The relationship between Gamification and Sustainability of small and medium enterprise: Explaining the role of digital transformation in open innovation and value co-creation

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Abstract

Accelerating digital transformation and the basic needs of businesses to adapt to environmental transformations and complexities have doubled the necessity for extensive stakeholder interactions. Gamification is a powerful tool that facilitates stakeholder interaction and a common understanding of the vision and contributes to the sustainability of businesses. Businesses' sustainability in the digital transformation age depends on the continuous interaction of stakeholders and a comprehensive understanding of all the business pillars, which will be possible through the flow of ideas inside and outside the workplace and by providing innovative processes. In this regard, this study explores the effect of gamification on corporate sustainability by explaining the role of digital transformation, open innovation, and value co-creation. The statistical population of this study comprises top managers and experts in e-businesses who use gamification in their processes. The statistical sample included 117 managers and experts active in this field, and they were selected through convenience sampling. The data collection tool was a questionnaire reliability of which was 0.763 using Cronbach's alpha. Using Smart PLS software, the gathered data were analyzed by structural equation modeling (SEM). Gamification, with a factor of 74%, has a positive effect on open innovation, while a factor of 85% has a positive effect on digital transformation.

Gamification, both directly and indirectly, creates value co-creation in businesses, and finally, value co-creation at 78% affects corporate sustainability.

Keywords: Gamification, Digital Transformation, Open Innovation, Co-creation, Corporate Sustainability

Introduction

Today, the concept of corporate sustainability has become an important and debatable issue in many industries and businesses because of the increasing awareness of its benefits and positive effects on the survival of companies. Many managers and researchers are concerned with corporate sustainability management based on the principles of sustainable development (Manninen and Huiskonen, 2022). In addition, one of the biggest challenges of organizations is the need to get adapted to a dynamic and high-demand environment. In fact, an organization can meet the expectations of its stakeholders if it consistently adapts its strategies and processes to the existing unsustainable environmental, social, and economic conditions (Van den Berg et al., 2019). On the other hand, due to globalization and the rapid development of technology, sustainability is a concept to which both big firms as well as small and medium enterprises are paying attention. Workspaces are drastically enhanced due to economic, social, and environmental development.

Paying attention to sustainability in strategies and corporate processes has become one of the significant ways to face the business's changing perspectives. Therefore, based on the world reports, the business failure rate was 90%, and less than 50% of businesses could reach their fifth year of activity. In fact, the high rate of business failure has necessitated considering sustainability alongside technology. Corporate sustainability is defined by three economic, social, and environmental components i.e. businesses, in addition to economic benefits, must communicate with society and the environment from their perspective. Moreover, today's society is built upon businesses that affect presentation values, decisions, and measures. This important role of businesses in shaping societies has doubled the importance of sustainability in society (Hostettler and Van Maurik, 2020).

Businesses have recognized the need for technological changes in how they perform their activities. They attempt to keep up with digital transformation by integrating sustainability principles into the process. However, it is argued that to create the principles of sustainability in business, it is necessary to form the right mindset of sustainability in businesses and

implement the principles of sustainability in the structure of businesses. In other words, sustainability is a very complicated matter and creates demand changes in all business principles (Narayanan and Adams, 2017). However, the changes made in the business based on technological evolution must be creative and involve different elements, which means that all elements of the business must have a similar attitude towards sustainability. If businesses have different attitudes towards sustainability, the process of change or modification will encounter problems and present value for stakeholders facing paradoxes (Greene et al., 2014). To overcome this problem, creating coordination among different aspects of businesses and building a comprehensive understanding is significantly important, and Gamification can be a tool to mount the existing challenges caused by a lack of common understanding in businesses. Regarding the advances in digital technology and social media, businesses have to turn the traditional process into game-like experiences to influence their stakeholders' behaviors (Nacke and Deterding, 2017; Alsawaier, 2017).

Gamification can be defined as the use of game design elements in a non-game context. In other words, Gamification includes the process of turning activities, systems, services, products, and business structures into an experience resembling playing games. Often the game experience facilitates a change in behavior and a reduction in erosion. Businesses use Gamification to motivate both stakeholders (staff and customers) (Wunderlich et al., 2019). Gamification gives businesses the opportunity to engage stakeholders and influence their activities. In fact, Gamification allows interaction with stakeholders in a new way that was not possible before with common formats. The gamification-related market is expected to grow by 30% from 2019 to 2024 (Mousavi and Shamizanjani, 2021). These findings demonstrate the importance of this issue in terms of how companies operate. The main purpose of Gamification is to increase interaction by adopting game techniques such as scoreboards, personalized feedback, and their general impact on the organization (Aziz et al., 2017). By making the business process more attractive and facilitating it, Gamification can improve the interaction between stakeholders and businesses and introduce a better approach to their survival (Hostettler and Van Maurik, 2020).

Gamification elements create motivation for innovative collaboration and contribute to confronting the challenges that this motivation is essential for facing changes in the business environment. Quick feedback is another important aspect of Gamification in businesses. With strengthens positive behavior and moderates negative behavior, adding an amusing element and increasing innovation and cooperation (Stevens, 2013). As Gudiksen (2015) argued, Gamification in businesses will help carry out complex management activities and how businesses process because Gamification boosts staff motivation, has behavioral alignment with organizational strategies and new programs, and leads to a better acceptance of the programs and increase productivity. Regarding stated cases and the persuasive technology of Gamification, it will have an unprohibited effect on behavior. Sustainability in business is a

process that must be achieved in all stages and activities. To make the business process sustainable, it is surmised that different executive units will implement their components well. The current study investigates the effect of Gamification on the sustainability of small and medium enterprises by determining the role of open innovation, digital transformation, and co-creation. Accordingly, research questions can be asked: How important is Gamification in the sustainability of small and medium enterprises? What roles do open innovation, co-creation, and digital transformation play in the sustainability of small and medium enterprises?

