African Journal of Emerging Issues
Peer reviewed | Double blind | Interdisciplinary

African Journal of Emerging Issues (AJOEI)
Online ISSN: 2663 - 9335
Available at: https://ajoeijournals.org

INNOVATION & MANAGEMENT

MODELS OF INNOVATION BY GENERATIONS

Egessa N. Christine

PhD Student, Pan Africa Christian University

Email Address: cegessa@gmail.com

Publication Date: April 2024

ABSTRACT

Introduction: Innovation has become a buzzword for every organization, large or small, in developed or emerging markets, owing to the benefits it promises, most notably in terms of providing organizations with a competitive edge. Innovation can take many forms, including process and product improvement, new product development, technological advancements, and sustainability, to name a few.

Purpose of the Study: The purpose of this paper is to discuss the various types of innovation models proposed by Roy Rothwell, including the first-generation model (technology push), the second-generation model (market pull), the third-generation model (coupling method), the fourth-generation model (integrated model), the fifth-generation model (network model), and finally the sixth-generation model (open innovation model), emphasizing both their advantages and disadvantages.

Methodology: This study is based on a comprehensive literature review of the innovation models proposed by Roy Rothwell. The researchers have examined the existing academic literature, case studies, and industry reports to gain a thorough understanding of these models and their applications in contemporary organizational settings.

Findings: The study reveals that different organizations may choose innovation models based on the specific impact they wish to achieve. Some organizations may opt for models that help them maintain their market position, while others may choose models that enable them to disrupt the current market or make incremental product improvements.

Conclusion: Understanding the various innovation models proposed by Roy Rothwell is crucial for organizations to navigate the complex and rapidly evolving landscape of innovation. By applying these models' assumptions to their specific contexts, organizations can better understand the innovation process, its constraints, and guide future research in this field.

Keywords: *Models, Innovation, Generations*

INTRODUCTION

The evolution of innovation models can be categorized into three main generations: linear and closed, interactive and closed and interactive and open (Cohendet & Simon, 2017). These models have been further developed and refined, with the latest being the self-learning system, which emphasizes the importance of knowledge acquisition from the environment (Blahun & Kukurudz, 2022). According to Krishnamoorthy and Damle (2017), innovation is any new idea that has an effective and efficient implementation, to effect a change, of a system's process or device or product that can be applied for improved results than previously applied. The role of technology in driving the evolution of business models has also been emphasized, with a focus on the need for constant reflection and redesign (Vangjel, 2021).

The concept of generational differences in innovation models is anchored in the broader literature on generational theory, which posits that individuals born within certain time periods share common experiences, values, and worldviews that influence their behaviors, attitudes, and approaches to problem-solving (Ibarra et al., 2020). According to Smoyer (2020), these generational cohorts, often classified as Traditionalists, Baby Boomers, Generation X, Millennials, and Generation Z, have been shaped by distinct historical, social, and technological contexts, leading to unique innovation mindsets and practices. Research on generational differences in innovation models has identified six distinct generations, each with its own characteristics (Ceravolo & Polenakovik, 2016). These models range from simple linear ones to more complex, integrated models, with the latest generation emphasizing dynamism, integration, and interactivity. The role of entrepreneurial orientation in influencing innovation generation and adoption has also been explored (Zaidi & Zaidi, 2021).

The shift towards open innovation networks has led to the development of a fourth-generation innovation model, which emphasizes the interconnectedness of scientific insights, technological capabilities, product design, and markets (Meissner & Kotsemir, 2016). The impact of age pyramids on the propensity to innovate has been studied, with a wide base being more favorable for technological and organizational changes (Ceipek et al., 2021). The influence of personal traits, educational background, risk awareness, and social capital on innovation behavior and performance in new generation entrepreneurs has been highlighted (Guan et al., 2019). The

evolution of family firms' innovativeness from the first to the second generation has been explored, with different dynamics and approaches towards innovation identified (Cesaroni et al., 2021).

