The rise of the gaming entrepreneurship – overview of the gaming industry ecosystem, case of Croatia

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Abstract*. The paper presents the video game industry, which is among the youngest and currently the fastest growing creative industries in the world. The global development of the industry in recent decades, and its impact on the Croatian gaming market has been investigated. Statistical research of secondary data on gaming in the Republic of Croatia and gaming in the world was conducted. Through an overview of collected data, an analysis of the current state of the gaming entrepreneurship ecosystem in Croatia was conducted. The current state of the gaming industry ecosystem was evaluated by examining the regulatory framework, incentives, education system and existing networks. The tendency of further development of gaming entrepreneurship, and its necessary factors, has been estimated.*

Keywords. creative and cultural industry, Croatia, ecosystem, gaming entrepreneurship, metaverse, video game industry

1 Introduction

Although the development of video games began inthe middle of the last century, this industry has seen significant growth in this millennium, partly due to the rapid advancement of technology, partly due to the global use of smartphones and the availability of the Internet. Consumer habits have also changed, the majority of the population spends a significant part of the day in front of a screen, and generations of new consumers are connected to the virtual world from an earlier age. The rise of online gaming and the growing demand for mobile games have created new opportunities for entrepreneurs. This statement is substantiated by the fact that in 2022 it was estimated that the industry will generate 184.4 billion dollars (Newzoo, 2023). Gaming entrepreneurship is a promising trend that encourages innovation, especially through the implementation of virtual reality, augmented reality and the metaverse. For the reasons mentioned, this research was carried out, i.e. the aim of the work is to present the current state of the gaming industry in Croatia, from the entrepreneurial aspect, but also to identify the potential in the future.

2 Development of the gaming industry

The first computer games appeared in the 1950s, and due to the limitations of the technology at the time,video games were very simple (ITU, 2011). With the appearance of the first functional games („Nim", „Oxo", „Tennis for two" and „Spacewar", and with the invention of the microprocessor and the beginning of the production of personal computers in 1970 and1971, the first arcade games were developed („Computer Space", 1971, „Galaxy game", 1971 and „Pong",1972). The industry implies the development, distribution and sales, so despite the existence and production of video games, it was only with the sale of the first Magnavox Odyssey player console in 1972 that the gaming industry began in its full sense (Langlotz et al., 2008). In the eighties of the last century, one of the first video games made in color „Pac-man" (1980), together with „Tetris" (1984) and „Super Mario Bros" (1985) became a global phenomenon that made video games more popular, and the industry began to attract more attention. During the 1990s, the video game industry has seen significant progress in technology, with the advent of 3D graphics and CDs as a gaming medium, and the rise of game consoles (Super Nintendo, Sega Genesis, and Sony PlayStation). The availability of mobile devices has contributed to the development of the industry in the past decade, attracting millions of players worldwide to games such as „Angry Birds" (2009) and „Candy Crush Saga" (2012) (Altamirano, 2012). With the emergence of a gaming streaming platform in 2011, Twitch has significantly influenced the development of computer games, primarily due to the possibility of

interaction between players and viewers. This created a community of players and spectators, which further popularized e-sports, and gaming became recognized and accepted as a serious competitor to traditional sports (Yaden, 2022). The current big shift in the industry is made possible by the development of Virtual Reality (VR) and Augmented Reality (AR).

3 Gaming entrepreneurship – definition and existing literature

Activities and business opportunities related to the video game industry encompasses gaming entrepreneurship. Gaming entrepreneurship includes the development of video games, which includes programming, character and world design, art, music, and game testing. The types of gaming entrepreneurs differ depending on the activities they perform; gaming developers manufacture and sell gaming hardware, including gaming consoles, peripheral devices (mice, keyboards, controllers), gaming headsets and other accessories that improve the gaming experience, publishers are placing video games to the market. They also provide financial support, marketing strategies, distribution and support for development studios or independent developers to help their games reach a wider audience (Petrić & Kajić, 2020). Some other directions of possible entrepreneurship in the gaming industry are the provision of services such as platforms for streaming games (Sutevski, 2023), organization of e-sport events, creation of streaming content related to video games and gaming education.

