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PREFACE

We are happy to announce the **Eight Volume** of our **Perspective of Business Management and Economics (PBME)**. The volume has brought in some fresh perspectives and research views related to Business Management and Economics. We notice the return of business to the pre-COVID-19 days. However, fresh fears of a recession globally are appearing.

The first paper in the volume is a research article by **Dr. Madhavi Srivastava** entitled ***Role of AI in Customer Relationship Management: A Perspective from E-Commerce in the Post-COVID Era***. The research finds that Artificial Intellience (AI) plays a significant part in preserving customer relationships by offering dependable services and retaining customers for extended durations than normal. The AI-powered user interface used by e-commerce companies is considered reliable and thought to be user-friendly, well-organized, efficient, attractive, and informative by the customers.

The second paper by **Swetha Thiruchanuru** entitled ***Foundations of Agile Management: Embracing Flexibility and Collaboration for Organizational Success*** dealt with the concept of Agile management which is a is a contemporary approach that prioritizes flexibility, collaboration, and customer satisfaction in managing projects, teams, and organizations.

The third paper by **Charles Asare et. al.** discusses ***Developing Entrepreneurial Ecosystems in Emerging Markets: The Quadruple Helix Model***. The Quadruple Helix Model emphasizes collaboration and interaction among four key actors: academia, government, industry, and civil society, to foster innovation and entrepreneurship.

Editorial Team
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ABOUT THE EDITORS

Mr. Vijaya Kittu Manda is an academic researcher and trainer. He has 11+ years of experience in capital markets, financial planning, and investing. He is an Advocate, an I.T. Entrepreneur, and a Capital Market Trainer. His investing journey started in his college days. As a firm believer that knowledge can make a difference, he is forever a student and has ten University Postgraduate Degrees in different subjects. He is NISM Certified in multiple topics. His passion for investing made him study MBA and M.A. (Economics), and he submitted his Ph.D. thesis in Management with a specialization in Mutual Funds. He always encourages everyone to learn any subject that drives them towards their life goals. He also guides Undergraduate and Postgraduate students of Management and Engineering disciplines in their project work. As a securities market researcher, he is the author of several research papers that were published in reputed International Journals and Case outlets. He is a Web of Science Publons *Certified Peer Reviewer* and a *Certified Publons Academy Supervisor*. He reviews papers for several international journals, including *Sage Journals* and *Science Domain International*.

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Dr. Rajesh has authored four books published by leading International and National publishers. He has published papers in several high-quality and reputed journals. He has served as a Member of the Board of Studies in reputed Institutions. He is a reviewer for many National and International Journals. His areas of interest include Accounting, Finance, Strategy, and Information Technology. He has guided and produced 9 M.Phil., Scholars, and is presently guiding 4 Ph.D., Scholars.

Dr. H M Matharu is a Doctorate in Management, PGDEM, MBA with dual specialization in Finance & Marketing and Commerce. She is working as an Associate Professor at St. Claret College, Bangalore. She has 15 years of vast teaching and industrial experience. Having pursued her education from Punjab, she has rich experience in the academic industry catering to graduate and postgraduate students' needs in Commerce and Management streams. She has guided many postgraduate students in their project work.

Dr. Matharu has shown her expertise in finance and marketing-related subjects. She has several papers published in National and International journals and presented at conferences. She authored a book on Banking Law and Operations for Bangalore University and on Organisational Behaviour for Mysore University. She was awarded as Indo Global Exemplary Educator award from the Indo-Global Chamber of Commerce and Agriculture Industries, Pune. She is a Review member of the *Journal of Emerging Technologies and Innovative Research* and the Associate Editor of the *International Journal of Commerce and Management Studies*.

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ROLE OF AI IN CUSTOMER RELATIONSHIP MANAGEMENT: A PERSPECTIVE FROM E-COMMERCE IN THE POST-COVID ERA

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ABSTRACT

Background: In the post-pandemic environment, it is crucial to comprehend how consumer behavior has changed. Business continuity is impacted by e-commerce enterprises' capacity to comprehend these behavioral shifts. This paper attempts to provide a bridge between customer relationship management (CRM) and other variables such e-commerce. This bridge is specifically discussed in post-pandemic period. Customers are becoming more aware of e-commerce and using it to fulfill their demands. In an effort to manage customer happiness in the post-pandemic period, businesspeople are simultaneously anticipating this consumer behavior through strengthening CRM.

Methodology: The researcher has employed descriptive research method. Research has used quantitative in nature where the researchers have collected primary data from the customer relationship manager in the e-commerce company say Amazon. 45 Amazon employees were taken as sample.

Results: Artificial Intelligence plays a significant part in preserving customer relationships by offering dependable services and retaining customers for extended durations than normal. Customers are becoming more involved with the e-commerce industry following the pandemic for a variety of reasons. This includes its easy-to-use interface and ease of payment. The one click order of wide range of goods along with automated recommendations on the basis of searches is attracting consumers.

Keywords	COVID-19, pandemic, customer relationship management, AI, e-commerce
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INTRODUCTION

According to the evolution of modern business theory and practice, CRM has become an essential component in guaranteeing corporate sustainability (Tran, L. T. T. 2021). Companies are getting better at managing CRM operations thanks to the change in consumer behavior brought on by COVID-19. Although clients may no longer readily do direct business transactions, this adjustment is made to keep customers (face-to-face). In the transition from offline to online business, the internet has played a key role in providing different channels on a single platform. CRM challenges are being improved and strengthened by the rapidly expanding internet industry and its extensive segmentation (Guthrie, C. et al., 2021).

The technological advancement made during the Industrial Revolution that has had one of the biggest influences on all sectors of work is Artificial Intelligence (AI). In order to satisfy its demands, modern technology has increased human productivity by a factor of two. A similar issue related to AI use has also occurred in the corporate sphere (Chatterjee, S. et al, 2021). AI may be used to manage customer support with an increasing range of demographic and geographic coverage. During the pandemic, it was natural to use AI-related facilities to handle operations by e-commerce companies. CRM may be enhanced when businesses use AI to process large customer-related data. This problem predominates in all nations (Khiong, K. 2022). This finding suggests that AI is one of the widespread technological innovations used by society for various purposes, such as business or retail services.

