



Strategizing Metaverse Growth via Open Innovation Strategies: Insights from the Gaming Industry of Morocco

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Abstract

The growth of the metaverse in the gaming industry is crucial as it drives innovation, creating immersive and interactive experiences that go beyond traditional gameplay. However, the growth of metaverse in the gaming industry is neglected by previous studies. It is a major challenge for the practitioners to enhance technological revolution through metaverse. Therefore, the objective of this study is to investigate the metaverse growth through open innovation strategies in the gaming industry of Morocco. To address this challenge, this study considered the relationship between external knowledge, internal innovation, open innovation and metaverse growth. A survey was considered to collect data from the employees of gaming industry in Morocco. PLS-SEM was employed for data analysis. It is found that open innovation is a strategic tool to enhance metaverse growth. External knowledge and international innovation can increase the open innovation leading to metaverse growth. Results of this study are helpful for practitioners working for gaming industry to enhance technological revolution through metaverse.

Introduction

Metaverse growth in the gaming industry is very crucial as it drives innovation, creating immersive and collaborative experiences that go beyond traditional gameplay (Power & Teigland, 2013; Rathore, 2017). It allows players to participate in virtual worlds where they can entertain, create, and even monetize their activities, hiding the lines between gaming as well as the real life. By considering the real importance of metaverse in gaming industry (Huvila, 2013; Nevelsteen, 2018), this study considered metaverse growth as potential instrument for growth in gaming industry. This growth also opens new profits streams for gaming companies, from in-game purchases to virtual events and marketing. Eventually, the metaverse is reshaping the gaming landscape, making it a focal hub for entertainment, social interaction, and commerce.

Prompt technological changes and increased understanding result in repeated changes in customer demand (de Sousa Jabbour et al., 2018; Niaz et al., 2020). To meet client requirements, the organization must adapt immediately by altering business plan, evaluating technological expertise, and embracing new technologies. To accomplish long-term growth as well as improved financial performance, businesses must be innovative (Duque-Grisales et al., 2020; Xie et al., 2019). Companies must concentrate on their research and development (R&D) to become more innovative, and by doing so, they may become more innovative, stemming in increased financial performance (Zafar et al., 2019). Gaming industry is also increasing in Morocco,

therefore, the growth of metaverse is required in gaming industry of Morocco.

On the other hand, regarding corporate innovation, the role of the world superpower is also implacable. In this case, the availability of metaverse technology is most crucial in the technological era. The United Nations has recently projected a project for sustainable development, which intends to achieve numerous environmental goals, also known as the 17 Sustainable Development Goals (SDGs). The 12th SDGs such as sustainable production and consumption, directly affecting every industry. Given the recent integration of the industries into our daily lives, the stimulation of sustainable consumption minimizes the use of scarce resources as well as emphasizes improved production through innovation, technology, and efficiency. In this case, R&D is most important in gaming industry (Fejoo et al., 2012; Hau & Kim, 2011) which is possible through open innovation. Open innovation is the two-way process in which companies receive innovation from external sources and develop products inside the boundaries of the companies as reported in Figure 1.

While the closed innovation model presupposes that the resources and personnel who can generate creative ideas are contained within the organization, open innovation implies that innovative ideas are not restricted to the company's limits (Chesbrough, 2011; Di Minin et al., 2016; Lichtenthaler & Lichtenthaler, 2009; West & Gallagher, 2006). Ideas can come from both internal and external sources. According to this study, open innovation can increase metaverse technology

because it helps the gaming industry to extract external knowledge and innovate something new by using the internal capabilities. Thus, this study attempted to address the positive contribution of open innovation through internal innovation

after extracting external knowledge from the market in Morocco. Therefore, the objective of this study is to investigate the metaverse growth through open innovation strategies in the gaming industry of Morocco.