Considering the rapid increase in the number of gamers, games, companies and other participants in the gaming industry, it is important to assess its effects on the economy and to identify obstacles, as well as undiscovered potential.

Seen from the entrepreneurial aspect, previous research can be categorized into five research areas:

- **The impact of gaming on entrepreneurial habits** (La Guardia et al., 2014; Newbery et al., 2016);

Transversal entrepreneurial skills are encouraged by applying the concept of game-based learning. Gaming, more precisely, serious games and simulations, when included in entrepreneurial education, can give a realistic insight of the journey of starting a business.

- **The impact of gaming on entrepreneurial education** (Thavikulwat,1995; La Guardia et al., 2014; Newbery et al., 2016; Bajraktari et al., 2021). La Guardia et al. (2014) use the concept of experiential learning, which includes gaming with the aim of encouraging entrepreneurial intentions. Bajraktari et al. (2021) proved the positive impact of games on entrepreneurial education. In addition to entrepreneurial traits and intentions, the positive influence of gaming has been proven on cognitive and affective abilities of adolescents (Zioga et al., 2024);
- **Tools and technology in game development**: forms of technical creation and development of games (Dubbels, 2016), or technology usage for improvement of user experience (Palmquist et al., 2024);
- **Enterprise success factors and the potential of the gaming industry** (Santasärkkä, 2017; Zhou et al., 2022; Primasari, 2022; Palma-Ruiz et al., 2022; Huang and Huang, 2023; Białek-Jaworska et al., 2023; Cao, 2023; Gumasing et al., 2023; Peri, 2024; Rogov, 2024). Some of the identified success factors of the gaming industry is its resilience in unpredictable times such as the pandemic, as well as constant hardware innovation and the inclusivity of the gaming content (Peri, 2024). Zhou et al. (2022) also examined the impact of Covid-19 on the gaming industry in Macao. Due to results, authors emphasized the need for portfolio diversification, expansion into new markets and cooperation with surrounding areas. Huang and Huang (2023) identified the potential for gaming industry development through the usage of ChatGPT, whose application could enhance the gaming experience and transform the gaming ecosystem. In research regarding new forms of gaming industry directions, such as of cloud gaming, Gumasing et al. (2023) point to its potential, due to the positive attitude of Generation Z towards cloud gaming, but also the general economic well-being such as sustainability, efficiency and optimization of energy and other resources. The results of a study conducted by Białek-Jaworska et al. (2023) indicated increased lagged innovation and efficiency of companies in the gaming industry, because of intellectual property protection policy. According to Rogov (2024), gaming is a specific social institution, with a still unrecognized potential;
- **Entrepreneurial ecosystem in the context of video games** (Huang, 2024; Mcintyre et al., 2023; Wang, 2024; Białek-Jaworska et al., 2023; Cao, 2023; Rogov, 2024; Hagverdiyev, 2024; Peri, 2024). Huang (2024) investigates how local cultural policies affect the establishment of businesses in the gaming industry. Tsymlyakov (2024) also examined the impact of local policies on the development of gaming industry, but concluded that governmental restrictions can have a negative effect on the gaming industry. While evaluating the effectiveness of the new gaming public policy in Macao, Wang (2024) identified positive policy changes which are visible through the focus on economic diversification, rather than on the growth of the industry. Białek-Jaworska et al. (2023) investigate the effects of government policies, specifically the intellectual property and taxation, on the efficiency of companies in the gaming industry. Additionally, some existing research focuses on the gaming industry ecosystem, but specifically on the legal perspective and security. Cao (2023) examined the potential of the metaverse development, with gaming as one of the main factors. The author suggests investments in new platforms, but also governmental policies for security

and protection, for both, companies and consumers. The stated challenge coincides with the highlighted challenges of the European Parliament (2023) in the report Protecting gamers and encouraging growth in the video games sector. Another threat for gaming entrepreneurs in existing ecosystems is the lack of policies to protect them from the influence of large corporations (Rogov, 2024). Peri (2024) emphasized security as one of the main challenges of the gaming industry, as well as Hagverdiyev (2024) who underlined the importance of governmental security and privacy policies, especially in the context of Big Data Analytics.