Literature review

Gamification

Gamification refers to the process of transforming activities, systems, services, products, or organizational structures into one of the game-like experiences, and it is considered a gaming experience that facilitates changes in behavior or cognitive processes (Wunderlich et al., 2019). The term gamification in the academic literature was not defined until 2011. The most common definition described the concept as game design elements in a non-game context which included various fields. Today, the context of the gamification business refers to "the application of the metaphors of the game in real tasks to influence behavior, improve motivation, and enhance engagement," which creates motivational and behavioral changes in individuals (employees or customers) (Silbar et al., 2018). Gamification uses game-design elements and game principles in non-game contexts (Kao and Chueh, 2022) as a motivational tool for individuals' participation in performing their duties, developing digital literacy and problem-solving skills, and improving hand and eye coordination. Gamification can be considered as a process of improving services to create a pleasant experience that can increase the overall value creation of users (Adhiatma et al., 2021). Organizations can use the gamification approach to achieve the benefits of employee and public consumer participation and promote behavioral change (Paravizo et al., 2018). Gamification involves some game design elements for different purposes, including interaction and behavioral changes in non-game contexts. This contradicts amusement and pleasure, which are the main reasons for games. Gamification does not include actual video games for important purposes. In fact, it has its own design principles and uses them in non-game situations (Silbar et al., 2018). However, only a good gamification experience that comes with rewards and emotions can make desired behavioral changes so that employees repeat the behavioral approach of the organization as usual. Gamification can be applied to internal operations (e.g., to improve employee participation) and external operations (e.g., product development with customers) (Patricio et al., 2020). Engaging stakeholders by encouraging them to adopt behaviors connected to gamification programs create value. Their engaging behaviors produce data and information that help companies understand customers more deeply. In general, Gamification applies game design elements in a non-game context to create experiences, influence users

'attitudes and behaviors, and provide interactive mechanisms to facilitate and support this change in users' overall behavior. Intrinsic motivation leads to behaviors that lead to achievements, such as feelings of enjoyment and other positive emotions. If intrinsic motivation leads to learning, it is more desirable; because Gamification should convey product or brand information to users, it is a motivation for participants. This involves learning information, joining, or continuing with an action. The desire for activity leads to enjoyment. Gamification also provides a space for users to compete and play and earn rewards and prizes that make them happy. People's desire to compete and win prizes can help improve their loyalty to a brand, products, and services. Social conditions also affect personal volition and engagement in activities, and if social needs are intertwined with play, users may be influenced by those factors in behavior and attitude (Yang et al., 2017).

Digital transformation

Digital transformation in a company would be carried out by using new digital technologies, such as social media, mobile devices, and analytics, i.e. factors that have made significant progress in business, including an increase in customer experience, simplification of operations, and creation of new business models (Horlacher and Hess, 2016). Therefore, digital transformation can be seen as the process of creating changes and significant development in business characteristics by combining data, computing, and communication technologies that promote business (Viyal, 2019). The exploitation and integration of digital technologies often affect many parts of the company and business processes, supply chains, and sales channels (Matt et al., 2015).

Some researchers have a specific emphasis on the "transformation" instead of "change," and they claim that an organization's digital transformation is much beyond operational thinking and generally consider comprehensive measures that need to be done to use the opportunities or avoid the threats from digital technologies (Warner and Wager, 2019). Digital transformation creates basic changes in company performance which are transformational technologies at the heart of these changes. It can be argued that digital transformation occurs when these technologies have revolutionized stakeholders' experiences, operational processes, and business models. Digital transformation as a systemic innovation based on three pillars: "the customer experience, which means creating an interactive relationship with the customer; and the customer's perception and feeling of facing the organization which can be a factor in supporting quality." The organization must be able to provide customers with physical and virtual access to services. The reorganization of operational and organizational processes also means creating a form of interaction and exchange of information between different functions of the organization and extending these new interactive methods to external partners and business models which means introducing new and existing products and services to the market through the integration of digital technologies or innovation of existing technologies (Captain, 2018).

Open innovation

Open innovation refers to the targeted commercialization and absorption of internally developed ideas in the external environment of an organization (Lyu et al., 2020). In economic systems, open innovation shapes the dynamics of the system and becomes the driving force for sustainable development and growth (Yun et al., 2020). The main idea of open innovation is that an organization opens the innovation process to other firms, individuals, research institutions, universities, suppliers, and customers to ensure the flow of ideas inside and outside the organization. Therefore, organizations can benefit from discovering external sources and exploiting internal sources (Pustovrh et al., 2020). As SMEs are more flexible, quicker, and less bureaucratic in decision-making and reaction to market changes, open innovation is a practical and innovative strategy that managers adopt. These features can enable smaller enterprises to benefit from open innovation compared to larger enterprises. This view requires examining the role of managers in discovering and exploiting SMEs' opportunities (Ali et al., 2020). To measure the open innovation variable, three components are used, which are organizational readiness, collaborative capabilities, and absorption capacity. Organizational readiness refers to factors that exist in innovative organizations and are related to dynamic capabilities for change, specific process designs, and technological improvement. Collaborative capabilities are at the core of the open innovation debate and can be described as the ability to integrate and leverage organizational factors to build organizational capacity and capacity for open innovation, and this includes three factors of internal collaboration, networking capability, and external-to-internal collaboration. It is the inside and out (Hafkesbrink and Schroll, 2010). Open innovation is a tool for companies to use targeted inputs and outputs of knowledge to accelerate domestic innovation and expand markets for external use of innovation. The use of Open innovation means that companies open their innovation activities to absorb more ideas and technologies from outside, achieve more internal knowledge, reduce innovation costs, accelerate market entry time, and share risks with other partners. In addition, the opener of innovation approaches relies on the organization's culture and mindset and the behavior and perspective of individuals, which are important elements in shaping innovation and organizational openness to external partnerships and relationships (Elia et al., 2020). Comparatively, it can be said that closed innovation is entirely due to the innovative internal activities of the company and are mainly in the form of organized research and development. In contrast, open innovation relies on the external resources of the company in combination with the innovative internal activities of the company (Mubarak and Petraite, 2020).

