Research on Design Decisions of Customer Value in a Cross-Cultural Context

1st Yousheng Yao*
Hexiangning College of Art and Design
Zhongkai University of Agriculture and Engineering
Guangzhou, China
120752037@qq.com

2nd Junpeng Zheng
Hexiangning College of Art and Design
Zhongkai University of Agriculture and Engineering
Guangzhou, China
z-junpeng@139.com

3rd Haoran Wang
College of Computer and Cyber Security
Fujian Normal University
Fuzhou, China
1979107452@qq.com

4th Yang Rao
Hexiangning College of Art and Design
Zhongkai University of Agriculture and Engineering
Guangzhou, China
warma8457@gmail.com

***Abstract*—With the accelerating pace of globalization, enterprises are facing severe challenges in the complex and ever-changing market environment. Product design innovation has become an important driving factor for enhancing the competitiveness of enterprises. This study focuses on the multi-level relationships among design innovation, design value, and customer value, and explores the moderating impact of cultural differences on their action paths. Through experimental studies in four countries with vastly different cultural backgrounds, namely Germany, Brazil, Japan, and the United States, it reveals the significant impacts of design innovation dimensions such as aesthetics, features, and emotions on humanistic design value and technical design value respectively, as well as the specific paths through which design value further affects product-related, service-related, and promotion-related customer values. The research indicates that different cultural backgrounds significantly moderate the intensity of the effects of various design innovation dimensions on design value. Meanwhile, cultural differences have an important influence on the transmission relationship between design value and customer value. This study provides theoretical support and practical guidance for enterprises to optimize product design and marketing strategies in the global market, especially demonstrating the unique mechanism of action of design innovation in the context of cross-culture.**

Keywords—Product Design Innovation; Customer Value; Design Value; Cultural Differences; Cross-cultural Research

I. INTRODUCTION

In the contemporary era, the process of globalization is advancing at an unprecedented speed, leading to earth-shaking changes in the business landscape where enterprises are situated (Waddock et al., 2020). The rapid development in the field of information technology, such as the popularization of the Internet, the application of big data, and the rise of artificial intelligence, has made the channels through which consumers obtain information extremely rich and diverse (Schilirò et al., 2020). This has directly resulted in the continuous evolution of their needs (Situm et al., 2024). Regarding products and services, their demands have become increasingly complex, changeable, and unpredictable (Suroso et al., 2024). In such a market environment, the competition among enterprises has also become extremely fierce. To stand out from numerous competitors and acquire and maintain a competitive advantage has become a formidable challenge faced by enterprises (Trad, 2019).

Product design innovation has gradually come to the fore in this process and has become one of the crucial factors for enterprises seeking development (Irtyshcheva et al., 2022). An ingenious and innovative product design can not only make the product more appealing in appearance but also achieve a qualitative leap in multiple aspects such as function, performance, and user experience (Shtal et al., 2021). Through product design innovation, enterprises can better meet the increasingly diverse needs of consumers, enhance the added value of products, and thereby gain more market share and create more economic benefits (Bozyk et al., 2019). However, although the importance of product design innovation has been widely recognized, the current research in both the academic and business communities on the profound inherent relationship between product design innovation and customer value is far from being comprehensive and perfect (Witt et al., 2021). Especially in the context of globalization, there are significant cultural differences among different countries and regions. How these cultural differences affect the relationship between product design innovation and customer value, and what role cultural differences exactly play in this complex relationship have not yet been thoroughly analyzed and explored (Brand et al., 2020).

Precisely based on such a research status quo, this study is dedicated to filling the gaps in this field. We will embark from the unique perspective of cross-culture and apply scientific research methods to conduct an in-depth and systematic analysis of the impact mechanism of design innovation on customer value (Sebhatu et al., 2022). By uncovering this impact mechanism, we hope to provide solid theoretical foundations and practical and operational guidance suggestions for the successful operation of enterprises in the global market (Hutabarat et al., 2021). This will assist enterprises in better understanding the needs and expectations of customers under different cultural backgrounds, thereby enabling them to make more sensible and precise decisions in aspects such as product design and marketing. Consequently, enterprises will be able to better adapt to market changes in the wave of globalization, enhance their international competitiveness, and achieve sustainable development (Farhoomand et al., 2021).