Given the existing literature and the observed limiting effect of policies on the development of the gaming industry, the goal of this paper is the analysis of the ecosystem in Croatia, that is, the identification of existing support instruments for entrepreneurs, as well as potential additional areas of support. Since a quality workforce is a prerequisite for gaming industry development in the future, special emphasis during the analysis will be on the education system and the popularization of gaming through competitions and tournaments.

4 The gaming industry ecosystem in Croatia

4.1 The development and current state of the gaming industry in Croatia

The industry started in the 1980's with the first commercial game („Vruće ljetovanje", 1985), and had its greater development in the 1990's with the establishment of the first computer game development studio („Croteam", today „Abest", 1993). 2008 and 2010. were milestones for Croatian gaming industry development, due to the foundation of the highly successful company Nanobit, whose revenues make up to 60% of the total revenues of the industry (Pavelić, 2022), and Gamepires, with its release of the popular survival action-adventure game "SCUM".

Currently, the number of active E-sports players in Croatia is 265 (Rajput, 2023). In addition to the general increase in the number of players, the video game industry records a significant increase in female players, so for comparison in 2006, the percentage of female players was 38%, while currently the share of female and male players is almost equal, i.e. 49% refers to female players (Qazi, 2023).

A decade ago, while still developing, the total revenues of the Croatian computer game industry from 2009 to 2013 grew at an average annual rate of 50.4 percent (Rašić Bakarić et al., 2015) as shown in Figure 1.

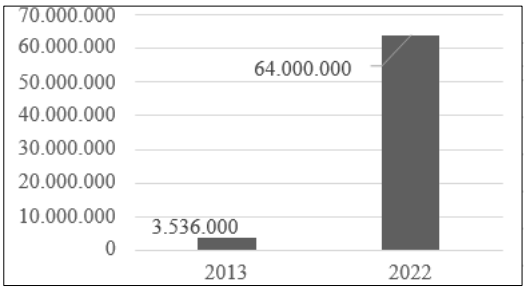

Figure 1: Croatian gaming industry revenue (in euro) over the last decade, source: Rašić Bakarić et al., 2015 and CGDA, 2022

Croatia gaming industry revenue in 2022 was 64 million euro (Knezović, 2023), as shown in Table 1, with comparison to Europe's 34.4 billion in revenue.

Table 1: Croatian gaming industry revenue compared to other European countries

Country		Revenue (euro)
1	France	38.800.000,00
2	Germany	37.400.000,00
3	Finland	32.000.000,00
4	Sweden	27.130.000,00
5	Spain	12.810.000,00
6	Poland	11.910.000,00
7	Netherlands	430.000,00
8	Romania	293.000,00
9	Czech Republic	290.000,00
10	Lithuania	154.000,00
11	Belgium	83.000,00
12	Slovakia	69.000,00
13	**Croatia**	**64.000,00**
14	Slovenia	32.000,00
15	Latvia	24.000,00
16	Portugal	22.000,00

Source: Knezović (2023).

According to Pavelić, there were about 45 legal entities in Croatia in 2022, that were engaged in the development of video games, while a decade ago, there were only 10 legal entities, according to the research conducted by The Institute of Economics, Zagreb. The number of employees in Croatian gaming industry is also growing significantly (Rašić Bakarić et al., 2015).

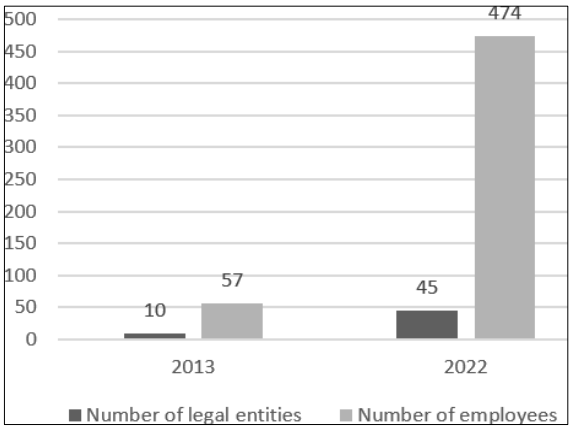

Figure 2: Rise of the number of legal entities and employees over the last decade, source: Rašić Bakarić et al., 2015 and CGDA, 2022.