Value co-creation

For a firm to flourish co-creation of value is at the center of business activities, and understanding what is value for consumers is not easily achievable. Traditional marketing

firms rely on their general understanding of the market opportunities. They used to offer products that they believed were valuable to consumers but realized that intangible processes, services, and relationships are more important in value co-creation (Saha et al., 2020). Value co-creation refers to the requirements and collaborative actions of customers and the organizations to create value and develop solutions to meet customer needs. One way to share, combine, and renew resources and mutual capabilities between active users and firms is to co-create value through new forms of services and interaction (Arnold, 2017). Consumers play an active role in value co-creation and create value in one or more stages of production and consumption (Ranjan and Read, 2014). Finally, it can be claimed that the company and customer create value by allowing the customer to create a service experience to appropriate their context (Mehera, 2017). Co-creation of value is a collective process in which people in organizations work together to create and develop new products, processes, or services. They introduce co-creation as a transition from industrial-age thinking to thinking based on human commitment. Complementary competencies, process alignment, behavioral alignment, perceived control, empowerment, and expectation matching are the components used to measure the value creation coefficient (Ng et al, 2010).

Corporate Sustainability

Corporate sustainability is related to a modern and multidisciplinary approach that states that companies should adopt green management strategies, community issues, and economic innovation, and use advanced technologies to develop environmentally friendly products and services. The social aspect of corporate sustainability focuses on enriching organizational communication with humans and society and promoting human health by understanding an organization's needs. The economic approach to corporate sustainability involves maximizing benefits by increasing sales and reducing operating costs (Abbas, 2019). Corporate sustainability is defined as meeting the direct and indirect needs of business stakeholders without compromising the ability to meet the future needs of the company and stakeholders (Sharaei et al., 2020). This definition has been used in several previous studies. A company is considered sustainable if it can quickly use innovation and optimally apply new technologies to use its resources (Townsend, 2017). Corporate sustainability is one of the company's approaches to creating value in the social economy and environmental fields from a long-term perspective, and it also supports more responsibility. Corporate sustainability refers to corporations' attempt to make a balance between social, economic, and environmental goals (Pellizzoni et al., 2020). The concept of corporate sustainability can be intuitively understood; yet explaining it under operational conditions is relatively difficult. All firms are required to evaluate the sustainability of their current proceedings and future policies. There are many ways to measure sustainability. Corporate sustainability depends on the economic performance and long-term profitability of a company. Corporate sustainability is defined in three dimensions: economic, social, and environmental, which means that, in addition to economic benefits, businesses must also consider their relationship with the environment and

society. Today's society is also based on businesses that influence how values decisions, and actions are presented, this important role of business in society has doubled the importance of corporate Sustainability (Hostettler and Van Maurik, 2020).

Development of hypotheses and theoretical model

Gamification seeks value co-creation in businesses by increasing innovation, creativity, strengthening participation, and teamwork (Milutinovic et al., 2018). Implementing open innovation in businesses requires Gamification to create motivational and beneficial partnerships by increasing creativity. Fernandez et al. (2021) conducted a study as "Gamification approaches for open innovation implementation" that investigated the effects of Gamification on open innovation. They concluded that Gamification in business creates open innovation by overcoming inertia. Also, Kauppinen et al. (2016), in their research titled "Involving citizens in the open innovation process through gamification," studied the role of Gamification in digital services. The findings of this study suggested that Gamification is beneficial for participating in open innovation processes and understanding new concepts. Patricio et al. (2020) also, in a study under the title of "Co-creation of new solutions through gamification: A collaborative innovation practice," revealed that the gamification method advocates the innovation process in business and leads to co-creation. Their study showed that gamification methods, through collaboration with stakeholders and outsourcing activities, facilitate participation in creativity and refer to it as open innovation. Moreover, gamification leads to co-creation through business coordination and provides a platform for interaction to create new solutions. Based on the proposed research, the first and second hypotheses of the present study were developed as:

H1: Gamification positively impacts open innovation.

H2: Gamification positively impacts value co-creation.

Gamification is used to implement the digital transformation process and increase employee participation by making the activities attractive and adaption to the digital transformation process. The results of the study conducted by Monstad and Burman (2020), "Digital transformations carried out through games, showed that Gamification can motivate participation in digital organizational transformation, and it could help a successful digital transformation. Thus, the third hypothesis of this study was developed as:

H3: Gamification positively impacts digital transformation.

Open innovation expands business cooperation and makes businesses use external resources and technologies to increase research and development and value co-creation. The open innovation process provides a common understanding of co-creation. Martinez (2014), in his study "Co-creation of value by open innovation: unlocking new sources of competitive

advantage," suggested that open innovation with the understanding of ideas and consumers' experiences and creating a platform for the interaction of all stakeholders can provide value co-creation in business. In addition, De Silva and Wright (2019) claim that open innovation through entrepreneurship development to create a social impact will lead to value co-creation. Based on this, the fourth hypothesis of this study is developed.