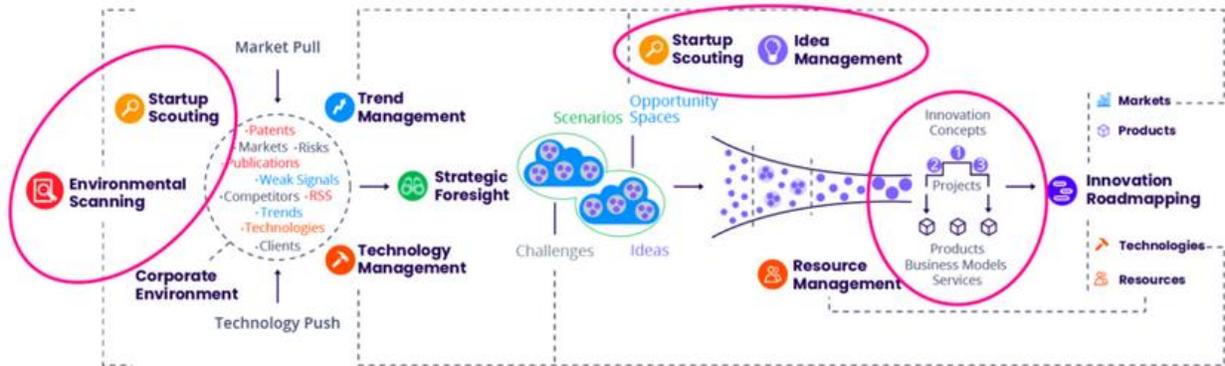


Figure 1: Open Innovation. Source: ITONICS.

Literature Review

The gaming industry is growing rapidly worldwide (Feijoo et al., 2012; Herman et al., 2020; Marchand & Hennig-Thurau, 2013; Shi et al., 2020). According to SuperData Research, the video game industry expanded by 4% in 2019, with global incomes of \$120.1 billion. According to SuperData, mobile games led the industry, accounting for \$64.4 billion, followed by games related to the personal computer (\$29.6 billion) and various other console games (\$15.4 billion). Therefore, with the increase in growth, the promotion of metaverse is most important in this industry which requires open innovation.

Open innovation quickens the development of metaverse technology through research and development by fostering cooperation between companies, startups, as well as developers,

leading to faster and more varied innovation. However, it is possible by promoting external knowledge which can be further enhanced by using internal innovation. It allows the sharing of ideas, resources, and capability, which increases the creation of advanced, user-centric virtual experiences. As it is reported in previous studies that external knowledge (Ferrerias-Méndez et al., 2019; Grimpe & Kaiser, 2010; Kang et al., 2016; Kim et al., 2019) and internal innovation can enhance valuable ideas (Cassiman & Veugelers, 2006; Díaz-Díaz & de Saá Pérez, 2014; Ferraris et al., 2017a). This collaborative method also decreases the time to market for new metaverse features and applications, driving extensive adoption and growth. The growth of metaverse through open innovation is shown in framework of the study given in Figure 2.



Figure 2: Framework of the Study Showing Metaverse Growth Through Open Innovation.

Open innovation is a disappearance from the traditional closed innovation methodology. In closed innovation, corporations dedicate significant resources to developing their own R & D capabilities in their own capabilities (Chiaroni et al., 2010). On the other hand, open innovation concerns breaking down administrative barriers and permitting external inputs and contributions to affect a company's internal innovation developments (Kim & Kim, 2018; Nestle et al., 2018). It also encompasses sharing unused concepts with other corporations for their use. There is the likelihood of inbound open innovation or outbound, or both inbound and outgoing combined (Stanko et al., 2017). The concentration of most research revolves around inbound open innovation, examining how a corporation could

stimulate the integration of numerous external inputs and contributions in its innovation method (Wemmer et al., 2016).

External knowledge raises the open innovation by initiating fresh perspectives, ideas, and expertise that may not be presented within an organization (Cassiman & Veugelers, 2006; Ferraris et al., 2017b; Fey & Birkinshaw, 2005). By banging into the knowledge of external collaborators, such as various universities, startups, or the industry experts, corporations can access cutting-edge research, innovative solutions, and the diverse viewpoints that drive creativity as well as problem-solving. It is the part of open innovation, instead close innovation which argues that in order to complete the needed return from innovation, internal personnel must recognize and handle ideas. This arrival of

external insights supports the organizations defeat internal limitations, decrease the development costs, and accelerate innovation process. Therefore, external knowledge has valuable importance for the promotion of open innovation in various industries (Brunswick & Vanhaverbeke, 2015; Díaz-Díaz & de Saá Pérez, 2014; Ferraris et al., 2017a; Hameed et al., 2020). Ultimately, incorporating external knowledge through open innovation raises the collaborative environment that improves the overall innovation potential as well as competitive advantage of a company.