The increasing significance of sustainability and environmental considerations has also shaped innovation models, with a greater emphasis on developing eco-friendly products, services, and processes (Bocken et al., 2014). This has led to the adoption of green innovation and circular economy frameworks, which focus on minimizing waste, maximizing resource efficiency, and creating closed-loop systems (Geissdoerfer et al., 2017). The role of government policies, regulations, and incentives in driving sustainable innovation has been widely discussed (Bierwerth et al., 2015). Another emerging trend in innovation models is the rise of social innovation, which focuses on addressing social and environmental challenges through innovative solutions (Cajaiba-Santana, 2014). This approach emphasizes collaboration between diverse stakeholders, including civil society organizations, social entrepreneurs, and community groups, to develop innovative solutions that create societal impact. The study of generational differences in social innovation models has also gained traction, as younger generations are often at the forefront of these initiatives (Moulaert & MacCallum, 2019).

UNDERSTANDING INNOVATION

The constantly changing global markets and the fierce competition have greatly affected the growing economies of many countries and the economic survival of many businesses and organizations. This competitive environment has created enough pressure for organizations which has precipitated the urgency for organizations to innovate and develop extra edges that will aid their consumers to choose them over their competitors when all factors are equated. In the current business environment innovating is critical for any organization to maintain a solid economic development and to increase their global competition. The last decades have seen considerable development in the body of knowledge when it comes to the term innovation and the models attributed to it (Muizniece & Peiseniece, 2012). This work aims to describe the basic models of innovation attributed to the six generations as proposed by Roy Rothwell. This will be achieved by beginning with defining the concept, its meaning, and its origin. This will help bring understanding and awareness of the concept and the impact innovation has on the survival of any organization, especially in the current pulsating global markets.

As highlighted by different literature the term “Innovation” has many definitions. It can simply be defined as “Any new idea that has an effective and efficient implementation, to effect a change, of a system's process or device or product that can be applied for the improved result than previously applied.” (Rosenberg, 2015). According to Segputa (2015) “Innovation in a broad sense involves developing new processes, new products, or new organizational improvements for the industry. It can take many forms, but in every form, it tends to reduce unit costs and/or helps to expand market demand. Eurostat (2018) similarly defines innovation as "A new or improved product or process (or a combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process). Innovation activities include all developmental, financial and commercial activities undertaken by a firm that is intended to result in innovation for the firm.” Leading world institutions like Innovation Network, US and U.K. Department of Trade and Industry define innovation as “The profitable implementation of an idea that creates value” and ‘The development of new ideas and their economic application for new product and processes” respectively (Innovation Report, 2014, p.67).

They defined the concept as the processes in which entrepreneurs create new products/processes in the way they manufacture the products and thus generating a “monopolistic profit” (Keresztes & Endresz, 2020). This means that competitors in the same markets adopt new market trends and pursue them until profits from the trends are extinguished then the markets balance themselves out and the cycle begins again with the adaptation of new trends. As observed from the definitions provided, innovation has widely been defined and the definitions vary from one author to another (Varadarajan, 2024). However, there seem to be key similarities in some of the definitions provided. For example, almost all authors agree that innovation is crucial to the survival of any organization and business. They also agree that innovation is about creating something new and better than what existed before. In addition, innovation goes hand in hand with the concept of creativity as it involves the implementation of new creative ideas. The definition of the concept has evolved over the decades but one thing remains constant. Its importance to any organization and business is to create growth and sustainability (Charles et al., 2017). Prasanna et al. (2019) indicated innovation helps organizations and businesses build sustainable growth by boosting their stimulus of maintaining a stable economic growth hence increasing their competitiveness in the

global markets. Insisting on the importance of innovation, Mazzucato and Stuart (2014) asserted that innovation increases an organization's global competition.