II. Theoretical Background and Hypotheses

A. The Relationship between Design and Innovation

Design and innovation are interdependent and mutually reinforcing in the development process of enterprises (Verganti et al., 2020). Design, as a crucial component of innovation, transforms novel concepts and advanced technologies into specific product or service forms through creative thinking and practical activities, thus providing a means of realization for innovation (Müller et al., 2021). Innovation, on the other hand, encompasses a broader scope, including various levels such as product innovation, process innovation, and market innovation, which offers direction and impetus for design (Rehman et al., 2021). Product design innovation can not only significantly enhance the competitiveness of products but also open up new market opportunities for enterprises and create more value (Nguyen, 2021).

B. Dimensions of Design Innovation

In this study, design innovation is further subdivided into three important dimensions: aesthetic attributes, characteristic attributes, and emotional attributes.

The aesthetic attributes focus on visual elements such as the appearance, shape, and color of the product. It can instantaneously capture the attention of customers and trigger an aesthetic response, thereby leaving a profound first impression in the minds of customers (Lee et al., 2020).

The characteristic attributes place particular emphasis on aspects such as the function, performance, and quality of the product, which are the core elements for the product to meet the basic needs of customers (Seman et al., 2019).

The emotional attributes highlight the emotional experiences of customers that are elicited during the use of the product, such as pleasure, satisfaction, and surprise. It can strengthen the emotional bond between the customer and the product and enhance customer loyalty (Hameed et al., 2021).

C. Classification of Design Value

Design value can be categorized into humanistic design value and technical design value.

The humanistic design value embodies the profound impacts of the product on the quality of human life, emotional needs, and social culture, covering multiple aspects such as safety, comfort, convenience, and personalization (Ode et al., 2020). It focuses on how the product can better meet the needs and expectations of human beings and enhance the quality of human life (Usman et al., 2021).

The technical design value, on the other hand, emphasizes the technical performance, efficiency, reliability, and other technical aspects of the product, serving as an important foundation for the product to fulfill its functions (Caballero-Morales et al., 2021). It reflects the degree of innovation and progress of the product in the technical field (Nguyen et al., 2021).

D. Components of Customer Value

Customer value is defined as the difference between the total benefits and the total costs that customers obtain from products or services. In this study, customer value is further classified into product-related customer value, service-related customer value, and promotion-related customer value.

The product-related customer value mainly pertains to aspects such as the quality, function, and performance of the product, which is the direct purpose for customers to purchase the product (Coca-Pérez et al., 2019).

The service-related customer value encompasses the quality and efficiency of pre-sale, in-sale, and after-sale services provided by enterprises. It can influence customers' purchasing decisions and purchasing experiences (Shao et al., 2020).

The promotion-related customer value is closely associated with factors such as enterprises' promotional activities and brand image. It can attract customers' attention and stimulate their purchasing desires (Rashid et al., 2020).

E. Proposition of Hypotheses

Based on the aforementioned theoretical background, we put forward the following hypotheses:

H1: Aesthetic attributes will have a positive impact on humanistic design value.

H2: Aesthetic attributes will positively influence technical design value.

H3: Characteristic attributes will have a positive impact on humanistic design value.

H4: Characteristic attributes will positively influence technical design value.

H5: Emotional attributes will have a positive impact on humanistic design value.

H6: Emotional attributes will have a positive impact on technical design value.

H7: Humanistic design value will positively affect product-related customer value.

H8: Humanistic design value will positively affect service-related customer value.

H9: Humanistic design value will positively affect promotion-related customer value.

H10: Technical design value will positively influence product-related customer value.

H11: Technical design value will positively influence service-related customer value.

H12: Technical design value will positively affect promotion-related customer value.

H13: Design value will have a positive impact on customer value, yet its outcome will be moderated by cultural differences.

III. Research Methods

A. Experimental Design

To thoroughly investigate the inherent relationships among design innovation, design value, and customer value, and to verify the moderating role of cultural differences in this process, this study adopts a cross-cultural comparative research method. By combining questionnaire surveys and statistical analysis, a multivariable model is constructed for

systematic verification. Four countries with significant cultural differences, namely Germany, Brazil, Japan, and the United States, are selected as the research objects in this study, aiming to comprehensively analyze the action paths and moderating effects of design innovation on customer value under different cultural backgrounds.