The method of inbound open innovation contains three essential steps. First, there is the preliminary phase, which implies seeking innovation from external sources (Moretti & Biancardi, 2020; Parida et al., 2012; Scuotto et al., 2017). This consist of activities such as searching, sourcing, incentivizing, and employing (Bianchi et al., 2016). Successively, the integration of these innovations involves identifying and adopting the factors that assist or impede their integration. Lastly, the third phase revolves around commercialization of the innovation activities. Given the non-linear nature of these levels, it is vital to have an interaction structure that includes feedback loops, reciprocal connections with co-creation partners, and association with external innovation networks as well as communities (West & Bogers, 2014).

Hypothesis 1: *External knowledge expedites open innovation.*

Internal innovation lays foundation for open innovation by adopting a culture of creativeness and investigation within the organization (Cassiman & Veugelers, 2006; Yeum et al., 2020; Zhang & Tang, 2017). When a corporation has strong internal innovation framework, it generally becomes more adept at detecting gaps and opportunities, making it affluent to cooperate with external partners. Internal innovation is shown in Figure 3. It shows managerial excellence, employee satisfaction, ideas, innovative sustainability and innovative agility are important for the promotion of innovative processes.



Figure 3: Internal Innovation Process.

Source: T-Systems-Information technology.

The open innovation model values each and every external ideas and is open to values that can rope to target's profit as well as market advantages (Bianchi et al., 2016). Therefore, it is clear from discussion, internal innovation can foster open innovation through different ways. This internal expertise along

with innovative mindset aid in effectively participating external ideas, improving the overall influence of open innovation. Finally, internal innovation increases the organization's capacity to leverage external knowledge and drive productive innovation outcomes (Heng et al., 2018).

Hypothesis 2: *Internal innovation expedites open innovation.*

Furthermore, this study examined the relationship between open innovation in gaming industry and metaverse growth which is very important. Open innovation fosters metaverse growth in gaming industry by accelerating cooperation between gaming companies, tech innovators, and creative communities. The innovation in gaming industry is most important for the growth (Crawford et al., 2013; Liu & Li, 2011). By sharing ideas, resources, and various equipment's, these collaborations lead to development of more sophisticated and immersive virtual environments. This methodology quickens integration of cutting-edge features (Paladino, 2008; Reichardt et al., 2016), such as AI-driven characters as well as cross-platform encounters, increasing the metaverse's attraction to a broader audience. Open innovation also encourages the co-creation of content (Baldwin & Von Hippel, 2011; Ferraris et al., 2017a; Lichtenthaler, 2008), granting users and developers to participate for developing metaverse ecosystem. Hence, this collaborative innovation drives the extension and adoption of the metaverse technology within the gaming industry.

Hypothesis 3: *Open innovation expedites metaverse growth.*

Hypothesis 4: *Open innovation mediates the relationship between external knowledge and metaverse growth.*

Hypothesis 5: *Open innovation mediates the relationship between internal innovation and metaverse growth.*

Methodology

The study design had a significant effect on the magnitude of the sample. Choosing an applicable study design is important for results. The role of design is necessary in deciding the success of a research attempt. According to Davis and Venkatesh (1996), there is no clear or undeniable method for establishing as well as selecting the optimum study design. The selection of suitable research designs plays an imperative role in determining the ability of the conclusions and recommendations derived from the study conclusions. Methodology as well as objectives classify business research, involving experiments, surveys, and experimental studies. Therefore, by considering the discussion of previous studies, this study selected cross-sectional research design.

The cross-sectional research design is important to collect data from the participants because it help to gather information related to the opinion of the people (Lou et al., 2010). Sample size of the study was decided by considering the previous studies in the area of open innovation. Several previous studies instigated open innovation through internal innovation and the influence of external knowledge because these are important parts of open innovation, most of the studies considered sample size less than 500. Therefore, this study selected 1000 sample size.

For distribution of the questionnaire, this study used simple

random sampling. A simple random sample is a subgroup of individuals selected at random from a greater set, with all individuals having the same likelihood (Gupta & Shabbir, 2008; Kaur et al., 1996; Siuly et al., 2011). It is the procedure of randomly selecting a sample. Thus, 1000 questionnaires were distributed among the employees of gaming industry in Morocco. Finally, 501 questionnaires were received, and the response rate was 50% approximately. For data collection, questionnaire was developed, and all the scale items are as follows:

External Knowledge

1. Information from suppliers is important for open innovation.
2. Information from customers is important for open innovation.
3. Information from external partners is important for open innovation.

Internal Innovation

1. Collaboration between employees helps in open innovation.
2. Meetings between employees help in open innovation.
3. Seminars on innovative ideas in organization help in open innovation.

Open Innovation

1. Commercialization of ideas is important.
2. The licensing process is an important part of innovation.
3. Outsourcing is an important part of innovation.

