 Geography and natural resources: climate (Johnson & Ali, 2004), land and water areas (Condon et al., 1999)

5.5 Infrastructure: airports, railroads, highways (Condon et al., 1999)

5.6 Hosting nation: it is shown that country hosting the Olympic Game has more government support which leads to higher success of hosting nation team (Noland & Stahler, 2015 & Trivedi Zimmer, 2014).

Prior study on the Country's success factors in sports uses the data for national teams, such as total winning medals in Olympic competition. Some studies use data from FIFA (soccer) competitions (Leeds & Marikova Leeds, 2009) as indicators.

In order to link the success factors of traditional sports in country-level, we apply Bernard and Busse's (2004) approach by using total prize winning to understand the country characteristic in sports performance for the non-nation competition.

6. Macroeconomic and E-sports indicators

Previous studies have used a variety of success factors in traditional sports. According to our analysis of the literature, approximately 15 determinants are widely used to describe a country's performance in traditional sports. We apply 3 of these factors, which we believe that they can explain they country-level success in e-sports.

6.1 Following the study of Gásquez and Royuela (2014), gross capital formation is used to describe as a country's total investments relative to its GDP and country growth. It is the estimation of net capital expenditure by the public and private sectors, which include the spending on transportation equipment, plant and machinery, software, new dwellings and other buildings. Rapidly

developing countries can be characterized by strong economic conditions, which increase people's willingness to spend time playing games, so it indicates a growing of e-sports industry. Weak economic conditions point to a late adoption of information technology and gaming. The advancement of technology in these countries could bring a greater interest in gaming as something new and exciting to explore. We consider this factor to measure a country's tangible orientation where e-sport is specified as a non-tangible orientation.

6.2 The factor of high-technology export which shared in manufactured exports to measure the degree to which an economy is opened to other countries. Gásquez and Royuela (2014), used this as a country's success factor in soccer. They argued that the economic liberalization has a positive impact on an economy and the likelihood of economic growth. We consider not only the degree of openness of an economy, but also the advancement of information technology. We assume that the country with high export on high technology product, such as gaming gear or computer product, are more involve in e-sports industry. The more industry coverage, the more time spend playing game and thus result to e-sport player prize earnings

6.3 Since e-sports is so closely linked to computer and internet usage (Parshakov, 2019), we use the percentage of internet subscription to measure the popularity of e-sports. Due to internet access is one of the main factors that drives the economics growth which can be measured via broadband infrastructure in the country, we believe that a higher or lower percentage of internet subscription leads to size of economics and the proportion people participate in computer gaming. The greater number of population gaming, the more likely it is that the country will have e-sports players who win the competitions.

7. Conceptual Framework

According to the literature review, variables used for this study can be summarized as a conceptual framework below.

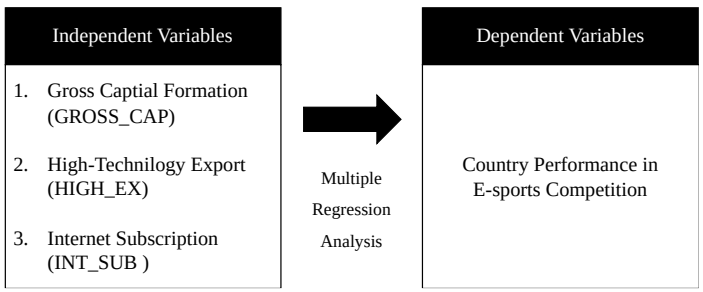

Figure 1. Conceptual Framework of the study

8. Hypotheses

H1: Gross capital formation has a positive impact on the increased of total prize won of the country.

Gross capital formation is used to describe as a country's total investments relative to its GDP and country growth, especially on the infrastructure and construction sectors. We assume that the more investment in e-sports facilities and infrastructure, the higher chance that players can practice efficiently which leads to victory of the country to win the prize.

H2: High-technology export has a positive impact on the increased of total prize won of the country.

High-technology export shares the degree of openness of an economy as well as the advancement of information technology in the country. We assume that the country with high export on high technology product are more involve in e-sports industry. The more industry coverage, the more time spend playing game and thus result to e-sport player prize earnings

H3: Internet subscription has a positive impact on the increased of total prize won of the country.

Since the internet access plays an important role on e-sport industry, we believe that a higher percentage of internet subscription leads to the proportion people participate in computer gaming. The greater number of population gaming, the more likely it is that the country will have e-sports players who win the competitions.

Methods

1. Data Collection Procedures

To study the success factors in e-sports, we collect the data of tournament prize winnings from E-Sports Earnings. This source is a freely public information which provides the information of e-sprots earning in each tournament, winner's name, as well as total prize won of each country each year. We use the data in the period of 2010 to 2019. For the economic factors, the information is collected from World Bank Open Data. The data are analyzed using two approaches, descriptive statistics and quantitative analysis.