B. Experimental Procedures

1) Research Samples

To ensure the diversity and representativeness of the samples, this study recruited undergraduate and graduate students from multiple universities in the four countries as the sample population. There were a total of 1,450 participants, including 350 from Germany, 380 from Brazil, 320 from Japan, and 400 from the United States.

The disciplinary backgrounds of the samples covered various fields such as social sciences, engineering, and art design, aiming to fully reflect the cognition and demands of students from different majors regarding product design under different cultural backgrounds.

2) Data Collection

Data collection was conducted through the use of electronic questionnaires, which were distributed to participants via social media platforms and email.

The content of the questionnaires was carefully designed, incorporating measurement indicators for design innovation dimensions such as aesthetic attributes, characteristic attributes, and emotional attributes, as well as specific measurement indicators for design value and customer value. To ensure the validity and reliability of the questionnaires, a pretest was carried out prior to the official distribution of the questionnaires. Based on the results of the pretest, the questionnaires were revised and refined accordingly.Design Innovation:

Aesthetic Attributes: The appearance design, aesthetic index, and coordination of the product were measured using a 5-point Likert scale, for example, "I think the appearance design of this product is very beautiful", "The color combination of this product is very coordinated", etc.

Characteristic Attributes: The practicality of the product's functions, the stability of its performance, and the convenience of its operation were measured, for example, "The functions of this product can meet my actual needs", "The performance of this product is very stable", "This product is very convenient to operate", etc.

Emotional Attributes: The emotional experiences such as satisfaction, pleasure, and surprise of consumers during the use of the product were measured, for example, "Using this product makes me very satisfied", "This product has brought me a pleasant experience", "Some functions of this product have surprised me", etc.

3) Design Value:

Humanistic Design Value: It covered aspects such as safety, cultural adaptability, sustainability, and personalization, for example, "This product can ensure my safety during use", "This product conforms to the local cultural customs", "This product has the characteristics of environmental protection and sustainability", "This product can meet my personalized needs", etc.

Technical Design Value: It focused on the actual contributions of technical performance and innovation, for example, "The technical performance of this product is very advanced", "The innovative design of this product is of great help to my use", etc.

4) Customer Value:

Product-Related Customer Value: It included a comprehensive evaluation of the product's quality, functions, and cost-effectiveness, for example, "I think the quality of this product is very good", "The functions of this product are very powerful", "The cost-effectiveness of this product is very high", etc.

Service-Related Customer Value: It measured the quality of after-sales service and its response speed, for example, "The after-sales service of the enterprise is very considerate", "The enterprise can respond to my service needs in a timely manner", etc.

Promotion-Related Customer Value: It examined the attractiveness of brand promotion and preferential activities to users, for example, "The brand promotion activities of this enterprise have made me interested in its products", "The preferential activities of this enterprise are very attractive", etc.

5) Reliability and Validity Tests

The reliability of the scale was evaluated by calculating the Cronbach's Alpha coefficient to ensure that the internal consistency of each variable's scale was higher than 0.85, indicating that the scale had a high level of reliability.

The validity of the scale was tested by combining exploratory factor analysis and confirmatory factor analysis. Exploratory factor analysis was used to extract latent factors, and confirmatory factor analysis was used to verify the fit degree between the factor structure and the theoretical model. The results showed that the scale had a good structural validity and could accurately measure the variables under study.

6) Statistical Analysis

Descriptive Statistics: The mean and standard deviation of the variables in each country were analyzed to intuitively understand the distribution of the samples in each country on each variable and explore the differences in cultural backgrounds.

Correlation Analysis: The Pearson correlation coefficient between the variables was calculated to preliminarily judge the linear relationship between the variables.

Structural Equation Model (SEM): The structural equation model was used to test the hypotheses and analyze the direct and indirect effects between the variables. By constructing a path model, the complex relationships between the variables could be more comprehensively revealed.

Moderating Effect Tests: The multi-group analysis method was adopted to explore the moderating effect of cultural differences on the relationships between the variables. By comparing the model parameters between different cultural groups, it was judged

whether cultural differences had a significant impact on the relationships between design innovation, design value, and customer value.