AI-POWERED CRM

Businesses may track and analyze their interactions with clients, suppliers, and staff using a customer relationship management (CRM) system. Enhancing and preserving these commercial ties seeks to boost sales effectiveness and profitability (Mishra, N., & Mukherjee, S. 2019).

CRM systems may access customer interaction histories and sales statistics by gathering information about current and future customers. This makes it possible for CRM systems to recognize the necessary services and goods to enhance sales procedures. In general, the software helps businesses understand their clients better. Companies may enhance their user experience by:

1. Identify new sales prospects,
2. Improve support services,
3. Create more successful marketing plans.

A survey indicates that current customers provide 65% of a company's income. Five times as much money goes into keeping a happy customer as finding new ones. It is essential to fully comprehend them and take the necessary action to forge strong relationships with clients and increase sales KPIs (Chatterjee, S., & Chaudhuri, R. 2022). The primary justifications for using AI in CRM applications are as follows:

1. Unstructured data may be transformed into structured data using AI techniques.

Algorithms for machine learning may identify trends and provide vital business insights, ultimately being converted into structured information. For enterprises, AI technology offers scalable solutions. The growing number of data enables them to manage a larger volume of data more rapidly and with fewer mistakes (Galitsky, B. 2020).

2. The increasing complexity of relationships

The number of transactions also complicates company connections and procedures. This is done along with huge data expansion. Because of this intricacy makes comprehending business ties and examining client trends more complex (Bu, Y., Quach, S., & Thaichon, P. 2022).

OBJECTIVES

1. To identify the areas of application of AI in customer relationship management
2. To identify the role of AI in CRM in E-Commerce in Post COVID era

LITERATURE REVIEW

According to (Castillo, M. J., & Taherdoost, H. 2023), the COVID-19 pandemic has completely altered consumer behavior due to over-reliance on internet buying. Several companies were compelled to create innovative strategies to remain competitive and adapt to these swift changes. Due to the widespread pandemic, which caused people to stay at home, this was necessary. Nonetheless, the pandemic has also sped up the advancement of

technology like AI. The science of building intelligent machines and computer programs is known as AI. AI can make decisions on its own or supply individuals with data to aid in decision-making. The design of artificial intelligence software can take organizational requirements and performance goals into account. Although AI has many benefits for e-businesses, it is still a relatively new technology they may use to set themselves apart from their rivals. Companies have not realized the full potential of this technology if its deployment is not understood. Moreover, disagreements about the ethics of AI and privacy issues have sparked additional studies into how to make these systems more dependable and moral.

(Pavlova, V., et al. 2021) Investigate the global trends in e-commerce development. The researchers are examining the adjustment of e-share commerce's overall retail sales in reaction to the crisis. The nature of the e-commerce sector for businesses has changed due to the crisis. The main problems e-commerce companies ran across throughout the most recent financial crisis are described in the piece, along with remedies to those problems. Blockchain and other technical innovations, such as chatbots, have been noticed by the worldwide e-commerce business. The study also analyzes the significant changes brought on by the crisis in the growth of e-commerce. These trends attempt to attract the "hottest" visitors by setting up situations that swiftly or even automatically allay the user's concerns and queries surrounding the purchase of items in the online shop.

According to (Sriram, V. P. et al. 2021), CRM software with AI assistance might compensate for lost performance by guiding teams to the optimum choice. This will be accomplished by randomly selecting among thousands of potential future steps. The system is built on AI algorithms that continuously learn from sales funnel activity and individual actions. The time it generally takes to close a lead is also considered based on past trends. This information is swiftly analyzed to give salespeople precise guidance on whom to call, when, and what to say next. Allowing AI to listen in on sales discussions can significantly influence the success rate of closed agreements. By listening for changes in voice intonation and analyzing specific phrases and words said, AI bots may detect clues about which difficulties are preventing the sale from moving forward and which can be rectified to advance the purchase. AI combines unrelated data sources, such as CRM and meteorological data. Details like past sales data and social media posts are also considered. Teams may use AI's practical insights to anticipate opportunities, be ready for them, and grasp them.

According to research, the major suppliers of Customer Relationship Management (CRM) systems have started investing in AI's value addition (Ben Dickson, 2017). Market leader in CRM Sales Force announced Einstein. When it was released last year, this artificial intelligence assistant was accessible throughout the whole platform. To continuously examine

the enormous quantity of data that Sales Forces collects through sales, e-commerce, and communications. The data generated by the IoT and streams from social media are considered with other sources. All of this serves as Einstein's AI prowess. The AI engine will then provide suggestions based on different use cases. For instance, based on previous consumer response trends, it offers advice on when to begin email marketing. According to engagement data analysis, this helps sales representatives focus on the most potential leads. Thanks to AI-powered technologies, sales teams may concentrate their efforts on providing consumers with more complex and demanding demands. These systems gradually improve in capability as they handle business and customer data.

RESEARCH GAP

While considerable research has been done on the use of AI in customer relationship management (CRM), less has been done on the particular AI applications that can be used in CRM. The research on the function of AI in CRM in E-Commerce, particularly in the post-Covid period, is also lacking. More investigation is required to pinpoint the precise AI applications that may be successfully incorporated into CRM and to examine how AI might improve CRM in the E-Commerce sector, particularly in light of the pandemic.

METHODOLOGY

The researcher used the descriptive research approach for the current investigation. The descriptive research method is used to enquire about the impact of artificial intelligence on customer relationship management in The E-Commerce industry post-pandemic period. Research is quantitative, where the researcher has collected primary data from the customer relationship manager in the e-commerce company, say Amazon. The researcher has enquired about the aspects of customer relationship management in the post-pandemic period and how artificial intelligence can be used to perform customer relationship management practices effectively.

DATA COLLECTION AND MANAGEMENT

Data was gathered using an online questionnaire consisting of 5 questions about the impact of artificial intelligence on customer relationship management in the e-commerce industry. Around 50 employees from Amazon India were contacted using online platforms such as email, WhatsApp & Facebook. The online link was shared with them, and they were asked to fill in the questionnaire as per their opinion. The response was collected, and it was found that around 45 responses were duly filled, and it was incorporated in the analysis of the study.

DATA ANALYSIS

The researcher used spreadsheet software to examine the data that had been collected. The study outcomes were subjected to statistical analysis by deriving the mean and the standard deviation.