H4: Open innovation positively impacts value co-creation.

By revising the policies and processes of businesses, digital transformation provides a simpler user experience and improves digital service offers, and more interaction with stakeholders brings value co-creation (Mergel et al., 2018). The study by Malar et al. (2019) suggests that digital transformation processes operate by introducing new online services, and considering all business stakeholders will result in co-creation. Based on this, the fifth hypothesis was developed.

H5: Digital transformation positively impacts value co-creation.

Value co-creation, with an emphasis on the importance of the involvement of all stakeholders, helps to change the performance of the business towards sustainability; there is a way to share and combine resources between all stakeholders and making awareness about products and services creates sustainability in business. Arnold (2017), in his study, " Fostering sustainability by linking co-creation and relationship management concepts," investigated how to create sustainability in business through value co-creation and communication management. The results showed that value co-creation by building collaboration and facilitating innovation minimizes negative social and environmental impacts and leads to corporate sustainability. The findings of Cannas et al. (2019) in "Fostering corporate sustainability in tourism management through social values within collective value co-creation processes," indicated that social values and value co-creation can strengthen social orientation and lead to social responsibility and corporate sustainability. The sixth hypothesis was developed based on this content.

H6: Value co-creation positively impacts corporate sustainability.

The research's conceptual model was developed using the six-hypothesis-model (Figure 1.).
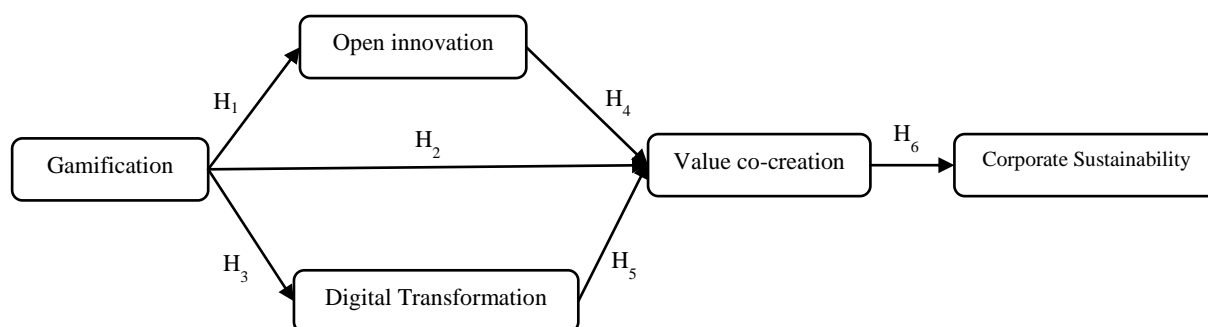
Fig. 1. The Conceptual Model

Methodology

The current study is applied in terms of purpose and data collection and is descriptive and correlational. It describes the effect of Gamification on corporate sustainability by explaining the roles of open innovation, digital transformation, and value co-creation. The statistical community of the study comprised of the top managers and experts in electronic businesses who use Gamification in their processes. The statistical sample includes 117 active managers and experts who were chosen using the available sampling method. Research scales for measuring variables were first extracted from theoretical foundations, and then a questionnaire was designed based on the Likert spectrum. Academic experts reviewed and confirmed the face and content validity of the questionnaire. The construct validity was confirmed using confirmatory factor analysis. Convergent and divergent validity were also checked using PLS software. Cronbach's alpha coefficient and composite reliability were used to ensure the sustainability of the measurement scales, and its results were as follows: The structure of the questionnaire is illustrated in Table 1.

Table 1: Questionnaire resources

Number	Variable	Resources
1-6	Open innovation	Hafkesbrink and Schroll. (2010)
7-12	Value co-creation	Ng et al. (2010)
13-17	gamification	Yang et al. (2017)
18-25	Digital transformation	Westerman et al. (2014)
26-30	Corporate Sustainability	Khomba and Vermaak. (2013)

Confirmatory factor analysis results (Table 2) indicates that all factor loadings related to the items of all research variables were more than 5%, and their validity was confirmed. To test convergent validity and construct reliability, the average variance extracted, composite reliability and Cronbach's alpha were calculated. Based on Table 2, the average variance extracted for all variables was higher than the satisfactory point of 0.5, and the composite

reliability was above 7%, indicating suitable reliability. The Cronbach's α values were above 0.7, demonstrating acceptable reliability.

Table 2: Measurement Model Validity and Reliability

Variable	Item	Factor Loading	AVE	CR	Cronbach's alpha
Value co-creation	1	0.791	0.723	0.880	0.830
	2	0.523			
	3	0.635			
	4	0.881			
	5	0.888			
	6	0.691			
Corporate sustainability	1	0.702	0.590	0.815	0.721
	2	0.746			
	3	0.672			
	4	0.674			
	5	0.636			
Digital transformation	1	0.545	0.601	0.869	0.834
	2	0.690			
	3	0.601			
	4	0.701			
	5	0.714			
	6	0.802			
	7	0.805			
	8	0.511			
Gamification	1	0.674	0.647	0.863	0.805
	2	0.750			
	3	0.839			
	4	0.624			
	5	0.838			
Open innovation	1	0.681	0.636	0.852	0.802
	2	0.757			
	3	0.739			
	4	0.639			
	5	0.628			
	6	0.750			

In the main diameter of Table3, the root of the mean extracted variance of each of the other cells in the table and the degree of correlation between the variables are listed. The

values of the elements in the original diameter of the matrix were greater than those of all the elements of the rows and columns corresponding to them. Therefore, divergence past confirmed. SPSS software version 23 was used to examine the research model for the demographic data analysis. Structural equation modeling with the partial least squares approach and Smart PLS software version 2 was used.