Metaverse Growth

1. Metaverse technology has the potential to enhance games.
2. Metaverse technology can bring more pleasure to gaming.

3. Metaverse technology in gaming is more attractive.
4. Metaverse technology in gaming increases effectiveness.

Findings

Findings of the study are based on PLS-SEM. In analysing PLS-SEM, validity as well as reliability are the major standards for assessing the measurement model (García-Fernández et al., 2018; Shiau et al., 2019). The connection between elements in the structural model depends on the truthfulness and dependability of the actions taken. To evaluate the suitability of the measuring model, various factors can be considered (Hair Jr et al., 2020; Matthews, 2017). The reliabilities of each item can be assessed, incorporating internal consistency reliability as well as indicator reliability using composite reliability (CR) (Jenkins & Taber, 1977; Peterson & Kim, 2013). The convergent validity of the scale can be measured by examining the average variance extracted (AVE) for each variable (Alarcón et al., 2015; Cheah et al., 2018; Cowin et al., 2008). Table 1 highlighted the factor loadings which are also shown in Figure 4.

Factor loadings confirmed that all the scale items are reliable because factor loading is higher than 0.5. Furthermore, convergent validity was examined through CR and AVE. The results of CR and AVE are reported in Table 2 and Figure 5. CR and AVE are higher than 0.7 and 0.5, respectively, which confirmed the achievement of convergent validity (Anis et al., 2020). The discriminant validity can be measured using the Fornell-Larcker Criterion and Heterotrait-Monotrait' (HTMT) (Alarcón et al., 2015; Henseler et al., 2015). This study used HTMT, and results are reported in Table 3 and Figure 6.

Table 1: Factor Loadings.

Variables	Scale Items	Loading
External Knowledge CR = 0.798 AVE = 0.522	Information from suppliers is important for open innovation.	0.823
	Information from customers is important for open innovation.	0.801
	Information from external partners is important for open innovation.	0.865
Internal Innovation CR = 0.852 AVE = 0.535	Collaboration between employees helps in open innovation.	0.901
	Meetings between employees help in open innovation.	0.725
	Seminars on innovative ideas in organization help in open innovation.	0.874
Open Innovation CR = 0.836 AVE = 0.509	Commercialization of ideas is important.	0.769
	The licensing process is an important part of innovation.	0.865
	Outsourcing is an important part of innovation.	0.789
Metaverse Growth CR = 0.898 AVE = 0.566	Metaverse technology has the potential to enhance games.	0.923
	Metaverse technology can bring more pleasure to gaming.	0.899
	Metaverse technology in gaming is more attractive.	0.888
	Metaverse technology in gaming increases effectiveness.	0.798

Table 2: Convergent Validity.

Variables	Composite Reliability (CR)	AVE
External Knowledge	0.799	0.511
Internal Innovation	0.875	0.525
Open Innovation	0.821	0.533
Metaverse Growth	0.888	0.601

The existing study assessed the structural model. Recent research employed a traditional bootstrapping approach with 5000 bootstrap samples and 501 responses to estimate the significance of the path coefficients. It was considered by

following guidelines from well-recognized researchers (Hair et al., 2019; Hair et al., 2013; Hair Jr et al., 2017; Hair Jr & Sarstedt, 2019; Kock, 2015). T-value and beta values were considered to examine the relationship between variables. The direct effect results are reported in Table 4 and Figure 7. According to the results, H1, H2 and H3 are supported because external knowledge and internal innovation has positive influence on open innovation. Furthermore, open innovation has a positive effect on metaverse growth.