IV. Analysis and Results

A. Data Processing

1) Descriptive Statistics

The means and standard deviations of samples from various countries in terms of aesthetic attributes, characteristic attributes, emotional attributes, humanistic design value, and technical design value are presented in the following table:

TABLE I. Data Tables of Samples from Different Countries

Country	Germany	Brazil	Japan	United States
Aesthetic Attributes	4.2 (0.5)	3.8 (0.6)	4.5 (0.4)	4.3 (0.5)
Characteristic Attributes	4.5 (0.4)	4.1 (0.7)	4.3 (0.5)	4.6 (0.4)
Emotional Attributes	4.0 (0.6)	3.9 (0.8)	4.4 (0.5)	4.3 (0.6)
Humanistic Design Value	4.3 (0.5)	4.0 (0.6)	4.6 (0.4)	4.4 (0.5)
Technical Design Value	4.6 (0.4)	4.2 (0.5)	4.5 (0.4)	4.7 (0.3)

It can be observed from the table that there are certain differences in the means and standard deviations of samples from various countries on each variable. For example, in terms of aesthetic attributes, the mean value of Japanese samples is the highest, reaching 4.5, indicating that Japanese consumers pay more attention to the appearance design of products; while the mean value of Brazilian samples is relatively low, being 3.8, which may reflect that Brazilian consumers have a relatively lower attention to aesthetic attributes when choosing products. In terms of technical design value, the mean value of American samples is the highest, being 4.7, suggesting that American consumers have higher requirements for the technical performance and innovation of products.

2) Correlation Analysis

The results of correlation analysis show that the positive correlations between aesthetic attributes and humanistic design value, as well as technical design value, are the most significant ($r > 0.6$, $p < 0.01$), indicating that the better the aesthetic design of a product, the higher its humanistic design value and technical design value will be. Characteristic attributes are highly correlated mainly with technical design value ($r > 0.7$, $p < 0.01$), illustrating that the functions and performance of a product have an important impact on its technical design value. Emotional attributes play an important connecting role between aesthetic and humanistic design values, and also exhibit a significant positive correlation with humanistic design value ($r > 0.5$, $p < 0.01$).

3) Structural Equation Model Analysis

The goodness-of-fit indices of the structural equation model are favorable (CFI = 0.95, RMSEA = 0.04), indicating that the model has a high degree of fit and can well explain the relationships between variables. The specific results are as follows:

The indirect effect of aesthetic attributes on customer value through humanistic design value is significant in Japan ($\beta = 0.42$, $p < 0.001$), suggesting that under the Japanese cultural background, aesthetic design innovation can have a positive impact on customer value by enhancing humanistic design value.

The direct impact of technical design value on promotion-related customer value is significant in the United States ($\beta = 0.36$, $p < 0.01$), indicating that in the American market, the technical design value of a product has a direct promoting effect on promotion-related customer value.

4) Moderating Effect Tests

Cultural differences play a significant moderating role in the relationship between aesthetic attributes and humanistic design value ($\Delta\chi^2 = 12.45$, $p < 0.05$). Further analysis reveals that in Germany, characteristic attributes are more inclined to directly enhance technical design value ($\beta = 0.78$, $p < 0.001$), while in Japan, the impact of emotional attributes on humanistic design value is more prominent ($\beta = 0.48$, $p < 0.001$). This indicates that under different cultural backgrounds, the impacts of various dimensions of design innovation on design value are different.

B. Graphical Analysis

Cross-Cultural Aesthetic Attributes Impact Graph: The cross-national differences in the impact of aesthetic attributes on humanistic design value are presented intuitively through a bar graph. It can be clearly seen from the graph that the mean value in Japan is the highest, the mean value in Brazil is the lowest, and other countries are in between. This result further validates the differences in aesthetic attributes among various countries as analyzed in the descriptive statistics.

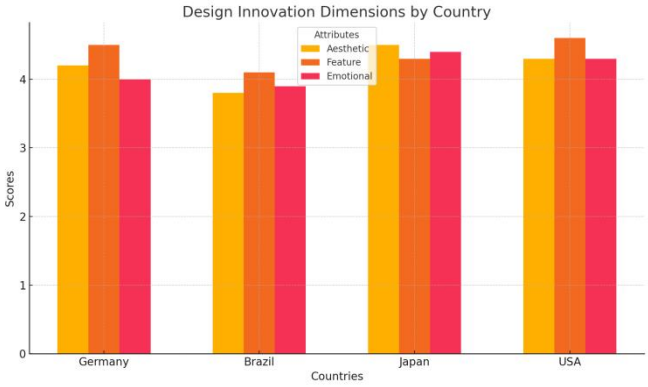

Fig. 1. Design Innovation Dimensions by Country.