Table 1: The frequency distribution of obtained responses from the questionnaire

Sr. No.	Questions	Responses				
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
		Frequency	Frequency	Frequency	Frequency	Frequency
1	Post pandemic period has emphasized customers to rely on AI-oriented approaches for their needs	22	10	3	7	3
2	The e-commerce industry uses AI to process the data of consumers and engage with them via chatbots, and assist with searching, sorting, and locating a suitable product.	20	12	4	6	3
3	AI is more effective and accurate, and it allows for the large-scale collection, processing, and inference of data from consumers	12	18	5	8	2
4	The e-commerce industry is developing customer-centric search retarget recommendations, combatting fraudulent reviews, and voice-powered search through AI.	16	9	5	7	8
5	Customer Relationship management is positively influenced by the use of AI	14	14	7	5	5

Data Source: Author compilation

RESULTS

Table 2: Statistical Analysis of the response obtained

Queries	n	Mean Score	Std. Deviation
Customer Reliance on AI	45	2.08	2.012461
AI for processing consumer data and engaging via chatbots,	45	2.11	1.824829
AI for the large-scale collection, processing, and inference of data of consumers in e-commerce	45	2.33	2.118962
Customer-centric search retarget recommendations through AI	45	2.6	2.545584
Customer Relationship management is positively influenced by the use of AI	45	2.4	2.260531

Data Source: Author compilation

DISCUSSION

The study results show that post-pandemic consumer behavior and their dependence on AI-oriented ways to satisfy their demands have been significantly impacted. The e-commerce sector uses AI to interact with consumers and handle their data more efficiently, improving customer relationship management. Processing vast volumes of data fast and accurately is one of the critical advantages of employing AI in e-commerce. According to the survey results, this has led to better decision-making procedures and a greater understanding of consumer behavior. To improve the entire customer experience, AI is used, for instance, to examine consumer search histories, product preferences, and purchase histories in order to make tailored suggestions. Using voice-powered search and chatbots to communicate with consumers more effectively is another advantage of implementing AI in customer relationship management. The poll found that these AI-focused strategies have successfully raised customer happiness and retention. The survey findings imply that the e-commerce sector employs AI to create customer-centric search and remarketing tactics. In order to do this, client data must be analyzed to pinpoint the customers' requirements and preferences, which are then targeted with relevant offers and goods. According to the report, these customer-centered initiatives have successfully boosted customer recommendations and thwarted fake reviews. Overall, the survey finds AI is critical to customer relationship management in e-commerce. AI is used to handle data more efficiently, advance decision-making, and improve the consumer experience. This implies that companies investing in AI-focused strategies will probably have a competitive edge post-pandemic.

CONCLUSIONS

The study infers that AI plays a significant part in preserving relationships with consumers by offering dependable services that keep them as clients for a longer time. After the pandemic, consumers are getting increasingly engaged in the e-commerce industry for many reasons, including its user-friendly interface and convenience of payment. The one-click ordering and diversity of offered products are attracting consumers. Also, the automated suggestions based on consumer searches on their website are helpful.

E-commerce companies also keep in touch with their customers by charging a small membership fee and offering them a choice of gift cards and deals. Also, it was shown that e-commerce companies use various successful strategies to attract new customers and cling to existing ones. The artificial intelligence-powered user interface is considered reliable and thought to be user-friendly, well-organized, efficient, attractive, and informative by the customers. The e-commerce company must update its clients on the most recent deals or sales using channels including emails, pop-up notifications, and text messaging. Lastly, it may be argued that AI helps maintain customer relationship management during a pandemic.

REFERENCES

1. Tran, L. T. T. (2021). Managing the effectiveness of e-commerce platforms in a pandemic. *Journal of Retailing and Consumer Services*, *58*, 102287.
2. Guthrie, C., Fosso-Wamba, S., & Arnaud, J. B. (2021). Online consumer resilience during a pandemic: An exploratory study of e-commerce behavior before, during and after a COVID-19 lockdown. *Journal of Retailing and Consumer Services*, *61*, 102570.
3. Chatterjee, S., Ghosh, S. K., Chaudhuri, R., & Chaudhuri, S. (2021). Adoption of AI-integrated CRM system by Indian industry: from security and privacy perspective. *Information & Computer Security*, *29*(1), 1-24.
4. Khiong, K. (2022). Impact and Challenges of Digital Marketing in Healthcare Industries during Digital Era and Covid-19 Pandemic. *Journal of Industrial Engineering & Management Research*, *3*(5), 112-118.
5. Bendickson, J. S., Muldoon, J., Liguori, E. W., & Midgett, C. (2017). High performance work systems: A necessity for startups. *Journal of Small Business Strategy*, *27*(2), 1-12.
6. Mishra, N., & Mukherjee, S. (2019). Effect of artificial intelligence on customer relationship management of amazon in Bangalore. *International Journal of Management*, *10*(4).
7. Chatterjee, S., & Chaudhuri, R. (2022). Adoption of Artificial Intelligence Integrated Customer Relationship Management in Organizations for Sustainability. *Business Under Crisis, Volume III: Avenues for Innovation, Entrepreneurship and Sustainability*, 137-156.
8. Galitsky, B. (2020). *Artificial intelligence for customer relationship management*. Springer International Publishing, Cham. https://doi. org/10.1007/978-3-030-52167-7.
9. Bu, Y., Quach, S., & Thaichon, P. (2022). Artificial intelligence (AI)-empowered customer relationship management. In *Artificial Intelligence for Marketing Management* (pp. 142-159). Routledge.
10. Sriram, V. P., Lakshmi, K., Podile, V., Naved, M., & Kumar, K. (2021). Role of machine learning and their effect on business management in the world today. *Vidyabharati International Interdisciplinary Research Journal*.

11. Castillo, M. J., & Taherdoost, H. (2023). The Impact of AI Technologies on E Business. *Encyclopedia*, *3*(1), 107-121.
12. Pavlova, V., Murovana, T., Sarai, N., Velychko, V., Illiashenko, K. V., & Hryshyna, H. (2021). Crisis phenomena as an incentive to intensify ecommerce of the enterprise.