Table 3. Discriminant Validity

Variable	1	2	3	4	5
Value co-creation	**0.850**				
Corporate sustainability	0.701	**0.768**			
Digital transformation	0.708	0.655	**0.775**		
Gamification	0.643	0.673	0.691	**0.804**	
Open innovation	0.759	0.687	0.608	0.673	**0.797**

Results

In the present study, 96 of 117 respondents (82.06 %) were men, and 21 (17.94 %) were women. Twenty-nine participants (24.78 %) were younger than 30 years of age. Forty-seven people (approximately 40.17 %) were between 30 and 40 years old, and 41 (35.05 %) were over 40 years old. In terms of education, people with master's degrees are the most frequent, with 52.15% (61 people). Demographic information is presented in Table 4.

Table 4. Demographic characteristics of respondents

Demographics		n	%
Gender	Male	96	82.06
	Female	21	17.94
Age	>30	29	24.78
	30-40	47	40.17
	<40	41	35.05
Education	Bachelors'	27	23.07
	Masters	61	52.15
	PhD	29	24.78

After examining the internal structure and status of the studied variables through confirmatory factor analysis, the correctness of the hypothesis was examined in the form of a structural model of the research. According to the interpretive structural equation modeling, if the value of t for each path is greater than 1.96%, it can be said that the relevant path is significant at the 95% confidence level, and the hypothesis of that path is confirmed. The model test results showed that the values of all hypotheses were higher than 96.1, and all paths were significant. Figure 2. illustrates the significance of this model.
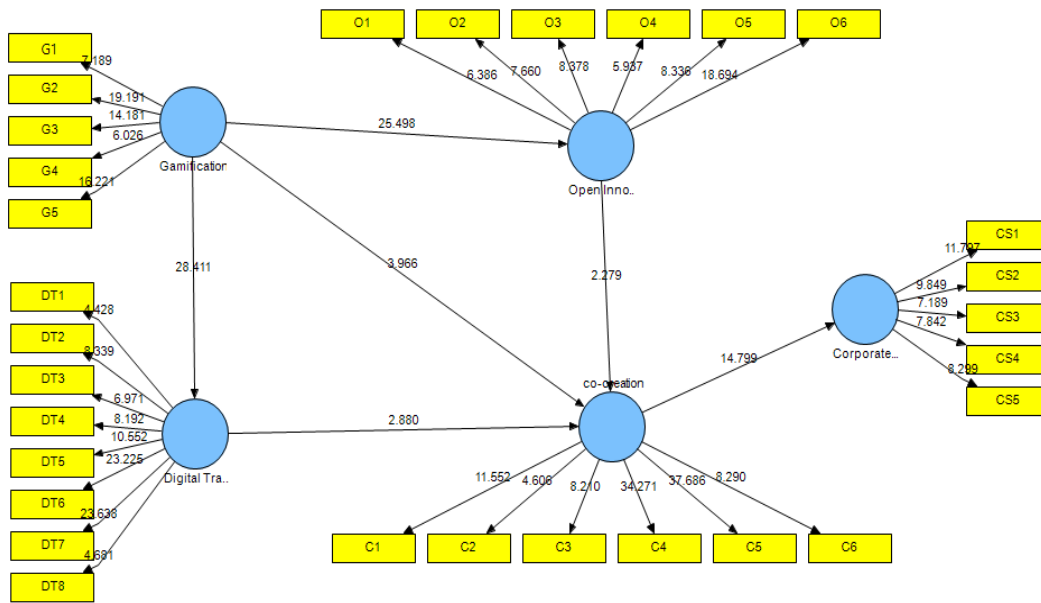
Fig. 2. Hypothesis Testing (T-Value Model)

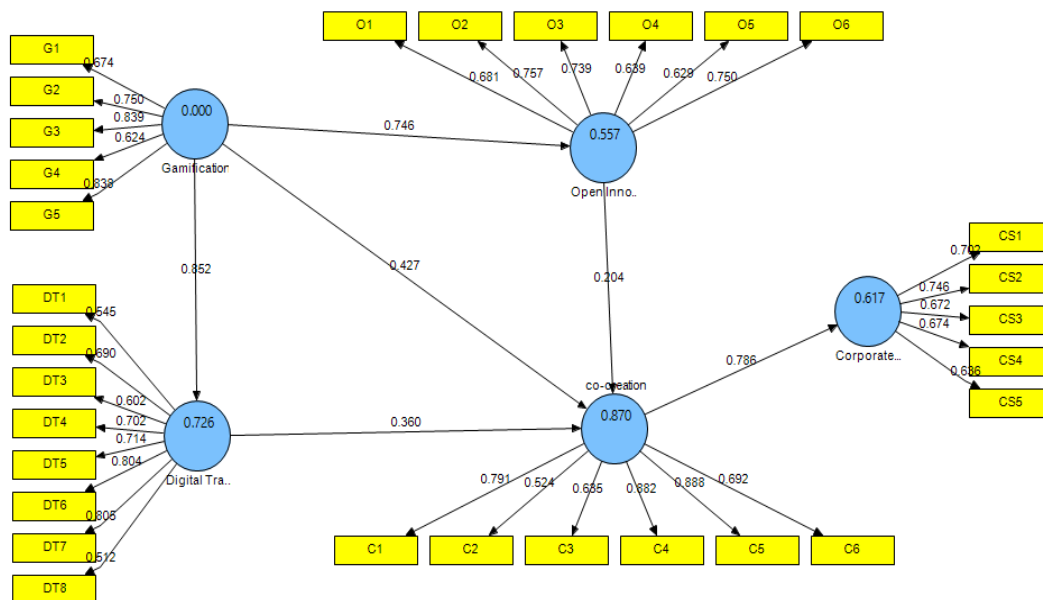Table 5 and Figure 3. Illustrate the research hypothesis tested by structural equation testing.