Grouped Bar Graph: It presents the scoring differences among different countries in terms of design innovation dimensions (aesthetic attributes, characteristic attributes, emotional attributes), allowing for an intuitive comparison of the cross-cultural manifestations of each dimension.

Path Coefficient Graph: The path coefficient results of the structural equation model are demonstrated in the form of a flowchart, which can clearly illustrate the significant paths and the strength of the effects between various variables. For instance, one can observe the path coefficients from aesthetic

attributes to humanistic design value and then to customer value, as well as those from technical design value to promotion-related customer value, etc., thus helping readers better understand the relationships between the variables.

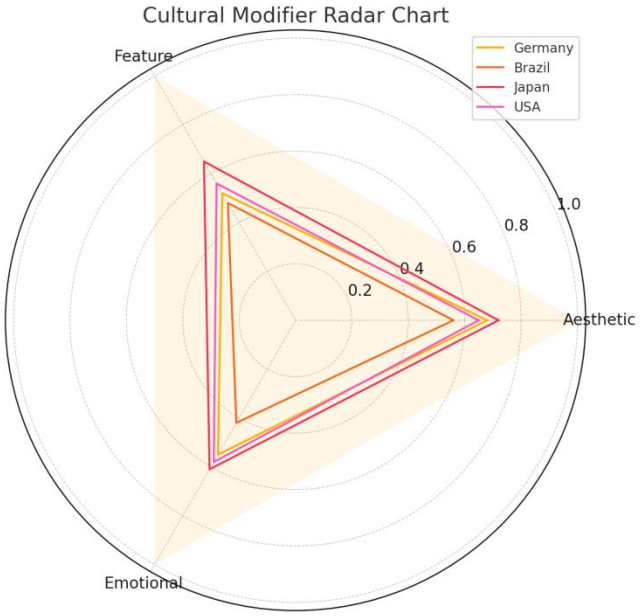

Fig. 2. Cultural Modifier Radar Chart.

Petal Diagram (Radar Chart): Taking cultural moderating factors (humanistic design value, technical design value, customer value) as dimensions, it presents the comprehensive performance of each country, highlighting the advantages and characteristics of different countries.

Moderating Effect Analysis Diagram: The interaction effect diagram is used to show the changing trend of the cultural moderating effect. For example, through this diagram, one can intuitively observe how the relationship between aesthetic attributes and humanistic design value changes with cultural differences under different cultural backgrounds, as well as the differences in the impacts of characteristic attributes and emotional attributes on design value and customer value in different countries.

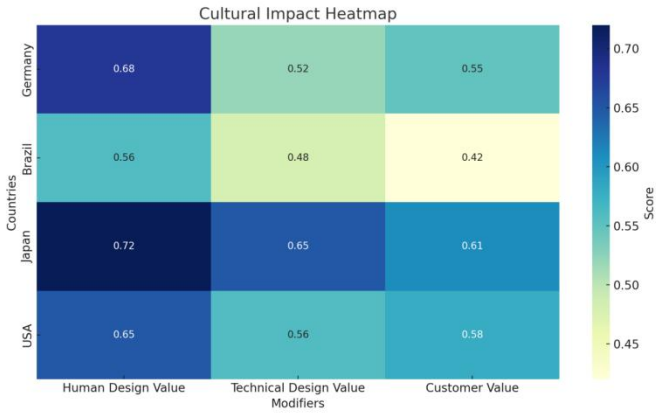

Fig. 3. Cultural lmpact Heatmap

Heat Map: Visualize the influence degree of cultural factors in different countries by means of color intensity, thus providing a clear pattern for the research on cross-cultural differences.

V. Discussion

A. Theoretical Significance of the Research Results

The results of this study are of great theoretical significance (Micheli et al., 2019). Firstly, they have enriched and expanded the research in the related fields of design innovation, design value, and customer value (Talmar et al., 2020). Through the empirical research on four countries with different cultural backgrounds, the differences in the impacts of various design innovation dimensions on design value and customer value have been clearly identified, providing a more comprehensive and in-depth perspective for cross-cultural research (Le & Lei, 2019). Secondly, the mediating role of design value between design innovation and customer value has been verified, further perfecting the relationship model among the three (Appio et al., 2021). Meanwhile, the moderating mechanism of cultural differences in this mediating process has been revealed, deepening the understanding of the role of cultural factors in the relationship between design innovation and customer value (Borah et al., 2022).