The process of innovation is an intricate one and it begins with an idea and a concept that has to be implemented at the perfect time for it to be successful (Liu et al., 2022). Frieman (2021) showed that timing is a key factor in all innovative processes posits that while some inventions are good and have the prospect of bringing about great change if implemented at the wrong time, they may get washed out without achieving the impact they were created for hence the process of innovation has to consider many factors for it to be successful. This means that innovation is more than the adoption of new ideas and knowledge and it is never a linear process as suggested by some authors but rather a multifaceted one with many feedback loops. By being innovative organizations show their adaptability and flexibility to change which is necessary for their survival in the current markets (Miceli et al., 2021). It is this need for adaptation and flexibility that led to the rise of innovation models used in organizations today. Change drivers like technological advancement, fierce competition, and globalization necessitated the need for innovative models in organizations to challenge organization leaders to develop new concepts and ideas to meet the ever-growing consumer and market demands in the ever-changing markets (Skare & Soriano, 2021).

INNOVATION MODELS

Innovation models encompass a range of approaches to driving change and creating value. They can be applied across various sectors, including the digital economy, where they are crucial for maintaining competitiveness (Guseva & Shvets, 2020). Mathematical modeling is one tool used to support innovation, particularly in predicting the number of participants needed for innovation (Solovev et al., 2019). The innovation process itself can be understood through various models, such as the "technological push" and "market challenge" models (Oleksenko, 2022). These models are influenced by the global economy and the need for new knowledge and information (Volkova & Dyvnych, 2023). In the food industry, innovation models have been a key factor in success, with a focus on new ideas and products (Bigliardi, 2020). Business model innovation, a specific type of innovation model, is particularly important for start-ups, as it can provide resilience and long-term success (Philippi et al., 2022).

Innovation models were developed to explain the innovation processes in organizations in the form of models as they provide the structures for facilitating and identifying the need for change in organizations by generating values that help in the sustainability of organizations' growth and development. The models assert that the innovation process is unique to each organization depending on the needs of the organizations and innovation models are never unidirectional. By considering the uniqueness and the different needs of an organization no innovation model fits all organizations and the choice of model is usually determined by the innovation goals of the organizations. For example, some organizations may decide that their innovation goals are to achieve new products and services to increase their product and services pipeline in this case such organizations will adopt models that facilitate the accomplishment of these innovation goals (Rogers, 2017).

Innovation models have changed from one generation to another due to the need to incorporate the needs of different consumers, processes, and stakeholders. They have over time generated from simple models to complex models that accommodate different needs of the organizations and their shareholders. The focus of this paper will be the six-generation innovation models as identified by Dhakal et al. (2019) where he suggested that the integration and the complexity of the innovation models have grown with each generation. Haas (2018) further argues that the complications and the complexity of the models have been brought on by the creation of new practices that have forced organizations to adapt to the various changing contexts while at the same time dealing with the weaknesses of the previous generations. Balocco et al. (2019) asserted that the evolution of each model did not suggest a substitution of past models but rather the coexistence of the models where they borrowed and shared elements of each other to create models that could be adopted by organizations to fit different contexts. While the models share some similar characteristics, they are also different in some aspects such as their management focus, functional level integration, and their attention to internal and external processes that have an impact on the organizations.

Technology Push Model (First Generation)

The Technology Push Model, a first-generation innovation process, is a linear sequence of stages that emphasizes the role of technological capabilities in driving innovation (Oleksenko, 2022). It is characterized by a focus on hard technologies and a lack of consideration for market needs (Sabeti et al., 2020). This model is contrasted with the Market Challenge Model, which prioritizes

market-driven innovation (Oleksenko, 2022). Despite its limitations, the Technology Push Model has been found to have a significant impact on the sustainable development of manufacturing industries (Singla et al., 2019). The first-generation model according to Rothwell was the technology push model whose assumption was that the emergence of new industries as a result of advancement in technology forced old industries to develop and adopt new machines to increase production. This technological push came with numerous benefits as the regeneration brought increased employment, increased consumption of goods and services, and prosperity in the industries.

With the replacement of old technology with a new one, there was the adoption of electronics and automobiles as industries tried to meet the demands of their consumers. Among the assumptions of the model is that many challenges that are faced by our society can be solved through scientific advancement a key indicator for growth in any business lies in its ability to innovate to meet the demands of its consumers (Rajapathirana & Hui, 2018). The focus of the first-generation innovation model was arguing that by organizations investing in extensive research and development they increased their chances of innovating successfully to new products that meet the demands of their current markets. Despite its many contributions to the innovation process, the model falls short on some aspects. It argues that innovation occurs in a linear progression, and this is usually not the reality of innovation because in some instance's innovation is non-linear with feedback loops. Another limitation lies in its argument that with extensive research organizations can innovate successfully. While this is true in some instances, data collected from research might be outdated and not meet the demands of the ever-changing markets leading to unsuccessful innovation (Tidd et al., 2015).