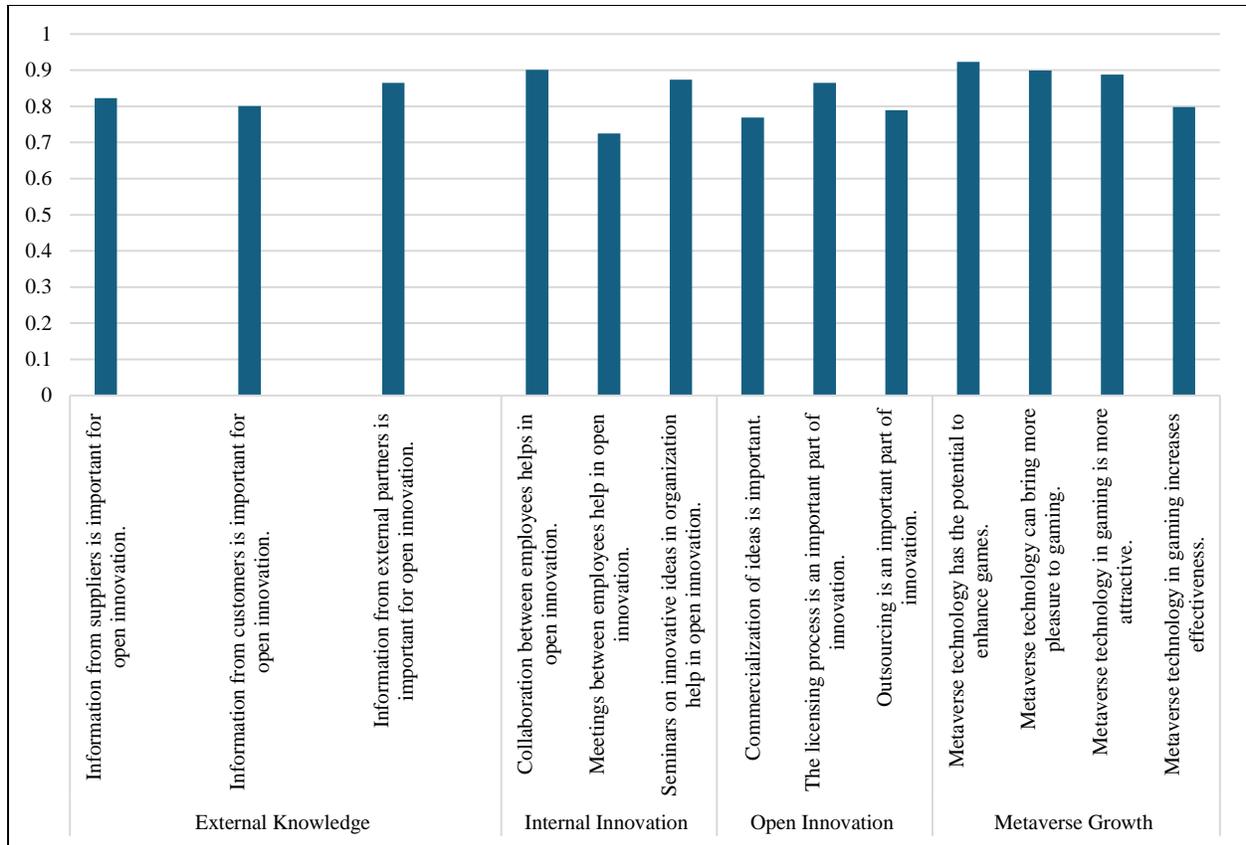


Figure 4: Individual Items Reliability.