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FOUNDATIONS OF AGILE MANAGEMENT: EMBRACING FLEXIBILITY AND COLLABORATION FOR ORGANIZATIONAL SUCCESS

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ABSTRACT

Agile management is a contemporary approach that prioritizes flexibility, collaboration, and customer satisfaction in managing projects, teams, and organizations. It originated from the Agile Manifesto created in 2001 by software developers seeking alternatives to traditional methodologies. Agile principles have since been extended to various management contexts, acknowledging the need for adaptability and innovation in today's rapidly changing and complex business environment. This article explores the foundations and frameworks of agile management, emphasizing its focus on individuals, responsiveness to change, frequent delivery of working solutions, customer collaboration, and embracing change as a competitive advantage. It discusses the widespread adoption of agile management and its benefits, including improved value delivery, risk reduction, and enhanced team collaboration. The article concludes by outlining the forthcoming chapters' content, which provides a detailed examination of agile management principles, practical examples of their application, and recommendations for successful implementation.

Keywords	agile manifesto, software development, traditional management, risk reduction, team collaboration
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INTRODUCTION

According Agile management is a modern approach to managing projects, teams, and organizations that emphasizes flexibility, collaboration, and customer satisfaction. It has emerged as a response to the limitations of traditional management approaches, which often prioritize process and control over adaptability and innovation.

PROBLEM STATEMENT

The limitations of traditional management approaches, which prioritize process and control over adaptability and innovation, hinder organizations from responding quickly and effectively to changing customer needs and market conditions. There is a need for a modern management approach that emphasizes flexibility, collaboration, and customer satisfaction to address these limitations and improve the ability of teams and organizations to deliver value, reduce risk, and improve collaboration.

AGILE MANAGEMENT

In the fast-paced and ever-evolving business landscape, organizational change has become a constant. However, the way companies approach and respond to change can make a significant difference in their success (John P. Kotter, 2021).

Agile management is based on certain principles and frameworks that prioritize individuals and interactions, responding to change, delivering working solutions frequently, collaborating with customers and stakeholders, and embracing change as a source of competitive advantage. Frameworks such as Scrum and Kanban provide a structure for agile management practices, including daily stand-up meetings, sprint planning meetings, and retrospectives.

Agile management has been widely adopted by organizations of all sizes and across a variety of industries. It has been shown to help teams and organizations improve their ability to deliver value to customers, reduce risk, and improve collaboration between team members.

In the following chapters, we will explore the principles and frameworks of agile management in more detail, as well as practical examples of how agile management can be applied in various contexts. We will also discuss the challenges and opportunities associated with agile management and provide recommendations for successful implementation.

PRINCIPLES AND FRAMEWORKS OF AGILE MANAGEMENT

Agile management is a modern approach to managing projects, teams, and organizations that emphasizes flexibility, collaboration, and customer satisfaction. It has emerged as a response to the limitations of traditional management approaches, which often

prioritize process and control over adaptability and innovation. Unlike traditional project management methodologies, Agile acknowledges that change is inevitable and embraces it as an opportunity for improvement. Agile teams are encouraged to be flexible and responsive, adapting their plans and strategies as new insights emerge throughout the project lifecycle. (Landau, 2022)

The current business environment is characterized by rapid change, uncertainty, and complexity. To stay competitive, organizations need to be able to respond quickly and effectively to changing customer needs and market conditions. Agile management provides a framework for doing so by prioritizing flexibility, collaboration, and customer satisfaction.

Agile management is based on a set of principles and frameworks that prioritize individuals and interactions, responding to change, delivering working solutions frequently, collaborating with customers and stakeholders, and embracing change as a source of competitive advantage. Frameworks such as Scrum and Kanban provide a structure for agile management practices, including daily stand-up meetings, sprint planning meetings, and retrospectives.

Agile management has been widely adopted by organizations of all sizes and across a variety of industries. It has been shown to help teams and organizations improve their ability to deliver value to customers, reduce risk, and improve collaboration between team members. This article aims to provide an overview of the principles and frameworks of agile management and discuss the practical applications of agile management in various contexts. We will explore case studies and examples of how agile management has been successfully implemented in different organizations and industries. We will also discuss the challenges and opportunities associated with agile management and provide recommendations for successful implementation.

By the end of this chapter, readers will have a thorough understanding of the principles and frameworks of agile management and practical insights into how to successfully apply agile management in their organizations.

Definition

Agile management is a modern approach to managing projects and teams that emphasizes adaptability, collaboration, and continuous improvement.

Agile: Agile is an iterative and incremental approach to project management that emphasizes flexibility, collaboration, and continuous improvement. It is based on the Agile Manifesto, which outlines a set of values and principles for managing projects in a highly adaptive and customer-centric manner. (eck, 2001)

HISTORICAL DEVELOPMENT AND EVOLUTION OF AGILE MANAGEMENT:

The historical development and evolution of Agile management can be traced back to several key events and influences. Here is an overview of the historical development of Agile management with a reference for further exploration:

Agile approaches emphasized delivering software in small increments and incorporating feedback to improve the product. (Highsmith, 2002).

Over time, Agile management has evolved and expanded beyond software development to various industries and project types. Different Agile frameworks, such as Kanban, Extreme Programming (XP), and Lean-Agile, have emerged, each offering specific practices and approaches for managing projects in an Agile manner (Ambler, 2012). The current state of the topic and its relevance for organizations:

Agile management is now widely recognized as a valuable approach to managing projects and teams. It has been shown to improve productivity, increase customer satisfaction, and enable teams to respond quickly and effectively to changing circumstances.

As a result, many organizations are adopting agile methodologies and frameworks, or incorporating agile principles into their existing management practices. This has led to a growing demand for professionals with expertise in agile management, as well as for tools and technologies that support agile workflows.

Here are some of the key reasons why agile management is important and how it is being applied in organizations today:

Faster time-to-market: One of the key benefits of agile management is that it enables teams to deliver products and services more quickly and with greater quality.

Increased customer satisfaction: Agile management places a strong emphasis on collaboration with customers and stakeholders throughout the development process. This enables teams to better understand customer needs and preferences, incorporate feedback and make changes more quickly, leading to higher levels of customer satisfaction.

Improved team morale and engagement: Agile management empowers teams to take ownership of their work, collaborate more effectively, and continuously improve. This can lead to higher levels of team morale, engagement, and job satisfaction.