2. Data Analysis

The data analysis will be separated into two parts, descriptive analysis and quantitative analysis, which can be explained as following;

2.1 Descriptive analysis described the importance of e-sports whose development has gained momentum on a global scale and has become widespread as a sports branch, the differences between traditional sports and e-sports, and economic factors that affect the traditional sports and e-sports performance in Thailand.

2.2 Quantitative analysis. To test whether country characteristics, in terms of economics, matter for the e-sports performance, we use the multiple regression analysis.

Following the previous study, we analyzed whether economic factors is a country matter for the e-sports performance by using the multiple regression analysis and estimating the coefficient of the equation by Ordinary Least Squares (OLS) method.

The estimated model is as equation (1):

$$Total\_prize_t = f(GROSS\_CAP_t, HIGH\_EX_t , INT\_SUB_t) \quad (1)$$

The outcome model for OLS in Log-linear function is as equation (2):

$$InTotal\_prize_t = \beta_0 + \beta_1 GROSS\_CAP_t + ln\beta_2 HIGH\_EX_t + \beta_3 INT\_SUB_t + \varepsilon_t \quad (2)$$

Where;

$Total\_prize_t$	is total prize won of the country in each year (unit: USD)
$GROSS\_CAP_t$	is gross capital formation (unit: percentage)
$HIGH\_EX_t$	is high-technology export (unit: USD)

INT_SUB_t	is the percentage of internet subscription (unit: percentage)
t	indicates year from 2010-2019
ε	is error term

Results

According to the first objective, to emphasize the importance of e-sports whose development has gained momentum on a global scale and has become widespread as a sports branch, the study shows that gaming is a booming industry in a global scale with the total global games market at 159.3 billion US dollars in 2020 and expected to be 200.8 billion US dollars in 2023 (Newzoo, 2020). E-sports turns online gaming into a spectator sport which give the experience similarly when watching a professional sporting event such as basketball or football league. The audience, however, watch the video game competitions in a virtual setting instead of a physical event. According to Newzoo (2020), e-sports audience grow to 495.0 million globally in 2020. From this number, 223 million of these people are e-sports enthusiasts, while 272 million are occasional viewers. The number of enthusiasts is expected to reach 285.7 million by 2024. In rising regions such as Latin America, the Middle East and Africa, and Southeast Asia, audience and awareness are growing due to urbanization and developments in IT infrastructure, as well as the rising popularity of mobile gaming. Comparing these 3 regions, Southeast Asia is the fastest growing with the game revenue generating of $4.4 billion in 2019 or slightly more than 70% of the market. Thailand, moreover, is now the 19th largest market for video games, with an annual revenue of USD 667 million. With the increasing of E-sports audience every year, gaming industry in Thailand has tendency to grow but a major pain point is that Thailand is lacking of specialist and skilled labor in ICT field to drive the e-sport industry. Fortunately, this pain point can be seen as an opportunity for gaming companies to invest in Thailand's gaming industry along the supply chain. With the training and skill development for laborers from gaming companies, it advantageous to develop key essential skills for laborers. As a result, the companies may profit from having skilled laborers in their organizations as well as lowering the expense of searching for skilled labor or specialists. Furthermore, collaboration with the government, in terms of marketing, can also positively impact on the Thailand’s gaming industry

In the second objective, to study the differences between traditional sports and e-sports. It is arguably that e-sports athletes' lack of physical exercise which is the key different from traditional sports. But, due to Hallmann and Giel (2018), many activities in e-sports need physical effort, such as typing, mouse-clicking, or button-mashing. In this study, the differences between traditional sports and e-sports will be summarized using economics context from the study of Parshakov (2019) instead. there are five characteristics differences between e-sports and traditional including, (1) the cost of participation of e-sports is relatively low comparing to traditional sports. (2) Unlike traditional sports, there are only a few professional schools for e-sports training existed due to the gaming industry is quite young. (3) There is no awarded on a country-level for e-sports, only on offline and online tournaments. While for traditional sports, Olympic Games have awarded on a country-level. (4) Prize won for e-sports are player’s performance-base, rarely find fixed contract for e-sports player. And lastly, (5) government has less investment in e-sports, but for traditional sports, on the other hand, they have huge investment on the infrastructure and facilities such as sport stadium.

For the third objective, to analyze the e-sports performance based on economics factors in Thailand. The result shows as following.

Table 3. Descriptive Statistics of Country Economic Factors

Variables	Mean	Std. Dev.	Max	Min
GROSS_CAP (percentage)	0.247	0.023	0.28	0.211
HIGH_EX (million USD)	24.393	0.032	24.525	24.311
INT_SUB (percentage)	0.092	0.072	0.145	0.048

Table 3 presents the descriptive statistics for the variables that used as success factors of e-sport performance on country-level. Gross capital formation average is 24.7%, standard deviation is 0.023, while minimum and maximum of this variable are 21.1% and 28% respectively. High technology export in average is 24.39 million US dollars, standard deviation is 0.032, and these data range is covering 24.311 up to 24.525 million US dollars. Internet subscription in average is 9.2%, standard deviation is 0.145, minimum percentage is 4.8 while the maximum percentage is 14.5.