Fig. 3. Path coefficients

Table 5. Hypothesis Testing

Path	β	R^2	T-value	Result
Gamification ⟶ Open innovation	0.764	0.557	25.498	Supported
Gamification ⟶ Value Co-creation	0.427	0.870	3.966	Supported
Gamification ⟶ Digital transformation	0.852	0.726	28.411	Supported
Open innovation ⟶ Value Co-creation	0.204	0.870	2.279	Supported
Digital transformation ⟶ Value Co-creation	0.360	0.870	2.880	Supported
Value Co-creation ⟶ Corporate Sustainability	0.786	0.617	14.799	Supported

The coefficients of determination of R_2 and the GOF was used to determine the fit of the research model. The coefficient of determination was calculated for dependent variables, which is within the acceptable range for the digital transformation variable with a value of 0.726, the open innovation variable with a value of 0.557, the co-creation variable with a value of 0.870, and the corporate sustainability variable with a value of 0.617 to fit the general model. In addition, the Q2 index was 0.403 for open innovation, 0.353 for the digital transformation variable, 0.429 for the co-creation variable, and 0.471 for the corporate sustainability variable. These numbers indicated the optimal predictive power of the model. The GOF index was used, and the values of 0.01, 0.25, and 0.36 were introduced as weak, medium, and strong, respectively.

$$GOF = \sqrt{\overline{communality \times R_2}} = \sqrt{0.639 \times 0.692} = 0.664$$

The GOF index indicated a strong fit for the research model.

Discussion and Conclusion

Gamification in business is based on an environment involving stakeholders and motivating them, making their roles and responsibilities more attractive. This study investigated the effect of Gamification on businesses' corporate sustainability by explaining the roles of open innovation, digital transformation, and value co-creation. The findings showed that Gamification could lead to corporate sustainability of businesses, which has not been extensively researched. The results of the first hypothesis confirmed Gamification's positive and meaningful effect on open innovation, which was consistent with the findings of Fernandez et al. (2021) and Kauppinen et al. (2016). Along with the previous studies, this result confirmed that Gamification helps flow ideas inside and outside the organization. Therefore, it can be concluded that Gamification is a tool for using technology to accelerate the innovation flow. Based on the results of the second hypothesis, the positive and

meaningful impact of Gamification on value co-creation is confirmed, consistent with the findings of Milutinovic (2018) and Patricio et al. (2020). Therefore, Gamification can add entertainment to the work process by involving stakeholders and building positive motivation, thus creating value co-creation.

The results of the third hypothesis showed that Gamification has a positive and meaningful impact on digital transformation, which is consistent with the findings of Monstad and Burman (2020). Based on the fourth hypothesis, open innovation's positive and meaningful effect on value co-creation was somehow consistent with the findings of the study by Martinez (2014) and De Silva and Wright (2019). Together with the previous consistent results, this confirmed that open innovation could affect employee engagement in processes and build value co-creation. Based on the fifth hypothesis, the positive and meaningful impact of digital transformation value co-creation was confirmed. This was consistent with Mergel et al. (2018) and Malar et al. (2019). It was confirmed that new digital transformation tools could be used to exploit and store stakeholder information and increase the interaction between stakeholders for value co-creation. Based on the sixth hypothesis, positive and meaningful value co-creation in corporate sustainability was confirmed, consistent with the findings of Arnold (2017) and Cannas et al. (2019). Accordingly, the researchers concluded that Gamification could help the dynamics and stakeholders' participation and support innovative activities to make an efficient interaction among stakeholders' shape and create value co-creation and sustainability.

With the outbreak of the covid-19 pandemic, the process of digitalizing businesses has increased, and it has provided a great opportunity to use Gamification in businesses. Therefore, using Gamification as a driving force of business to facilitate the process of digitalization to create more sustainable businesses is recommended.

Businesses can go through innovation and digitalization faster through Gamification, and staff will be situated in constant interaction with processes. The purpose of gamification tools is to strengthen stakeholders' sustainable behavior and greatly emphasize boosting internal motivation. Based on the acquired results, the following conclusions were drawn:

- It is recommended that the managers customize the game's design principles accordingly to fit the characteristics of the stakeholders so that the elements of Gamification in businesses become more efficient.
- Considering the effect of value co-creation on corporate sustainability, it is suggested that managers in the process of value co-creation focus on the whole chain of value and merge different stakeholders to minimize negative environmental and social effects and strengthen sustainability.

- It is recommended that managers use a gamification approach to boost participation and coordination of key stakeholders through constant interaction and learning because it will bring long-term connections and knowledge creation.

- As open innovation requires a culture of risk-taking and rapid adoption of environmental changes, managers are advised to use Gamification in the innovation process as an effective approach to train employees to facilitate the development of values.

- To efficiently use Gamification as a tool for aligning values and corporate sustainability, businesses must have a comprehensive understanding of sustainability concepts and consider the challenges and opportunities they may face in implementing sustainability.

- Considering the effect of co-creation on corporate sustainability, businesses are recommended to update the technologies they use to facilitate open innovation and promote the speed of digital transformation.