Table 2: Top 10 enterprises by revenue in Croatia

Name of enterprise	Revenue in mil $
Nanobit d.o.o.	**36,08**
Pine studio d.o.o.	7,83
Gamepires d.o.o.	4,42
Abest d.o.o.	3,07
Orqa d.o.o.	2,84
DEV d.o.o.	1,66
Diversitas IT sustavi d.o.o.	1,66
Fury studios d.o.o.	1,49
Protopixel d.o.o.	0,96
Poster d.o.o.	0,95

Source: CGDA (2022).

Table 2 shows the revenues of top ten Croatian gaming companies. Total number of employees in the industry in 2021 was 474 (CGDA, 2022). Share of employed women in the gaming industry in Croatia is 30%, which is above average comparing to countries in region (Slovenia 41%, Serbia 30%, Romania 30%, Germany 25%, Czech Republic 19%, Slovakia 17,4%).

4.2. Gaming ecosystem in Croatia

The gaming ecosystem in Croatia encompasses different elements that create the rules within the industry and dictate the directions of its development. The entities that are active in this ecosystem work according to the set of se regulatory framework, incentives, educations system and networks. For the clarity of its description, we have organized the ecosystem elements into the Table 3, and the relevant sources are cited within the table.

Table 3: Croatian gaming ecosystem

Regulation, policies, documents

- Competent institution: Ministry of Entrepreneurship and Crafts;
- The Law on Audiovisual Activities („Narodne novine“ No. 61/18, NN 114/22), which entered into force in 2018 (on the initiative of the Ministry of Culture and Media), includes the production of video games by audiovisual activities, which are additionally defined in Article 8 and Article 25;
- National Classification of Activities (NKD): Sub-sectors of creative and cultural industries according to NKD 2007, 58.21 Publishing of computer games;
- Rulebook on the procedure, criteria and deadlines for the implementation of the National Program for the Promotion of Audiovisual Creativity („Narodne novine“ No. 95/23), on entrepreneurship and crafts;
- Mapping creative and cultural industries in the Republic of Croatia (2015), The institute of economics, Zagreb, Croatian cluster of competitiveness of creative and cultural industries (Rašić Bakarić et al., 2015);

Public calls for grants

- The public call to encourage the development and production of video games: "Transformation and strengthening the competitiveness of cultural and creative industries" under the National Recovery and Resilience Program (Ministry of Culture and Media of the Republic of Croatia, 2024);
- The Croatian Audiovisual Center (HAVC) published first call for projects in 2021 to support the development of the video game industry in Croatia, with a budget of approximately 100,000 euros;
- Creative Europe MEDIA strand

Financing

- Creative Europe MEDIA strand
- Crowdfunding
- Venture capital

Educational programs

1) High school

Major: video game technician

- Technical School Sisak
- Secondary School in Novska

2) Higher education (university)

- Undergraduate study - Development of computer games, College of Algebra
- Undergraduate study - Information and Business Systems (IPS), a compulsory subject "Development of computer games", Faculty of Organization and Informatics, University of Zagreb

3) Vocational

- Two-year education: Game artist, United POP, Academy of Music, Media and the Arts, Zagreb