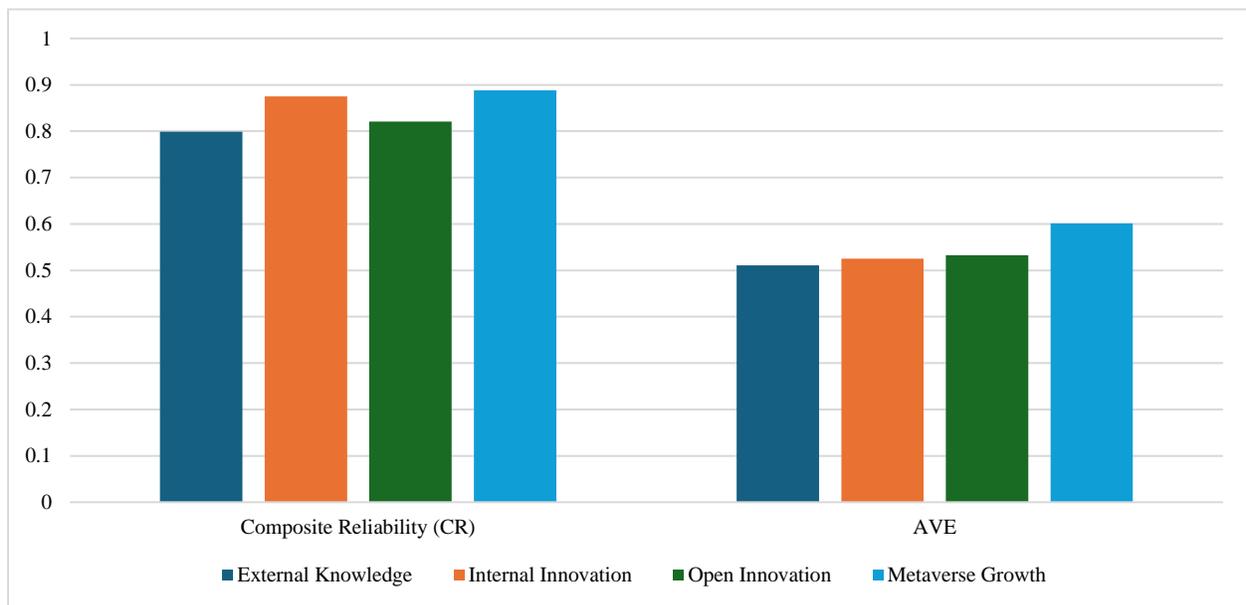


Figure 5: CR and AVE.

Table 3: Discriminant Validity.

Variables	External Knowledge	Internal Innovation	Open Innovation	Metaverse Growth
External Knowledge	0.775			
Internal Innovation	0.831	0.613		
Open Innovation	0.688	0.611	0.499	
Metaverse Growth				

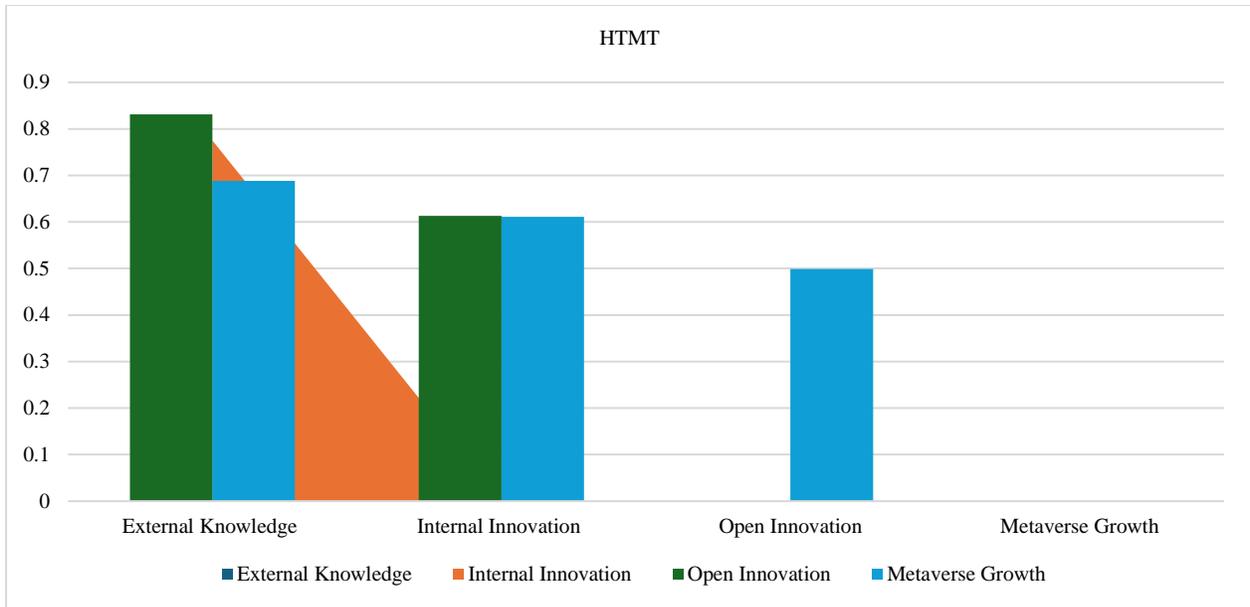


Figure 6: Discriminant Validity.

Table 4: Hypotheses Results (Direct Effect).

Hypothesis	Relationship	Beta Value	T-Value	Supported
H1	External Knowledge -> Open Innovation	0.254	2.589	Accepted
H2	Internal Innovation -> Open Innovation	0.089	2.981	Accepted
H3	Open Innovation -> Metaverse Growth	0.058	2.055	Accepted