Table 4. Unit Root Test

Variable	ADF test statistic	Prob.	Order of Integration	Result
ln_Total_prize	-5.184225	0.0067***	Second Difference	Stationary
GROSS_CAP	-3.879924	0.0747*	Level	Stationary
ln_HIGH_EX	-4.179643	0.0323**	Second Difference	Stationary
INT_SUB	-3.077433	0.0745*	Second Difference	Stationary

Note: * represents probability value statistically significant at 0.1.
** represents probability value statistically significant at 0.05.
*** represents probability value statistically significant at 0.01.

The result of unit root test shows in table 4 that all variables using in the estimated model are stationary. The dependent variable, ln_Total_prize, is stationary at second difference with significance at 1% level. ln_HIGH_EX is also stationary at second difference with significance at 5% level. While GROSS_CAP and INT_SUB are stationary at level and second difference respectively with significance at the 10% level.

Table 5. Correlation Analysis of Country Economic Factors

Conducting a test of correlation on independent variables is to avoid the problem on multicollinearity, which the correlation coefficient should be less than 0.8.

Variable	GROSS_CAP	HIGH_EX	INT_SUB
GROSS_CAP	0		
HIGH_EX	-0.4167	0	
INT_SUB	-0.4954	0.8089	0

Table 5 shows that the correlation coefficients are in the range between 0 to 0.8. Only high technology export (HIGH_EX) is slightly higher, which is 0.8089. But in this paper, this variable will be used in the model because high technology export (HIGH_EX) is a key factor for the study.

Table 6. Results of Regression Analysis

Variable	GROSS_CAP	HIGH_EX	INT_SUB
Coefficient	-0.168611	1.085192	0.492418
	(-4.2501)	(-0.2511)	(4.9237)***
R-squared	0.948409		
Adjusted R-squared	0.922614		
Durbin-Watson stat	2.423892		
F-Statistic	36.76663		

Note: t-statistic in parentheses.

* represents probability value statistically significant at 0.1.

** represents probability value statistically significant at 0.05.

*** represents probability value statistically significant at 0.01.

Based on the OLS function of equation 2, the result shows in table 6 that gross capital formation (GROSS_CAP) is not a significant issue for e-sport. Interestingly, the outcome for the factor that indicates an investment in country's infrastructure is not important for e-sport players performance. The result contradicts the study of Bernard and Busse's (2004) on traditional sports, which they find that the more investment in sports facilities or sport infrastructure, the more likely that country will win the medal in Olympic Games. The reason behind this finding is because Thailand is still a developing country so that the investment for e-sports industry and infrastructure has not been focused on yet.

The same finding on high-technology export (HIGH_EX), a factor of innovation structure in a country or high R&D product such as aerospace, pharmaceutical or scientific instruments, is also insignificant for e-sports. Because in the past Thailand is an agricultural producing country, the export was more on agricultural products. Nowadays, the export of high technology such as electronic machinery, appliances, and vehicles are growing every year. We can assume that the effect of this indicator has not yet occurred in these days but will surely have the impact in the near future.

However, the number of internet subscription is statistically significant at the 1% level, which matches with the study of Gásquez and Royuela (2014). The finding shows that 1% increase in internet subscription leads to 0.49% increase in e-sport total prize winning. Thus, a successful country on the e-sport is more likely have strong development in broadband infrastructure so that population in the country is able to access to the internet more easily.

Discussions

This study provides evidence of economic factors that affect country performance in e-sports based on total prize won. This finding is in line with Gásquez and Royuela (2014) who study the development of traditional sport performance. We find that some factors that affect tradition sport also have an impact on e-sports performance. Our results also show that the more population in a country can access to the internet, the more likely that country will win the prize in e-sports competitions.

Recommendations

Regarding the growing of e-sport industry and the result showing in this study, there are suggestions for government as follows

1. The e-sport industry is growing rapidly. Recognizing e-sports as a professional industry can be a first step for governments to consider.
2. Sponsoring in e-sports tournament or directly invest on the construction of infrastructure to give space for players to host tournaments, train, and show off the country's hospitality. The result from these will help to position country as a global leader in the e-sport sector as well as attract foreign players and investor to come and invest more in Thailand.
3. Support schools or universities for building up a new program curriculum for e-sport. Similar to sports university, e-sport can be on the curriculum for students, who are interested in having future careers in e-sports field, such as an e-sports professional player, coach, game strategic planner, broadcaster, game developer, etc.

Acknowledgement

The author would first like to thank my major advisor Ms. Sirikwan Jaroenwiriyakul, for her valued support and guidance throughout the entire process of my graduate work.

I would also like to thank to lecturers and staff in economics faculty who share their rich teaching experiences and knowledge as well as continually support in many things during the time of study. Another gratitude goes to my friends that always help when I needed.

Finally, I would like to extend my deepest gratitude to my family, for believing in my ability and giving me the courage to attain my goals.

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