Market Pull Model (Second Generation)

The Market Pull Model (Second Generation) is a flexible product development process that emphasizes the systematic search for customer needs through market study (Acciarini et al., 2023). It is often used in e-commerce strategies to stabilize the bullwhip effect and is particularly relevant in the high-tech industry, where it is used to manage market volatility (George et al., 2022). The model is also associated with a pull marketing approach, which is increasingly popular in the digital age (Shadow, 2019). In the context of market-driven management, the model is linked to pull policy, which focuses on processes that start from the market and go towards the company

(Dehghani et al., 2022). The model is also used in the context of technology innovation, where it is associated with a strategy of searching for market needs and opportunities (Lin et al., 2020).

The Market Pull model is also known as the second-generation innovation model innovation is driven by consumer demands and should be guided by the demands of the current markets. Companies can use data collected from R&D to establish consumer needs and drive their innovation goals towards the same. Simply put, the launching of a new product and services should be dependent on the needs of the consumers regarding the said products and services. A perfect example of a company that failed to innovate with the needs of the market was Kodak. Once a tech giant in the production of analog cameras, Kodak refused to innovate to the digital cameras that the consumers needed, and it collapsed due to this lack of innovation. Today, Cameras evolve to meet the needs of the consumers as compared to the cameras that were produced in the 1980s. Today tech companies ate developing portable cameras with bigger storage to cater to the needs of the market to meet consumer demands (Trott, 2017).

The Market Pull innovation model shares some similarities with the Technological Push model. Both models believe that innovation occurs in a linear progression. The difference between the two is that the technology push model assumes that advancement in technology is what causes innovation while the market pull model argues that consumer needs and market demands are what drive innovation. The limitation of the market pull model is that with this model organizations risk prioritizing technological advancement at the expense of real technological and market change. This can lead to the negative reception of an otherwise good technology hence affecting their overall organizational growth (Zien & Buckler, 2016).

Coupling or Chain Linking Model (Third Generation)

The third-generation model, often referred to as the coupling, connecting, or interactive model, emphasizes the need of identifying the intricacies of innovation. The coupling model builds upon the assumptions of the preceding first and second-generation models, asserting that both technology and market needs are essential variables that organizations must address in order to successfully innovate. The model also addressed the linear approach of the preceding models by emphasizing the nuanced approach to innovation. One further distinction between the coupling model and the prior model lies in the fact that the earlier models recognized just one component

as a catalyst for creativity. The coupling model recognizes both components of innovation as essential, and it improves upon the constraints and simplicity of prior models (Rothwell, 1994).

System Models (The fourth generation)

The system model assumes that successful innovation within an organization is a byproduct of different systems working as one unit (Hutahayan, 2020). It further argues that organizations that cannot afford to innovate in-house, can benefit from partnerships with other organizations. Advantages of the system model include collective learning of all participants, a combination of skills to overcome innovation challenges, reduced innovation costs, and time and networking advantages for smaller firms. Unlike the previous models that focused on in-house innovation, the system model posits that successful innovation is driven by interactions between systems. While the linear model focused on internal factors for innovation, the system model looks at the internal and external factors that drive innovation. The key difference between the system model and the older models is the importance it plays on third-party integration like the external environment, strategic network influences, cross-functional integration, and government policies and how they influence the innovative processes. Older models ignored the impact of these external factors in the innovation process while the system model highlights its importance (Su, Zhang & Ma, 2020).