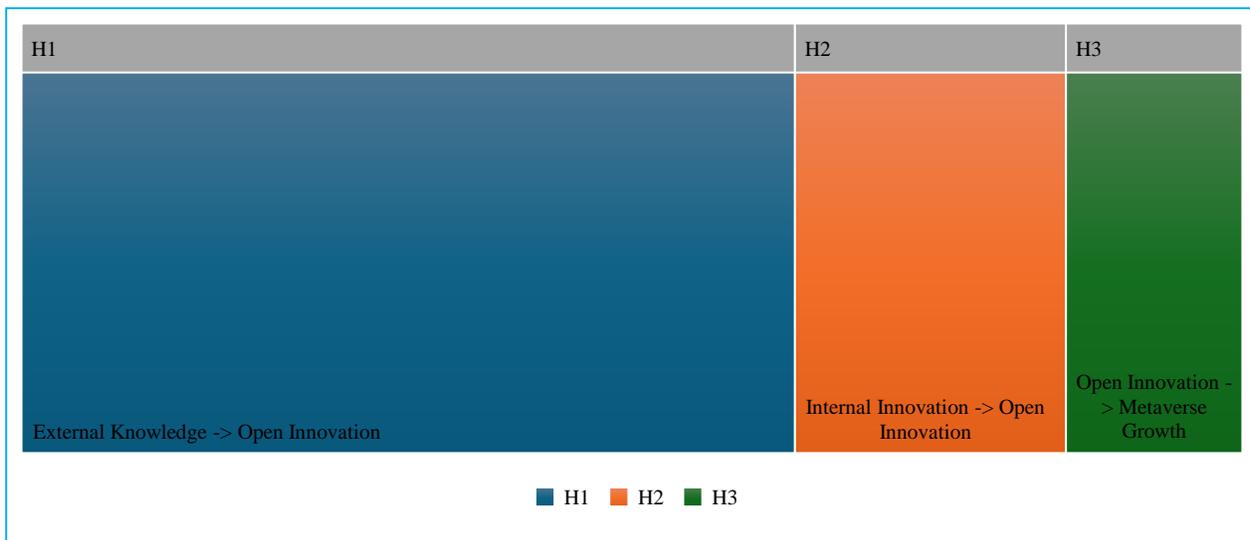


Figure 7: Direct Effect (H1, H2, H3).

Moreover, indirect effect results are given in Table 4 and Figure 8. In these hypotheses, the mediation effect of open innovation was examined. Both the hypotheses, H4 and H5 are supported because the indirect effect of open innovation is significant. This study followed the guidelines of Preacher and

Hayes (2004, 2008) to examine the mediation effect. According to the results, open innovation mediates the relationship between external knowledge and metaverse growth. Furthermore, open innovation mediates the relationship between internal innovation and metaverse growth.

Table 5: Hypotheses Results (In-Direct effect).

Hypothesis	Relationship	Beta Value	T-Value	Supported
H4	External Knowledge -> Open Innovation -> Metaverse Growth	0.158	3.452	Accepted
H5	Internal Innovation -> Open Innovation -> Metaverse Growth	0.231	3.025	Accepted

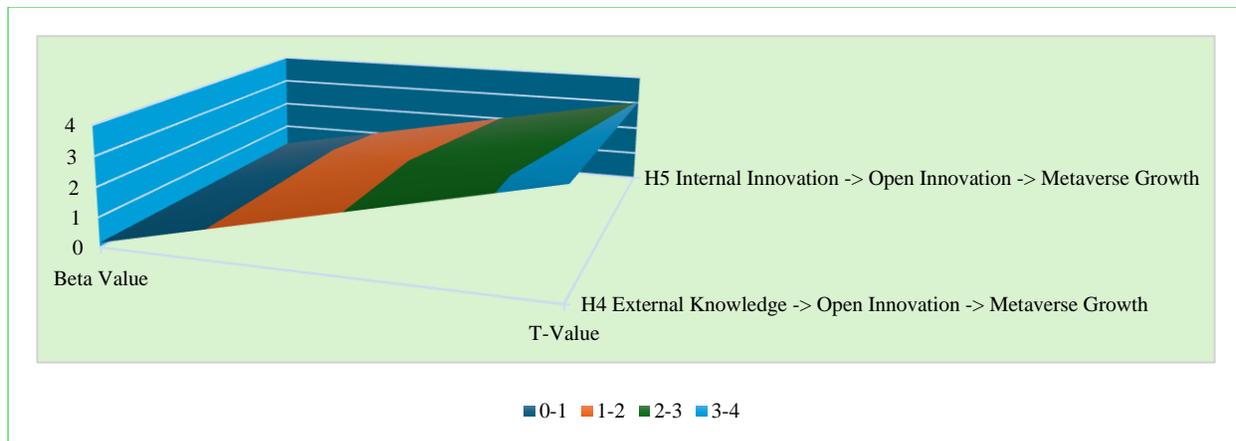


Figure 8: Direct In-Effect (H4, H5).