B. Practical Significance of the Research Results

The results of this study play an important guiding role in the practices of enterprises in the global market (Pel et al., 2020). When enterprises conduct product design innovation and make marketing decisions, they should fully consider the cultural differences among different countries (Verganti et al., 2020). For example, in the Japanese market, due to consumers' high attention to aesthetic design and humanistic design value, enterprises should place greater emphasis on the appearance design and cultural connotations of products to enhance their attractiveness and competitiveness (Singh et al., 2020). In the American market, as consumers attach great importance to technical design value and personalized needs, enterprises can highlight the functional innovation and emotional design of products to meet consumers' demands (Mensah et al., 2019). In the German market, the balance between technical design value and humanistic design value is of crucial importance. Enterprises should focus on user experience and cultural adaptability on the basis of ensuring product quality and performance (Soewarno et al., 2019). In the Brazilian market, enterprises need to pay attention to the basic functions and cost-effectiveness of products, and at the same time, carry out appropriate design innovation in combination with local cultural characteristics to improve the market acceptance of products (George et al., 2020).

C. Limitations of the Research

Although this study has achieved certain results, there are still some limitations (Afsar et al., 2020). Firstly, only four countries were selected as the research objects in this study. Although these four countries are somewhat representative, they still cannot fully cover all cultural types worldwide. The limitation of the sample may affect the universality of the research results (Hammedi et al., 2019). Future research could further expand the sample scope by including more countries and regions to gain a more comprehensive understanding of the relationship between design innovation and customer value under different cultural backgrounds (Huynh et al., 2022). Secondly, the student sample was adopted in this study. Although students can represent the consumer group to a certain extent, there may be certain differences from the actual consumer group (Khin et al., 2019). In subsequent research, a broader sample source, such

as ordinary consumers, enterprise employees, etc., could be considered to improve the external validity of the research results (Shin et al., 2020). Finally, this study only focused on one product type, namely mobile phones. The applicability of the research results to other product types awaits further verification (Hagger et al., 2019). Different products have different characteristics and user requirements. Future research could select multiple product types for investigation to explore the relationship between design innovation and customer value more in-depth (Hammedi et al., 2019).

VI. Conclusion

Through the cross-cultural experimental research conducted in four countries, namely Germany, Brazil, Japan, and the United States, this study has delved into the relationships among design innovation, design value, and customer value, and analyzed the moderating role of cultural differences therein. The research findings demonstrate that design innovation influences customer value through design value, and cultural differences exert a significant moderating effect on this process. This study has provided theoretical bases and practical guidance for enterprises to formulate effective product design strategies and marketing strategies in the global market, facilitating enterprises to better meet the needs of customers in different countries and enhance their international competitiveness. Future research could further expand the sample scope to cover more countries and cultural types, and simultaneously select multiple product types for investigation, so as to more comprehensively and in-depth reveal the relationships between design innovation and customer value, thereby offering more robust support for the globalization development of enterprises.

References

[1] Bozyk, Pawel. Globalization and the transformation of foreign economic policy. Routledge, 2019.

[2] Brand, Ulrich, Christoph Görg, and Markus Wissen. "Overcoming neoliberal globalization: Social-ecological transformation from a Polanyian perspective and beyond." Globalizations 17, no. 1 (2020): 161-176.

[3] Farhoomand, Ali, M. Lynne Markus, Guy Gable, and Shamza Khan. Managing (e) business transformation: a global perspective. Bloomsbury Publishing, 2021.

[4] HUTABARAT, Christine, Suharyono SUHARYONO, Hamidah Nayati UTAMI, and Arik PRASETYA. "Servant leadership, business transformation, and corporate competitiveness." The Journal of Asian Finance, Economics and Business 8, no. 2 (2021): 1091-1099.

[5] Vishnevskaya, Olga, Inna Irtyshcheva, Iryna Kramarenko, and Nazariy Popadynets. "The influence of globalization processes on forecasting the activities of market entities." (2022).

[6] Schilirò, Daniele. "Towards digital globalization and the covid-19 challenge." (2020): 1710-1716.

[7] Enquist, Bo, and Samuel Petros Sebhatu. "Service Management for Sustainable Business Transformation." In The Palgrave Handbook of Service Management, pp. 411-435. Cham: Springer International Publishing, 2022.