Competitive advantage: As more organizations adopt agile management practices, those that do not risk falling behind in terms of innovation, speed, and customer focus. By adopting agile practices, organizations can gain a competitive advantage and stay ahead of the curve.

Overall, the current state of agile management is that it is widely recognized as a valuable approach to managing projects and teams, and it is being applied in a growing number of organizations across a wide range of industries. As the pace of business continues to accelerate, likely, the demand for agile management will only continue to grow.

PRINCIPLES AND FRAMEWORKS OF AGILE MANAGEMENT

The Agile Manifesto

The Agile Manifesto, established in 2001, serves as a foundational document for agile software development. It articulates four core values that guide the principles and practices of agile management:

a) Individuals and interactions over processes and tools: Agile management prioritizes the collaboration and communication between team members and stakeholders. It recognizes the importance of fostering effective human interactions to drive project success.

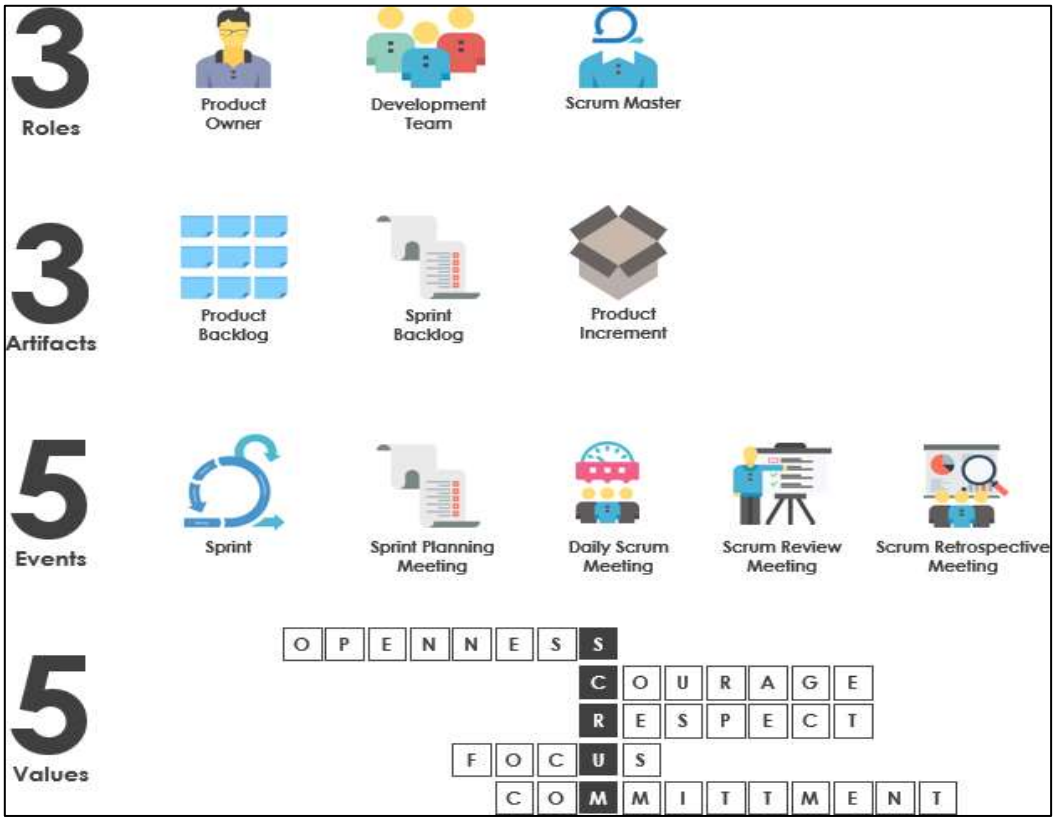
b) Working software over comprehensive documentation: Rather than solely focusing on extensive documentation, agile management emphasizes the delivery of functional software. It values tangible results and working prototypes as a means to gather feedback and validate progress.

c) Customer collaboration over contract negotiation: Agile management recognizes the significance of engaging customers and involving them throughout the project lifecycle. By fostering collaboration and active customer involvement, agile teams can better understand and address customer needs, resulting in more valuable outcomes.

SCRUM

Scrum is an agile framework for managing projects. It is based on the principles of transparency, inspection, and adaptation. Scrum is organized around a set of roles, events, artifacts, and rules. a popular framework for implementing the agile methodology, which involves short sprints of work, daily stand-up meetings, and a focus on delivering value to the customer. Scrum is a widely adopted framework within the Agile methodology. It involves breaking down work into short iterations called sprints, typically lasting 1-4 weeks. Scrum teams have cross-functional members who collaborate closely to deliver value incrementally. Daily stand-up meetings, sprint planning, sprint reviews, and retrospectives are key elements of Scrum. (Schwaber, 2023)

Figure 1: Scrum Roles



Source: https://guides.visual-paradigm.com/scrum-101-a-comprehensive-guide-to-agile-project-management-for-beginners/

Key Roles: The key roles in Scrum are:

- **Product Owner**: responsible for defining the product backlog and ensuring that the team is working on the most valuable features
- **Scrum Master**: responsible for facilitating the Scrum process and ensuring that the team is following the Scrum framework
- **Development Team**: responsible for building the product (Anon., 2023)

Key Events: The key events in Scrum are:

- **Sprint Planning**: a meeting where the team plans the work that will be done during the upcoming sprint
- **Daily Scrum**: a daily stand-up meeting where the team discusses progress and plans for the day
- **Sprint Review**: a meeting where the team demonstrates the work that was completed during the sprint and receives feedback from stakeholders
- **Sprint Retrospective**: a meeting where the team reflects on the sprint and identifies areas for improvement.