Discussion and Conclusion

The objective of this study was to investigate the metaverse growth through open innovation strategies in the gaming industry of Morocco. This objective was achieved by examining the relationship between external knowledge from outside the boundaries of the company, internal innovation, open innovation and metaverse growth. Four hypotheses were proposed. Three hypotheses were direct effect hypotheses, and one hypothesis was indirect effect hypothesis. All the hypotheses were found significant and positive.

The gaming businesses are progressively seeking external sources of expertise to drive innovation and increase their financial accomplishment in today's highly aggressive business environment (Duque-Grisales et al., 2020; Ezzi & Jarboui, 2016; Games & Rendi, 2019). Latest studies have looked at the link between external knowledge integration and open innovation. Integrating external knowledge states to how businesses collect as well as apply external information to improve their internal innovation processes (Bogers et al., 2018; Chesbrough, 2006). The research conducted by Wong and Chan (2016) assessed the impression of external knowledge on the financial performance of various companies. This research has shown that small and medium-sized enterprises (SMEs) are more likely to accomplish higher levels of financial outcomes, if they effectively integrate external knowledge into their innovation practices. This knowledge can be collected from suppliers and customers. Relatedly, Johnson et al. (2011) that investigated the influence of incorporating external knowledge on the financial performance of Chinese enterprises. For instance, the study revealed that companies in regions with high levels of technological concentration have a greater likelihood of attaining better financial performance if they magnificently integrate external knowledge into their innovation procedures.

Moreover, an innovative study from literature delved into the involved relationship between financial performance (Faems et al., 2010; Lee et al., 2015) and the assimilation of external expertise within high-tech enterprises. Literature reveals that businesses were more probable to accomplish higher levels of

financial performance, specifically in terms of revenue growth as well as profitability, when they efficiently integrated external knowledge into their innovation processes. To uphold a competitive edge as well as foster corporate extension, it is decisive to maximize internal innovation (Brunswick & Vanhaverbeke, 2015; Díaz-Díaz & de Saá Pérez, 2014; Ferraris et al., 2017a; Hameed et al., 2020). This study argues that increasing internal innovation has a substantial impact on a corporation's performance which can be in terms of metaverse technology. It has been examined in several studies that internal innovation has a positive role in open innovation. It is discovered in the literature, Meyer and Allen (2004) reported that internal innovation had a helpful effect on innovation performance. Therefore, internal innovation has a positive effect on open innovation, exceptionally for companies in the gaming industry.

Finally, the growth of the metaverse through open innovation is driven by cooperative efforts between gaming companies and tech developers, as well as creative communities. This attempt speeds up development of sophisticated, immersive virtual experiences by incorporating distinct ideas along with technologies. Open innovation also urges user-generated content, inspiring the metaverse ecosystem and increasing its appeal. At last, this cooperative model propels the widespread acceptance and evolution of metaverse technology in the gaming industry of Morocco.

Implications and Future Recommendations

The findings of the study have valuable implications for the academicians and practitioners related to the gaming industry in Morocco. These implications are also applicable to the other nations' gaming industry. The growth of metaverse in the gaming industry is neglected by previous studies. It is a major challenge for the practitioners to enhance technological revolution through metaverse. The study's findings imply that adopting open innovation can pointedly accelerate growth of metaverse technology within the gaming industry, leading to more evolved as well as immersive gaming experiences. Future studies should work on the implementation of open innovation strategies in

gaming industry. Gaming companies should aggressively seek collaborations with external partners to leverage miscellaneous expertise and innovative solutions. On the other hand, future studies should include the direct influence of customers and suppliers in transferring the positive information. This approach not only improves technological development but also strengthens competitive advantage by keeping pace with rapid industry changes. Additionally, future studies should also include various other important elements of open innovation such as intellectual property management and commercialization.

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CRedit Authorship Contribution Statement

Elkotni Laila: Conceptualization, Data curation, Formal analysis. Amina Talbi: Funding acquisition, Investigation, Methodology, Project administration, Resources, Software. Amina Talbi: Supervision, Validation, Visualization. Amina Talbi: Writing – original draft. Elkotni Laila: Writing – review & editing.

Declaration of Competing Interest

The authors have no financial or non-financial competing interests to report.

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Ethical Statement

The authors confirm that ethical guidelines were followed, and approval was not needed since no tissue or biological samples were involved.

Data Availability Statement

The authors confirm that the datasets supporting this study are available from the corresponding author upon reasonable inquiry.

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