- Gamification in the business environment creates a space in which game elements are combined to increase employee participation and reduce activity time; therefore, getting Gamification mixed with performing processes requires giving importance to organizational training and learning.

- Gamification elements should be designed to allow users to compare their performance with others; performance comparison encourages employees to open innovation and increase motivation, ultimately leading to value co-creation.

- Through training, stakeholders help better understand the functions of Gamification and use them in performing activities.

- Gamification is associated with creating an experience for stakeholders; therefore, there must be an alignment between stakeholder opinions and feedback and the gamification process so that customers have a good experience and a more desirable digital transformation process is implemented.

- In value creation, companies can explore and understand customer needs by using transformational technologies. This can be achieved by examining and analyzing the relationships between stakeholders in the digital context, cyberspace, and social media. Additionally, creating new distribution and communication channels using transformational technologies will create value for stakeholders and ultimately lead to sustainability.

- Businesses can use cyberspace and digital channels to reduce negative impacts that threaten the environment.

- Given the importance of social impact, it is suggested that managers help a company achieve sustainability by creating sustainable relationships with customers and trying to solve social problems arising from presenting their value propositions.

It is worth mentioning that copying gamification tools without considering the business's situation is useless because gamification tools can be efficient when a game design is produced considering the terms and status of the company.

Conflict of interest

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

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References

Abbas, J. (2019). Impact of total quality management on corporate sustainability through the mediating effect of knowledge management. *Journal of Cleaner Production*, 11(8), 1-37.

Adhiatma, A., Sari, R. D., & Fachrunnisa, O. (2021). The role of personal dexterity and incentive gamification to enhance employee learning experience and performance. Cognition, *Technology & Work*, 1-13.

Ali, F. H., Ali, M., Malik, S. Z., Hamza, M. A., & Ali, H. F. (2020). Managers' Open Innovation and Business Performance in SMEs: A Moderated Mediation Model of Job Crafting and Gender. *Journal of Open Innovation: Technology, Market, and Complexity*, 6(3), 89-101.

Alsawaier, R. (2017). The effect of Gamification on motivation and engagement. The International Journal of Information and Learning Technology, 35(1), 56-79.

Arnold, M. (2017). Fostering sustainability by linking co-creation and relationship management concepts. *Journal of Cleaner Production*, 140(1), 179-188.

Aziz, A., Mushtaq, A., & Anwar, M. (2017). *Usage of Gamification in enterprise: A review*. In 2017 international conference on communication, computing and digital systems (C-CODE), 249-252.

Cannas, R., Argiolas, G., & Cabiddu, F. (2019). Fostering corporate sustainability in tourism management through social values within collective value co-creation processes. *Journal of sustainable tourism*, 27(1), 139-155.

Capitani, G. (2018). CIO's: Drivers or Followers of Digital Transformation?. *In CIOs and the Digital Transformation*, Springer, Cham. 69-83.

De Silva, M., & Wright, M. (2019). Entrepreneurial co-creation: societal impact through open innovation. *R&D Management*, 49(3), 318-342.

Elia, G., Petruzzelli, A. M., & Urbinati, A. (2020). Implementing open innovation through virtual brand communities: A case study analysis in the semiconductor industry. *Technological forecasting and social change*, 155(1), 1-19.

Fernandez, E., Abril, C., Breuer, H., & Gudiksen, S. (2021). Gamification approaches for open innovation implementation: A conceptual framework. *Creativity and Innovation Management*, 30(3), 455-474.

Greene, C., Crumbleholme, L. & Myerson, J. (2014). Sustainable cultures: Engaging employees in iv creating more sustainable workplaces and workstyles. *Facilities*, 32(7/8), 438-454.

Gudiksen, S. (2015). Business model design games: Rules and proceduresto challenge assumptions and elicit surprises.*Creativity and InnovationManagement*, 24(2), 307–322.

Hafkesbrink, J., & Schroll, M. (2010). Organizational Competences for open innovation in small and medium sized enterprises of the digital economy. *Competence Management for Open Innovation: Tools and It Support to Unlock the Innovation Potential Beyond Company Boundaries*, 30(2), 21.

Horlacher, A., & Hess, T. (2016). What does a Chief Digital Officer do? Managerial tasks and roles of a new C-level position in the context of digital transformation. *In 2016 49th Hawaii International Conference on System Sciences (HICSS)*, 5126-5135.

Hostettler, Y., & Van Maurik, B. (2020). *Gamification for Sustainability-An experts' perspective on the opportunities and challenges of Gamification as a tool to foster sustainability practices within organisations*. Master's thesis, Malmo university.

Kao, C. Y., & Chueh, H. E. (2022). A Real-Time Bidding Gamification Service of Retailer Digital Transformation. *SAGE Open*, 12(2), 1-13.

Kauppinen, S., Luojus, S., & Lahti, J. (2016). *Involving citizens in open innovation process by means of gamificatin*. In Proceedings of the 9th Nordic Conference on Human-Computer Interaction, 1-4.

Khomba, J. K., & Vermaak, F. N. (2013). Towards corporate Sustainability: Equitable wealth allocation to all participating stakeholders, *African Journal of Business Management,* 6(9), 3470-3481.

Lyu, Y., Zhu, Y., Han, S., He, B., & Bao, L. (2020). Open innovation and innovation" Radicalness"—the moderating effect of network embeddedness. *Technology in Society*, 62(1), 1-29.

Malar, D. A., Arvidsson, V., & Holmstrom, J. (2019). Digital transformation in banking: Exploring value co-creation in online banking services in India. *Journal of Global Information Technology Management*, 22(1), 7-24.