Key Artificats: The key artifacts in Scrum are:

- **Product Backlog**: A prioritized list of features that need to be developed
- **Sprint Backlog**: A list of items that the team plans to complete during the current sprint
- **Increment:** The sum of all completed product backlog items at the end of a sprint

KANBAN

Kanban is another framework within Agile that focuses on visualizing work and optimizing flow. It uses a Kanban board, typically divided into columns representing different stages of work, to manage tasks and track progress. Kanban emphasizes limiting work in progress (WIP) to maintain a smooth workflow and prioritize tasks based on customer needs. (Anderson, 2010). Kanban is another agile framework for managing projects. It is based on the principles of visualizing work, limiting work in progress, and managing flow. The key components of Kanban are:

- **Visual Board**: A physical or digital board that displays the status of work items
- **Work in Progress (WIP) Limits**: A limit on the number of items that can be in progress at any given time
- **Pull System**: Work is pulled through the process based on customer demand
- **Continuous Improvement**: The team regularly reflects on their process and identifies areas for improvement
- **Lean Startup**: The Lean Startup is an approach to building and launching products that emphasize rapid experimentation, customer feedback, and iteration.

The key principles of the Lean Startup include:

- **Validated Learning**: testing assumptions and hypotheses through experimentation
- **Build-Measure-Learn**: a feedback loop where product features are built, measured, and improved based on customer feedback
- **Minimum Viable Product (MVP)**: a product that includes only the essential features needed to test hypotheses and gather feedback
- **Pivot**: changing course based on feedback and data.

PRACTICAL APPLICATIONS OF AGILE MANAGEMENT

Agile management has been applied in a wide variety of contexts, from software development to marketing to education. Here are a few examples of how agile management has been used in practice:

Software development: Agile management is widely used in software development, with Scrum and Kanban being two of the most popular frameworks. Agile practices such as iterative development, continuous delivery, and self-organizing teams have been shown to increase productivity, improve quality, and enhance customer satisfaction.

Marketing: Agile management can also be applied to marketing, with agile marketing emphasizing flexibility, customer focus, and data-driven decision-making. Agile marketing teams use short cycles, continuous improvement, and cross-functional collaboration to respond quickly to changing market conditions and customer needs.

Education: Agile management can also be used in education, with agile learning emphasizing collaboration, feedback, and adaptability. Agile learning teams use short cycles, continuous improvement, and student-centered approaches to improve learning outcomes and enhance student engagement.

Project management: Agile management can be applied to a wide range of project management contexts, from construction to event planning. Agile project management emphasizes flexibility, customer focus, and continuous improvement, and can help teams deliver projects more efficiently and effectively.

In each of these contexts, agile management has been shown to provide significant benefits, including increased productivity, improved quality, enhanced customer satisfaction, and greater adaptability. By practically applying agile principles and frameworks, teams and organizations can achieve better outcomes and create more value for their stakeholders.

CASE STUDIES AND EXAMPLES OF HOW AGILE MANAGEMENT HAS BEEN APPLIED IN DIFFERENT CONTEXTS

Here are a few examples of how agile management has been applied in different contexts and the results and outcomes that have been achieved:

SPOTIFY: Spotify is a music streaming platform that has adopted an agile management approach. Spotify's engineering teams use a customized version of the Scrum framework, with cross-functional teams and short development cycles. As a result of this approach, Spotify has been able to continuously deliver new features and improvements to its platform, which has helped it stay ahead of its competitors.

GE HEALTHCARE: GE Healthcare used agile management to develop a new medical imaging system called Revolution CT. The development team used a combination of Scrum and Lean methodologies to collaborate more effectively, reduce waste, and speed up development. The result was a high-quality product that was delivered on time and budget.

THE AGILE SCHOOL: The Agile School is an educational institution in India that has adopted an agile management approach. The school uses a combination of Scrum and Kanban methodologies to manage its operations, with cross-functional teams and a focus on continuous improvement. This approach has helped the school respond more quickly to changing student needs and deliver a higher-quality education.

TOYOTA: Toyota has adopted an agile management approach in its manufacturing processes, using a combination of Lean and Scrum methodologies. This approach has helped Toyota reduce waste, increase efficiency, and improve the quality of its products. As a result, Toyota has become one of the most successful and innovative car manufacturers in the world. These examples demonstrate the versatility and effectiveness of agile management in a range of different contexts. By adopting agile principles and frameworks, teams and organizations can improve collaboration, reduce waste, and deliver value more quickly and efficiently.

ANALYSIS OF THE RESULTS AND OUTCOMES OF THE APPLICATIONS

The analysis of the results and outcomes of the applications of agile management in different contexts shows that it has several benefits for organizations:

Faster time-to-market: Agile management emphasizes on delivering value to customers quickly and efficiently. By using agile methodologies, organizations can reduce the time to market their products and services. This helps them respond to changing customer needs and preferences faster, and stay ahead of their competitors.

Improved collaboration: Agile management involves the formation of cross-functional teams that work together to achieve a common goal. This improves communication and collaboration within the team, resulting in better teamwork, higher morale, and better outcomes.

Increased flexibility: Agile management is based on the principle of adapting to change quickly. Agile methodologies allow organizations to be more flexible and responsive to changes in the market, technology, or customer needs. This helps them stay relevant and competitive in a rapidly changing environment.

Better quality: Agile management emphasizes on continuous improvement and delivering high-quality products and services. By using agile methodologies, organizations can identify and address issues and defects early on in the development cycle, resulting in better quality outcomes.

Reduced costs: Agile management focuses on reducing waste and optimizing processes. By adopting agile methodologies, organizations can reduce the cost of development, testing, and deployment, resulting in higher profitability and better return on investment.

Overall, the analysis of the results and outcomes of the applications of agile management shows that it has several benefits for organizations. By adopting agile methodologies, organizations can improve collaboration, reduce waste, increase flexibility, and deliver value to customers more quickly and efficiently.

LESSONS LEARNED AND BEST PRACTICES FOR SUCCESSFUL IMPLEMENTATION

Implementing agile management can be challenging, but there are several lessons learned and best practices that can help organizations achieve success:

Start small and scale up: Agile management can be implemented in small projects before scaling it up to larger ones. This helps organizations test and refine their processes before applying them to larger and more complex projects.

Define clear roles and responsibilities: It is important to define clear roles and responsibilities for team members, stakeholders, and customers. This helps ensure that everyone is aware of their responsibilities and can work together more efficiently.

Foster a culture of continuous improvement: Agile management is based on the principle of continuous improvement. Organizations should encourage team members to provide feedback and suggestions for improvement to foster a culture of learning and innovation.