[8] Märk, Stefan, and Mario Situm, eds. Family Business Transformation: Strategic Orientation and Business Modelling. Vol. 1. Walter de Gruyter GmbH & Co KG, 2024.

[9] Hrynko, Pavlo, Alla Grinko, Tatyana Shtal, Hanna Radchenko, and Mariia Pokolodna. "Formation of an innovative business model of a trade organization in the context of economic globalization." Scientific Horizons 6, no. 24 (2021): 92-98.

[10] Suroso, Jarot S., Emil R. Kaburuan, Adrianus Kelvin, and Elko Priatama. "Technology drive entrepreneurial digital business transformation." In 2020 8th International Conference on Orange Technology (ICOT), pp. 1-7. IEEE, 2020.

[11] Trad, Antoine, ed. Using applied mathematical models for business transformation. IGI Global, 2019.

[12] Waddock, Sandra. "Achieving sustainability requires systemic business transformation." Global Sustainability 3 (2020): e12.

[13] Witt, Michael A. "De-globalization: Theories, predictions, and opportunities for international business research." Journal of International Business Studies 50, no. 7 (2019): 1053-1077.

[14] Verganti, Roberto, Luca Vendraminelli, and Marco Iansiti. "Innovation and design in the age of artificial intelligence." Journal of product innovation management 37, no. 3 (2020): 212-227.

[15] Müller, Julian M., Oana Buliga, and Kai-Ingo Voigt. "The role of absorptive capacity and innovation strategy in the design of industry 4.0 business Models-A comparison between SMEs and large enterprises." European Management Journal 39, no. 3 (2021): 333-343.

[16] Rehman, Shafique Ur, Sascha Kraus, Syed Asim Shah, Dmitry Khanin, and Raj V. Mahto. "Analyzing the relationship between green innovation and environmental performance in large manufacturing firms." Technological Forecasting and Social Change 163 (2021): 120481.

[17] Lam, Long, Phuong Nguyen, Nga Le, and Khoa Tran. "The relation among organizational culture, knowledge management, and innovation capability: Its implication for open innovation." Journal of Open Innovation: Technology, Market, and Complexity 7, no. 1 (2021): 66.

[18] Lee, Allan, Alison Legood, David Hughes, Amy Wei Tian, Alexander Newman, and Caroline Knight. "Leadership, creativity and innovation: A meta-analytic review." European Journal of Work and Organizational Psychology 29, no. 1 (2020): 1-35.

[19] Seman, Noor Aslinda Abu, Kannan Govindan, Abbas Mardani, Norhayati Zakuan, Muhamad Zameri Mat Saman, Robert E. Hooker, and Seckin Ozkul. "The mediating effect of green innovation on the relationship between green supply chain management and environmental performance." Journal of cleaner production 229 (2019): 115-127.

[20] Hameed, Waseem Ul, Qasim Ali Nisar, and Hung-Che Wu. "Relationships between external knowledge, internal innovation, firms' open innovation performance, service innovation and business performance in the Pakistani hotel industry." International journal of hospitality management 92 (2021): 102745.

[21] Ode, Egena, and Rajenthyran Ayavoo. "The mediating role of knowledge application in the relationship between knowledge management practices and firm innovation." Journal of Innovation & Knowledge 5, no. 3 (2020): 210-218.

[22] Usman, Muhammad, and Nesrine Hammar. "Dynamic relationship between technological innovations, financial development, renewable energy, and ecological footprint: fresh insights based on the STIRPAT model for Asia Pacific Economic Cooperation countries." Environmental Science and Pollution Research 28, no. 12 (2021): 15519-15536.

[23] Caballero-Morales, Santiago-Omar. "Innovation as recovery strategy for SMEs in emerging economies during the COVID-19 pandemic." Research in international business and finance 57 (2021): 101396.

[24] González-Blanco, Jennifer, José Luis Coca-Pérez, and Manuel Guisado-González. "Relations between technological and non-technological innovations in the service sector." The Service Industries Journal 39, no. 2 (2019): 134-153.

[25] Shao, Shuai, Zhigao Hu, Jianhua Cao, Lili Yang, and Dabo Guan. "Environmental regulation and enterprise innovation: a review." Business strategy and the environment 29, no. 3 (2020): 1465-1478.