Evolutionary Models (The fifth generation)

The evolution model posits that innovation is contingent upon the presence of technical defects that need change. In addition, it acknowledges that innovation is influenced by several variables outside the costs associated with it. The model illuminates the decision-making process inherent in the innovation process. In order for innovation to take place, there are crucial factors that impact the decision-making process. These factors include the external and internal environment, as well as government rules and standards. The model's distinctiveness stems from its recognition of the emergence of novel ideas that foster enhanced productivity and more diversity inside organizations. Further, it asserts that companies must undergo transformation in order to ensure their continued existence and adjust in order to preserve their competitive advantage. It also motivates organizations to investigate the flaws in the external environment and generate new solutions to address these issues as a crucial element of their effective inventive processes (Massaro et al., 2015).

The Innovative Milieu (The sixth generation)

The sixth generation, or Innovative Milieu, is a concept that includes a variety of elements that support the development of an environment that is both dynamic and sustainable for innovation. These variables include the way that institutional, knowledge, socioeconomic, and geographic limits interact (Mikhaylov et al., 2018); how innovation districts promote innovation (Aranda-Mena, 2019); and how cultural values affect technical innovation (Klein, 2019). According to Vecchio et al. (2020) and Nie (2021) the idea also encompasses the adoption of sustainable technologies in urban and periurban environments as well as the development of Chinese "Sixth Generation" cinema. But there are drawbacks to the idea as well, such as the possibility of market exploitation and the need for a critical analysis of its impact (Rispoli, 2019). This paradigm, which is regarded as the sixth generation, is predicated on the ideas that innovation doesn't happen in a vacuum and instead requires resources that are specifically designed to fulfil local requirements. Understanding certain places and the demands of their customers helps to generate creative ideas that are customised to fit those areas' requirements. Trott (2017) emphasised that the interchange and mobility of commodities, services, and information, among other concepts, influence the inventive milieu rather than market demand.

The ability of creative organisations has been affected by elements such as productive work conditions. Businesses today understand the importance of a location in spurring innovation. The creative process is directly impacted by a location's natural features, temperature, air quality, and overall quality of life. As per the concept, an individual's innovativeness is influenced by their physical surroundings. Innovative enterprises are born in distinct places because of their unique patterns, knowledge pathways, and technological growth. As a result, by networking and information exchange inside a particular location, organisations have a larger possibility of innovation. The concept doesn't explain how innovation and ecology are related, even if it implies a clear link between the two. The sixth-generation model, which says that innovation is the result of a particular place and networking to get the know-how of the area, has succeeded in demonstrating the significance of geographical location to innovation whereas other models have taken a simpler approach.

CONCLUSION

The study of innovation models highlights the fact that innovation is a complex phenomenon that is in continuous evolution hence cannot be mastered at the individual or corporate level. The complexity of innovation models is elaborated in the way the models change towards different elements that help organizations to innovate successfully to maintain their competitive edge in the global and local markets. As pointed out in the work, each innovation model is unique just as organizations are unique. Therefore, the choice of model to be used by an organization should entirely depend on its market needs as well as its innovation goals. By studying the model's organization leaders and managers can take advantage of the changing consumer demands and shift their businesses to meet the expectations and demands of their consumers. The fact that organizations operate in an ever-changing business environment means that through innovation models' companies should strive to create products and ideas that aim to make the lives of their consumers better.

REFERENCES

Acciarini, C., Cappa, F., Boccardelli, P., & Oriani, R. (2023). How can organizations leverage big data to innovate their business models? A systematic literature reviews. *Technovation*, *123*, 102713. https://doi.org/10.1016/j.technovation.2023.102713

Aranda-Mena, G. (2019). Milieu d L'interior: Innovation Districts are not new. In *Proceedings of the International Conference on Changing Cities IV: Spatial, Design, Landscape & Socio-economic Dimensions* (pp. 343-354). University of Thessaly.

Balocco, R., Cavallo, A., Ghezzi, A., & Berbegal-Mirabent, J. (2019). Lean business models change process in digital entrepreneurship. *Business Process Management Journal*, *25*(7), 1520-1542. https://doi.org/10.1108/BPMJ-07-2018-0194

Bierwerth, M., Schwens, C., Isidor, R., & Kabst, R. (2015). Corporate entrepreneurship and performance: A meta-analysis. *Small business economics*, *45*, 255-278. https://doi.org/10.1007/s11187-015-9629-1

Blahun, I., & Kukurudz, R. (2022). Interactive Model of Partnership Development On The Basis Of Behavioral Determinants Of Relationships. *Modeling the Development of The Economic Systems*.