Prioritize communication and collaboration: Communication and collaboration are key components of agile management. Organizations should prioritize frequent communication and collaboration among team members, stakeholders, and customers to ensure that everyone is on the same page.

Use agile tools and techniques: Some several agile tools and techniques can help organizations manage their projects more effectively. Examples include sprint planning, user stories, daily stand-ups, and retrospectives.

Ensure senior leadership support: Senior leadership support is critical for the successful implementation of agile management. Leaders should provide the necessary resources, support, and guidance to ensure that agile methodologies are implemented effectively.

By following these best practices, organizations can increase their chances of success when implementing agile management.

ANALYSIS OF EMERGING TRENDS AND OPPORTUNITIES FOR FUTURE DEVELOPMENT OF AGILE MANAGEMENT

Agile management has been around for several years and has gained a lot of attention in recent times due to its ability to increase productivity and adaptability in organizations. As organizations continue to adopt agile management, several emerging trends and opportunities are becoming evident.

Agile beyond IT: One emerging trend is the application of agile management beyond the traditional IT setting. Agile methodologies are now being applied in areas such as marketing, sales, HR, and finance, to name a few. Organizations are finding that agile management can improve their overall performance and achieve greater success in various areas of their operations.

Scaling agile: Another trend is the scaling of agile management across large organizations. Agile was originally developed for small teams, but now larger organizations are beginning to adopt the approach. This requires additional frameworks, tools, and techniques to support the implementation of agile across multiple teams and departments.

Agile and DevOps integration: A significant opportunity for agile management is its integration with DevOps practices. DevOps aims to bring together the development and operations teams to improve the speed and quality of software development and delivery. By integrating agile with DevOps, organizations can achieve faster time-to-market, better quality products, and improved customer satisfaction.

Data-driven agile: Agile management is becoming more data-driven, with organizations using data to measure and analyze the performance of their agile teams. This helps organizations identify areas of improvement and make data-driven decisions to optimize their agile processes.

Agile in a remote environment: The COVID-19 pandemic has forced many organizations to adopt remote work arrangements, which has presented challenges for agile management. However, this has also created opportunities for the further development of agile management in remote settings. Agile methodologies are adaptable and can be implemented remotely with the use of various collaboration tools and technologies.

In conclusion, agile management has come a long way since its inception and is continually evolving to meet the changing needs of organizations. The emerging trends and opportunities discussed above present exciting possibilities for the future development of agile management, and organizations that embrace these trends and opportunities are likely to achieve significant benefits in terms of improved performance and increased competitiveness.

RECOMMENDATIONS FOR ADDRESSING CHALLENGES AND TAKING ADVANTAGE OF OPPORTUNITIES

Based on the analysis of challenges and opportunities in agile management, here are some recommendations for organizations to address the challenges and take advantage of opportunities:

Foster a culture of continuous improvement: To effectively implement agile management, organizations need to prioritize continuous improvement. This includes regularly assessing and adapting their processes, identifying areas for improvement, and implementing changes to optimize efficiency and effectiveness.

Invest in training and development: Agile management requires a shift in mindset and a different way of working. Organizations should invest in training and development programs

to ensure their teams are equipped with the necessary skills and knowledge to effectively implement agile practices.

Create cross-functional teams: One of the key principles of agile management is collaboration and teamwork. Organizations should create cross-functional teams that include members from different departments and with different areas of expertise to foster collaboration and facilitate knowledge sharing.

Embrace technology: Technology can play a critical role in enabling agile management, particularly in remote or distributed teams. Organizations should invest in tools and platforms that support agile practices such as project management software, communication tools, and collaboration platforms.

Foster a culture of transparency and trust: Agile management relies heavily on trust and transparency between team members and stakeholders. Organizations should foster a culture that encourages open communication, sharing of information and promotes a sense of trust between team members.

Continuously monitor and evaluate progress: Agile management requires a focus on continuous improvement and iteration. Organizations should continuously monitor and evaluate their progress, measure their success, and make adjustments as needed to optimize their processes and outcomes.

By implementing these recommendations, organizations can address the challenges of implementing agile management while taking advantage of the opportunities it presents for improved efficiency, productivity, and innovation.

SUMMARY OF KEY POINTS AND TAKEAWAYS

Agile management is a modern approach to project management that prioritizes flexibility, collaboration, and continuous improvement. The principles of agile management include customer collaboration, iterative development, and a focus on delivering value quickly. Agile management has its roots in software development, but it has since expanded to other industries and functions. The benefits of agile management include increased efficiency, faster time-to-market, and improved customer satisfaction. Successful implementation of agile management requires a shift in mindset, investment in training and development, and a culture of collaboration and transparency. Reflection on the significance of agile management for organizations and managers:

Agile management is becoming increasingly relevant for modern organizations and managers. As competition and customer demands continue to evolve, organizations need to be agile and responsive to stay ahead. Agile management provides a framework for organizations to deliver value quickly and efficiently while fostering collaboration and

continuous improvement. For managers, adopting agile management can help them lead their teams more effectively, prioritize customer needs, and drive innovation.

Suggestions for further reading and resources

For those interested in learning more about agile management, there are a variety of resources available. Here are some suggestions for further reading:

1. "The Agile Manifesto" by the Agile Alliance
2. "Scrum: The Art of Doing Twice the Work in Half the Time" by Jeff Sutherland
3. "Agile Estimating and Planning" by Mike Cohn
4. "Agile Project Management with Scrum" by Ken Schwaber
5. "Kanban: Successful Evolutionary Change for Your Technology Business" by David J. Anderson

Additionally, there are numerous online resources, training programs, and certifications available for those looking to deepen their understanding and skills in agile management.