[26] Rashid, Md Harun Ur, Mohammad Nurunnabi, Mahfuzur Rahman, and Md Abdul Kaium Masud. "Exploring the relationship between customer loyalty and financial performance of banks: Customer open innovation perspective." Journal of Open Innovation: Technology, Market, and Complexity 6, no. 4 (2020): 108.

[27] Micheli, Pietro, Sarah JS Wilner, Sabeen Hussain Bhatti, Matteo Mura, and Michael B. Beverland. "Doing design thinking: Conceptual review, synthesis, and research agenda." Journal of Product innovation management 36, no. 2 (2019): 124-148.

[28] Talmar, Madis, Bob Walrave, Ksenia S. Podoynitsyna, Jan Holmström, and A. Georges L. Romme. "Map**, analyzing and designing innovation ecosystems: The Ecosystem Pie Model." Long Range Planning 53, no. 4 (2020): 101850.

[29] Le, Phong Ba, and Hui Lei. "Determinants of innovation capability: the roles of transformational leadership, knowledge sharing and perceived organizational support." Journal of knowledge management 23, no. 3 (2019): 527-547.

[30] Appio, Francesco Paolo, Federico Frattini, Antonio Messeni Petruzzelli, and Paolo Neirotti. "Digital transformation and innovation management: A synthesis of existing research and an agenda for future studies." Journal of Product Innovation Management 38, no. 1 (2021): 4-20.

[31] Borah, Prasad Siba, Shuja Iqbal, and Shamim Akhtar. "Linking social media usage and SME's sustainable performance: The role of digital leadership and innovation capabilities." Technology in Society 68 (2022): 101900.

[32] Pel, Bonno, Alex Haxeltine, Flor Avelino, Adina Dumitru, René Kemp, Tom Bauler, Iris Kunze, Jens Dorland, Julia Wittmayer, and Michael Søgaard Jørgensen. "Towards a theory of transformative social innovation: A relational framework and 12 propositions." Research Policy 49, no. 8 (2020): 104080.

[33] Verganti, Roberto, Luca Vendraminelli, and Marco Iansiti. "Innovation and design in the age of artificial intelligence." Journal of product innovation management 37, no. 3 (2020): 212-227.

[34] Singh, Sanjay Kumar, Manlio Del Giudice, Roberto Chierici, and Domenico Graziano. "Green innovation and environmental performance: The role of green transformational leadership and green human resource management." Technological forecasting and social change 150 (2020): 119762.

[35] Quaye, Daniel, and Isaac Mensah. "Marketing innovation and sustainable competitive advantage of manufacturing SMEs in Ghana." Management Decision 57, no. 7 (2019): 1535-1553.

[36] Soewarno, Noorlailie, Bambang Tjahjadi, and Febrina Fithrianti. "Green innovation strategy and green innovation: The roles of green organizational identity and environmental organizational legitimacy." Management decision 57, no. 11 (2019): 3061-3078.

[37] George, Gerard, Karim Lakhani, and Phanish Puranam. "What has changed? The impact of Covid pandemic on the technology and innovation management research agenda." Journal of Management Studies (2020).

[38] Afsar, Bilal, Yuosre F. Badir, and Bilal Bin Saeed. "Transformational leadership and innovative work behavior." Industrial Management & Data Systems 114, no. 8 (2014): 1270-1300.

[39] Muninger, Marie-Isabelle, Wafa Hammedi, and Dominik Mahr. "The value of social media for innovation: A capability perspective." Journal of Business Research 95 (2019): 116-127.

[40] Huynh, Phuc Hong. "Enabling circular business models in the fashion industry: The role of digital innovation." International Journal of Productivity and Performance Management 71, no. 3 (2022): 870-895.

[41] Khin, Sabai, and Theresa CF Ho. "Digital technology, digital capability and organizational performance: A mediating role of digital innovation." International Journal of Innovation Science 11, no. 2 (2019): 177-195.

[42] Shin, Hakseung, and Juhyun Kang. "Reducing perceived health risk to attract hotel customers in the COVID-19 pandemic era: Focused on technology innovation for social distancing and cleanliness." International Journal of Hospitality Management 91 (2020): 102664.

[43] Hagger, Martin S. "Habit and physical activity: Theoretical advances, practical implications, and agenda for future research." Psychology of Sport and Exercise 42 (2019): 118-129.