Bocken, N. M., Short, S. W., Rana, P., & Evans, S. (2014). A literature and practice review to develop sustainable business model archetypes. *Journal of cleaner production*, *65*, 42-56. https://doi.org/10.1016/j.jclepro.2013.11.039

Cajaiba-Santana, G. (2014). Social innovation: Moving the field forward. A conceptual framework. *Technological forecasting and social change*, *82*, 42-51. https://doi.org/10.1016/j.techfore.2013.05.008

Ceipek, R., Hautz, J., De Massis, A., Matzler, K., & Ardito, L. (2021). Digital transformation through exploratory and exploitative internet of things innovations: The impact of family management and technological diversification. *Journal of Product Innovation Management*, *38*(1), 142-165. https://doi.org/10.1111/jpim.12551

Ceravolo, L., & Polenakovik, R. (2016). Generations of innovation models and their characteristics–towards creating a new innovation model.

Cesaroni, F. M., Chamochumbi Diaz, G. D., & Sentuti, A. (2021). Family firms and innovation from founder to successor. *Administrative Sciences*, *11*(2), 54. https://doi.org/10.3390/admsci11020054

Charles Jr, O. H., Schmidheiny, S., & Watts, P. (2017). *Walking the talk: The business case for sustainable development*. Routledge.

Cohendet, P., & Simon, L. (2017). Concepts and models of innovation. In *The Elgar companion to innovation and knowledge creation* (pp. 33-55). Edward Elgar Publishing. https://doi.org/10.4337/9781782548522.00009

Dehghani, M., Abubakar, A. M., & Pashna, M. (2022). Market-driven management of start-ups: The case of wearable technology. *Applied computing and informatics*, *18*(1/2), 45-60. https://doi.org/10.1016/j.aci.2018.11.002

Dhakal, T., Min, K. S., & Lim, D. E. (2019). Review of multi-generation innovation diffusion models. *Industrial engineering & management systems*, *18*(4), 794-807. https://doi.org/10.7232/iems.2019.18.4.794

Eurostat, Oslo Manual (2018): Guidelines for Collecting, Reporting and Using Data on Innovation, 4th Edition, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing.

Frieman, C. J. (2021). Archaeology of innovation: Approaching social and technological change in human society. https://doi.org/10.7765/9781526132659

Geissdoerfer, M., Savaget, P., Bocken, N. M., & Hultink, E. J. (2017). The Circular Economy–A new sustainability paradigm? *Journal of cleaner production*, *143*, 757-768. https://doi.org/10.1016/j.jclepro.2016.12.048

George, M., Nhi, L. K. Y., Ngoc, N. M., Tung, V. N. D., Truc, L. P. T., & Nayak, R. (2022). Digital Technologies for Lean Manufacturing. In *Lean Supply Chain Management in Fashion and Textile Industry* (pp. 219-267). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-19-2108-7_10

Guan, H., Zhang, Z., Zhao, A., Jia, J., & Guan, S. (2019). Research on Innovation Behavior and Performance of New Generation Entrepreneur Based on Grounded Theory. *Sustainability*. https://doi.org/10.3390/su11102883

Guseva, A.S., & Shvets, I. (2020). Innovative Business Models in The Digital Economy and Their Competitive Advantages. *Scientific Review Theory and Practice*. https://doi.org/10.35679/2226-0226-2020-10-11-2652-2665

Haas, E. B. (2018). *When knowledge is power: Three models of change in international organizations* (Vol. 22). University of California Press.

Hutahayan, B. (2020). The mediating role of human capital and management accounting information system in the relationship between innovation strategy and internal process performance and the impact on corporate financial performance. *Benchmarking: An International Journal*, *27*(4), 1289-1318. https://doi.org/10.1108/BIJ-02-2018-0034

Ibarra, D., Bigdeli, A. Z., Igartua, J. I., & Ganzarain, J. (2020). Business model innovation in established SMEs: A configurational approach. *Journal of Open Innovation: Technology, Market, and Complexity*, *6*(3), 76. https://doi.org/10.3390/joitmc6030076

Keresztes, G., & Endresz, M. G. (2020). Innovation and models of innovation: A brief insight into the definition and different models of innovation. *Innovations*, *8*(2), 53-55.