Manninen, K., & Huiskonen, J. (2022). Factors influencing the implementation of an integrated corporate sustainability and business strategy. *Journal of Cleaner Production*, 343(5), 43-61.

Martinez, M. G. (2014). Co-creation of value by open innovation: Unlocking new sources of competitive advantage. *Agribusiness*, 30(2), 132-147.

Matt, C., Hess, T., & Benlian, A. (2015). Digital transformation strategies. *Business & information systems engineering*, 57(5), 339-343.

Mehera, A. R. (2017). Shared value literature review: implications for future research from stakeholder and social perspective. J. *Mgmt. & sustainability*, 7(4), 98-111.

Mergel, I., Kattel, R., Lember, V., & McBride, K. (2018). *Citizen-oriented digital transformation in the public sector*. In Proceedings of the 19th Annual International Conference on Digital Government Research: Governance in the Data Age, 1-3.

Milutinovic, R., Stosic, B., Cudanov, M., & Stavljanin, V. (2018). A conceptual framework of game-based ideation. *The International journal of engineering education*, 34(6), 1930-1938.

Monstad, T. H., & Burman, S. (2020). Digital Transformations Carried Out Through Games. *In Utilizing Gamification in Servicescapes for Improved Consumer Engagement*,1(3) 119-147.

Mousavi, A., Shamizanjani, M. (2021). The impact of Gamification on customer digital experience and customer engagement: A Meta-synthesis approach. *Journal of Business Administration Researches*, 13(25), 395-418.

Mubarak, M. F., & Petraite, M. (2020). Industry 4.0 technologies, digital trust and technological orientation: What matters in open innovation?. *Technological Forecasting and Social Change*, 161(1), 1-27.

Nacke, L. E., & Deterding, C. S. (2017). The maturing of gamification research. *Computers in Human Behaviour*,12(3), 450-454.

Narayanan, V. & Adams, C. (2017). Transformative change towards sustainability: the interaction between organisational discourses and organisational practices. *Accounting and Business Research*, 47(3), 344-368.

Ng, I. C. L., Nudurupati, S. S., & Tasker, P. (2010).. Advanced Institute of Management (AIM) Research: Working paper series

Paravizo, E., Chaim, O. C., Braatz, D., Muschard, B., & Rozenfeld, H. (2018). Exploring Gamification to support manufacturing education on industry 4.0 as an enabler for innovation and sustainability. *Procedia manufacturing*, 21(1), 438-445.

Patricio, R., Moreira, A., Zurlo, F., & Melazzini, M. (2020). Co-creation of new solutions through Gamification: A collaborative innovation practice. *Creativity and Innovation Management*, 29(1), 146-160.

Pellizzoni, E., Trabucchi, D., & Landoni, P. (2020). Co-design of Sustainability Models: Examples. *In Universities as Drivers of Social Innovation*, Springer, Cham, 289-305.

Pustovrh, A., Rangus, K., & Drnovšek, M. (2020). The role of open innovation in developing an entrepreneurial support ecosystem. *Technological forecasting and social change*, 152(1), 119-129.

Ranjan, K. R., & Read, S. (2016). Value co-creation: concept and measurement. *Journal of the Academy of Marketing Science*, 44(3), 290-315.

Saha, V., Mani, V., & Goyal, P. (2020). Emerging trends in the literature of value co-creation: a bibliometric analysis. *Benchmarking: An International Journal*. 27(3), 981-1002.

Sharaei, F., Colabi, A., Khodadad Hosseini, S. (2020). The Impact of Entrepreneurial Marketing on the Sustainability of Knowledge-Based Companies with an Emphasis on Strategic Renewal. *Journal of Entrepreneurship Development*, 13(3), 421-440.

Slibar, B., Vukovac, D. P., Lovrenčić, S., Šestak, M., & Andročec, D. (2018). Gamification in a business context: Theoretical background. *In Central European Conference on Information and Intelligent Systems*, Faculty of Organization and Informatics Varazdin, 123-131.

Stevens, S. (2013). How Gamification and Behavior Science Can Drive Social Change One Employee at a Time. *International Conference of Design*, User Experience, and Usability, 597-601.

Townsend, J. H. (2017). *Digital systems for sustainability: a classification of ICT4S and smart green startups distinguishing automation, social computing and cleantech push* (Doctoral dissertation, University of Southampton).

Van den Berg, J., Zijp, M. C., Vermeulen, W. J., & Witjes, S. (2019). Identifying change agent types and its implications for corporate sustainability integration based on worldviews and contextual factors. *Journal of Cleaner Production*, 229(1), 1125-1138.

Vial, G. (2019). Understanding digital transformation: A review and a research agenda. *The journal of strategic information systems*, 28(2), 118-144.

Warner, K. S., & Wager, M. (2019). Building dynamic capabilities for digital transformation: An ongoing process of strategic renewal. *Long Range Planning*, 52(3), 326-349.

Westerman, G., Bonnet, D., & McAfee, A. (2014). *Leading digital: Turning technology into business transformation.* Harvard Business Press.

Wunderlich, N. V., Gustafsson, A., Hamari, J., Parvinen, P., & Haff, A. (2019). The great game of business: Advancing knowledge on Gamification in business contexts. *Journal of Business Research*, 23(3), 1-4.

Yang, Y., Asaad, Y., & Dwivedi, Y. (2017). Examining the impact of Gamification on intention of engagement and brand attitude in the marketing context. *Computers in Human Behavior*, 73(1), 459-469.

Yun, J. J., Zhao, X., Park, K., & Shi, L. (2020). Sustainability condition of open innovation: Dynamic growth of alibaba from SME to large enterprise. *Sustainability*, 12(11), 4379.

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