Support infrastructure for entrepreneurship (institutions) Croatian entrepreneurial gaming incubator „PISMO“, City of Novska, with a campus extension planned (studio, student dormitory, business incubator for E-sport arena with 4000 seats and Gaming Industry Accelerator)
Federations, associations, networks • Croatian eSPORTS Federation, member of the International Esports Federation (IESF). • CGDA, Croatian game development alliance
Competitions and tournaments, conferences, fairs • E-sport competition A1 Adria League, competition that brings together players from Croatia, Serbia, Macedonia, Slovenia, Bosnia and Herzegovina, Montenegro and Albania • OGA Dota Pit tournament • Odyssey Masters • University (faculty) league • Student Esports Tournament, since 2021 – 16 Croatian faculties are taking part in the competition (Faculty of Electrical Engineering and Computing in Zagreb, Faculty of Electrical Engineering, Mechanical Engineering and Shipbuilding in Split, Technical Polytechnic in Zagreb, Faculty of Organization and Informatics, University Algebra, Faculty of Electrical Engineering, Computing and Information Technologies Osijek, Polytechnic in Bjelovar, Jurja Dobrila University in Pula, Faculty of Mechanical Engineering and Shipbuilding, University of the North, Department for Mathematics, J. J. Strossmayer University in Osijek, Faculty of Science and Mathematics in Split, Faculty of Engineering, University of Rijeka, Polytechnic Velika Gorica, Faculty of Transport Sciences at the University of Zagreb and the Faculty of Philosophy in Osijek. • Zagreb GameDev Meetup • Gaming center „Hall of Game” • The largest regional video game fair Reboot (InfoGamer fair, since 2011)

Source: authors' work

5 Analysis and discussion

Based on the presented data, a significant growth of the gaming industry in Croatia is visible. Along with the increase in income on average by 50% per year, the development is visible in the number of employees and the number of companies, especially if we look at the last decade. In addition to the above, it is good to mention the presence of the female population among players, as well as employees, given that the observed industry is still considered predominantly male. The most successful Croatian companies in the gaming industry are known on the international scene, so there is no shortage of investment funds. There are formal and informal educational programs aimed at creating qualified personnel. However, opportunities for improvement were identified.

The share of exports in the total revenues of the industry is higher than 80%, which is a significant success considering the competition in the case of this truly globalized market, but it results in a double taxation, the problem that entrepreneurs cite as one of the most significant obstacles (Rašić Bakarić et al., 2015). Besides the most common threat in the video game industry, which is consumer protection and transparency (Borghese, 2023), developer protection is another risk that needs to be handled. Video game producers are generally not sufficiently familiar with the issues of intellectual property protection, and often do not have the resources to implement procedures for the protection of rights from infringement (WIPO, 2022). Globalization, with its opportunities, increased both competition and potential saturation. It is difficult for novice entrepreneurs to stand out on the global market, which is why additional actions of local authorities in the form of incentives, monetary as well as non-monetary, such as education, promotion, counselling and networking assistance, are necessary.

After considered obstacles and challenges, recommendations for a more effective gaming ecosystem are recognized:

- double taxation regulation
- governmental policies for protection of consumers and developers
- governmental funding (monetary incentives and state subsidies)
- education and cooperation with industry
- marketing – small Croatian enterprises
- inclusivity, but also heterogeneity – knowing your audience
- usage of AI
- promotion of healthy gaming
- use of talented employees
- strong public support for the industry.

Identified recommendations are comparable to recommendations identified in a study by Goldani & Goldani (2018), based on Finland's good practice gaming ecosystem, but adjusted for Iranian gaming industry. Governmental policies should not limit, for example through tax policies, but encourage the industry development. Policies should also focus on security and protection, for both companies and consumers. General public perceptions about the positive effects of gaming on mental health and education needs to be changed, since adequate games can contribute to creativity, resourcefulness, problem solving, and inclusion through group play. The same can be achieved with local and national projects promoting healthy gaming. Networking and visibility are important for entrepreneurs, therefore the establishment of more centralized places such as the aforementioned incubator in Novska, or clusters where new entrepreneurs can turn to and find support, are recommended.

One of the ways to build a sustainable gaming industry is the additional analysis of existing successful companies and

projects and their promotion as an example of good business model practice, user experience, marketing and sustainability. Recommendations can be applied on local, aswell as national and regional governmental level.

6 Conclusion

The positive impact of the gaming industry on economic growth is seen not only through revenue, employment and international business, but alsothrough innovation. Santasärkkä (2017) emphasizes how gaming industry players can be catalysts for innovation and knowledge-based growth, where knowledge spillover is an important factor of economic development. Further development is inevitable and also desirable, but with additional regulations to protect both users and developers, as well as entrepreneurs who are just starting out. The cooperation of all actors of the ecosystem (companies, government, entrepreneurial support institutions, educational system, society, networks) can contribute to the efficiency of the industry and better inclusivity.

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