Krishnamoorthy, B., & Damle, M. (2017). Models of innovations: an overview of perspectives and expositions. *International Journal of Value Chain Management*, *8*(4), 342-362. https://doi.org/10.1504/IJVCM.2017.089374

Lin, W. L., Yip, N., Ho, J. A., & Sambasivan, M. (2020). The adoption of technological innovations in a B2B context and its impact on firm performance: An ethical leadership perspective. *Industrial Marketing Management*, *89*, 61-71. https://doi.org/10.1016/j.indmarman.2019.12.009

Liu, Z., Shi, Y., & Yang, B. (2022). Open innovation in times of crisis: An overview of the healthcare sector in response to the COVID-19 Pandemic. *Journal of Open Innovation: Technology, Market, and Complexity*, *8*(1), 21. https://doi.org/10.3390/joitmc8010021

Massaro Maurizio, Dumay John, Bagnoli Carlo (2015) , Where there is a will there is a way, Journal of Intellectual Capital; 2015, Vol. 16 Issue 3, p490-517, 28p, ISSN: 14691930. https://doi.org/10.1108/JIC-07-2014-0091

Mazzucato, Mariana, Parris, Stuart, (2014), High-Growth Firms in Changing Competitive Environments: The US Pharmaceutical Industry, Small Business Economics. Jan2015, Vol. 44 Issue 1, P145-170. https://doi.org/10.1007/s11187-014-9583-3

Meissner, D., & Kotsemir, M. (2016). Conceptualizing the innovation process towards the 'active innovation paradigm'—trends and outlook. *Journal of Innovation and Entrepreneurship*, *5*, 1-18. https://doi.org/10.1186/s13731-016-0042-z

Miceli, A., Hagen, B., Riccardi, M. P., Sotti, F., & Settembre-Blundo, D. (2021). Thriving, not just surviving in changing times: How sustainability, agility and digitalization intertwine with organizational resilience. *Sustainability*, *13*(4), 2052. https://doi.org/10.3390/su13042052

Mikhaylov, A. S., Mikhaylova, A. A., & Savchina, O. V. (2018). Innovation security of cross-border innovative milieu. *Entrepreneurship and Sustainability Issues*, *6*(2), 754. https://doi.org/10.9770/jesi.2018.6.2(19)

Moulaert, F., & MacCallum, D. (2019). *Advanced introduction to social innovation*. Edward Elgar Publishing.

Nie, W. (2021). The Generation, Transformation, and Dissipation of the "Sixth Generation" Cinema in China: The Entropy Change of a Concept. *Journal of Chinese Film Studies*, *1*(2), 377-397. https://doi.org/10.1515/jcfs-2021-0033

Oleksenko, L. (2022). Models of Innovative Activity. *Economics and Law*. https://doi.org/10.15407/econlaw.2022.03.097

Philippi, S., Hinz, A., & Kabous, L. (2022, September). How Swiss start-ups deal with business model innovation. In *European Conference on Innovation and Entrepreneurship* (Vol. 17, No. 1, pp. 408-415). https://doi.org/10.34190/ecie.17.1.534

Prasanna, R. P. I. R., Jayasundara, J. M. S. B., Naradda Gamage, S. K., Ekanayake, E. M. S., Rajapakshe, P. S. K., & Abeyrathne, G. A. K. N. J. (2019). Sustainability of SMEs in the competition: A systemic review on technological challenges and SME performance. *Journal of Open Innovation: Technology, Market, and Complexity*, *5*(4), 100. https://doi.org/10.3390/joitmc5040100

Rajapathirana, R. J., & Hui, Y. (2018). Relationship between innovation capability, innovation type, and firm performance. *Journal of Innovation & Knowledge*, *3*(1), 44-55. https://doi.org/10.1016/j.jik.2017.06.002

Rispoli, M. (2019). Innovazione: quale miglioramento?. Pratiche di costruzione sociale. *Ardeth. A magazine on the power of the project*, (5), 42-55. https://doi.org/10.17454/ARDETH05.04

Rogers, E.M. (2017) *Diffusion of Innovations*, Free Press,

Rosenberg, C, J. (2015) Of Prod. Inn. Man., Third Generation New Product Processes, Vol 11.,

Rothwell, R. (1994). Towards the fifth-generation Innovation Process. International Marketing Review, 11, (1), 7-31. https://doi.org/10.1108/02651339410057491

Sabeti, M., reza Hashemzadeh, G., Gelard, P., & Rabiei, M. (2020). Designing a knowledge-based technology transfer model using the fourth-generation approach in the automotive industry. *Revista Gestão & Tecnologia*, *20*, 106-125. https://doi.org/10.20397/2177-6652/2020.v20i0.1864

Shadow, D. (2019). Why Transition from a Push Marketing model to a Pull Marketing model.

Singla, A., Ahuja, I. P. S., & Sethi, A. P. S. (2019). Technology push strategies and their consequences on sustainable development in manufacturing industries. *International Journal of Process Management and Benchmarking*, *9*(3), 351-376. https://doi.org/10.1504/IJPMB.2019.10021873

Skare, M., & Soriano, D. R. (2021). How globalization is changing digital technology adoption: An international perspective. *Journal of Innovation & Knowledge*, *6*(4), 222-233. https://doi.org/10.1016/j.jik.2021.04.001

Smoyer, B. A. (2020). Leading across generations: The organizational shift from baby boomers to Millennials.

Solovev, D., Shkarina, T., Chudnova, O., & Kuzora, S. (2019). Mathematical Modeling in Innovation. In *Smart Technologies and Innovations in Design for Control of Technological Processes and Objects: Economy and Production: Proceeding of the International Science and Technology Conference" FarEastCon-2018" Volume 2* (pp. 603-610). Springer International Publishing. https://doi.org/10.1007/978-3-030-18553-4_73

Su, J., Zhang, S., & Ma, H. (2020). Entrepreneurial orientation, environmental characteristics, and business model innovation: a configurational approach. *Innovation*, *22*(4), 399-421. https://doi.org/10.1080/14479338.2019.1707088

Tidd, J. Besant, K. Pavitt, (2015) Managing Innovation, Integrating Technological, Market and Organizational Change, John Wiley&Sons, pp. 15

Trott, P (2017): Innovation Management and New Product Development, 6th Edition, Pearson.

Vangjel, X. (2021). New Business Models Generated by Technological Innovation. *Annals of the University of Oradea, Economic Science Series*, *30*(2). https://doi.org/10.47535/1991AUOES30(2)002

Varadarajan, R. (2024). Mitigating the definitional quagmire in innovation research: An inclusive definition of innovation as a template for defining various types of innovations uniformly. *Journal of Product Innovation Management*. https://doi.org/10.1111/jpim.12729

Vecchio, Y., Adinolfi, F., Albani, C., Bartoli, L., & De Rosa, M. (2020). Boosting sustainable innovation in densely populated areas: a milieux innovateurs approach. *Sustainability*, *12*(21), 9131. https://doi.org/10.3390/su12219131

Volkova, N., & Dyvnych, O. (2023). Innovative Model of Economic Growth in Globalization Processes. *Market Infrastructure*. https://doi.org/10.32782/infrastruct71-4

Zaidi, S. S. A., & Zaidi, S. S. Z. (2021). Linking entrepreneurial orientation and innovation intensity: Moderating role of environmental turbulence. *Journal of Entrepreneurship, Management, and Innovation*, *3*(2), 202-236. https://doi.org/10.52633/jemi.v3i2.78

Zien, K. A. & Buckler, S. A. (2016), 'Dreams to Market: Crafting a Culture of Innovation', Journal of Product Innovation Management, vol. 14, no. 4, pp. 274-87. https://doi.org/10.1111/1540-5885.1440274