BIBLIOGRAPHY

1. Ambler, S. W. &. L. M., 2012. *Disciplined Agile Delivery: A Practitioner's Guide to Agile Software Delivery in the Enterprise.,* s.l.: IBM Press.
2. Anderson, 2010. *Kanban: Successful Evolutionary Change for Your Technology Business. ,* s.l.: Blue Hole Press.
3. eck, K. B. M. v. B. A. e. a., 2001. *Manifesto for Agile Software Development..* [Online] Available at: https://agilemanifesto.org/ [Accessed 2023].
4. Highsmith, J., 2002. *Agile Software Development Ecosystems.* s.l.:Addison-Wesley..
5. John P. Kotter, V. A. a. G. G., 2021. *HBR.* [Online] Available at: https://hbr.org/2021/08/is-your-organization-surviving-change-or-thriving-in-it [Accessed 13 August 2021].
6. Landau, P., 2022. *Project Manager.* [Online] Available at: https://www.projectmanager.com/blog/agile-principles [Accessed 7 March 2022].
7. Schwaber, K. &. S. J., 2023. *Scrum Guides.* [Online] Available at: https://scrumguides.org/

DEVELOPING ENTREPRENEURIAL ECOSYSTEMS IN EMERGING MARKETS: THE QUADRUPLE HELIX MODEL

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ABSTRACT

This book chapter explores the development of entrepreneurial ecosystems in emerging markets, with a specific focus on the Quadruple Helix Model. The Quadruple Helix Model emphasizes collaboration and interaction among four key actors: academia, government, industry, and civil society, to foster innovation and entrepreneurship. The chapter provides an overview of the concept of entrepreneurial ecosystems and their significance in driving economic growth and societal development in emerging markets. The chapter discusses the expected roles and contributions of academia, government, industry, and civil society in building and nurturing entrepreneurial ecosystems. The chapter concludes by highlighting the importance of a holistic and collaborative approach to creating vibrant entrepreneurial ecosystems that support innovation and growth and success of startups and entrepreneurs.

Keywords	entrepreneurial ecosystem, innovation, emerging markets, quadruple helix model, collaboration, economic growth
JEL Classification	M1
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INTRODUCTION

Entrepreneurship is becoming an increasingly important factor in economic development and innovation. Both Rodríguez et al. (2020) and Medeiros et al. (2020) refer to the emergence of entrepreneurship as a crucial component in future economic development and technological advancement. The authors believe that this trend will continue. The act of starting and growing a business on one's own is fraught with risk and challenges since it necessitates overcoming many challenges and obstacles along the way. Some of these obstacles include a lack of access to resources, talent, and markets; regulatory barriers; and cultural norms (Yasin et. al, 2021). Because of this, there must be an environment that is supportive and gives entrepreneurs the resources, networks, and knowledge they need to be successful in overcoming these obstacles. In addition, entrepreneurship is seen to be a process that is both complex and dynamic that calls for the participation of a variety of actors and the exchange of knowledge between them. There has been a change in attention among policymakers, academics, and business leaders toward building entrepreneurial ecosystems that assist in the growth of sustainable firms. An entrepreneurial ecosystem (EE), according to Stam (2015), is a set of interdependent actors and factors coordinated in such a way as to enable productive entrepreneurship. In addition, Mason and Brown (2013), posited that EEs are made up of connected entrepreneurial actors, organizations, processes, institutions, and personal characteristics that "formally and informally coalesce to connect, mediate, and govern performance within the entrepreneurial environment. As a result, this chapter adds to Stam's (2015) original definition of entrepreneurial ecosystems by defining EE as a group of interconnected actors and components that exist within a geographic area to promote entrepreneurial success.

Actor interaction within the entrepreneurial ecosystem began with the triple helix model (Universities, Industry, and the Government), and it has since been further developed

into the quadruple helix model (Universities, Industry, government, and donor community). In recent years, there has been a growing interest in a paradigm known as the quadruple helix model as a means of both understanding and developing entrepreneurial ecosystems. This model recognizes the distinct yet complementary responsibilities that the government, academic institutions, private businesses, and donor organizations may play in fostering the growth and development of entrepreneurship (Carayannis et al., 2018). This chapter aims to conceptualize how the quadruple helix model may be used to foster thriving entrepreneurial ecosystems for entrepreneurs in emerging markets.

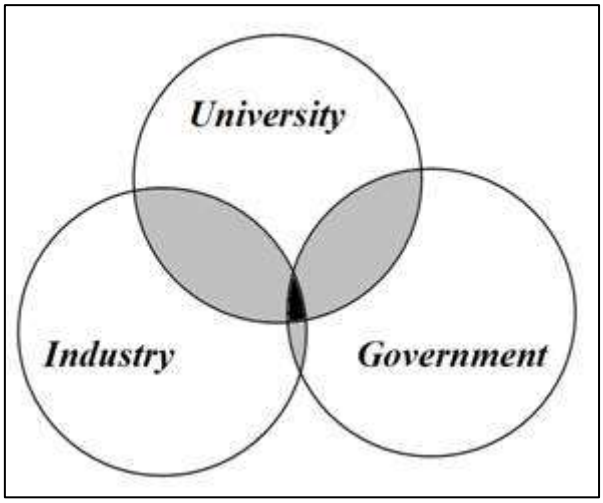
THE TRIPLE HELIX MODEL

While the Triple Helix model has been helpful in gaining a better understanding of the dynamics of innovation, it is not without its flaws. It fails to recognize the significance of society as a whole and the role that society plays in the process of innovation. In addition, in the interconnected world of today, the quick speed of technical breakthroughs, the emergence of new societal concerns, and the increase of public participation need an approach to innovation that is more inclusive and participatory.

As stated earlier, the triple helix model has several inherent restrictions, which have led to the development of a new model called the quadruple helix. The quadruple helix model broadens the scope of the conventional triadic collaboration by adding a fourth helix, which may be thought of as the public or civil society. It acknowledges the significant role that individuals, communities, and non-governmental organizations play in the formation of innovation ecosystems. Carayannis and Campbell's (2009, 2021) focus on users who drive innovation in society and democracy-based knowledge production adds a fourth domain to the model. This domain is civil society. Carayannis and Campbell's work is an expansion of the original triple helix model that Etzkowitz and Leydesdorff (2000) developed. This addition has advanced the triple helix to a quadruple helix which is under consideration in this chapter. The goal of the quadruple helix model is to involve citizens as co-creators and active participants in the innovation process, as well as to engage and empower those individuals.

According to Carayannis (2008), it is conceivable to create a continuous knowledge production system because of the dynamic interaction that occurs across the four domains, which are characterized as "agglomerations of human, social, intellectual, and financial resources." The quadruple helix model presents an analysis of entrepreneurial ecosystems in an organizational context that is more comprehensive than the triple helix model (Cloitre et. al, 2022).

Figure 1: Triple Helix Model



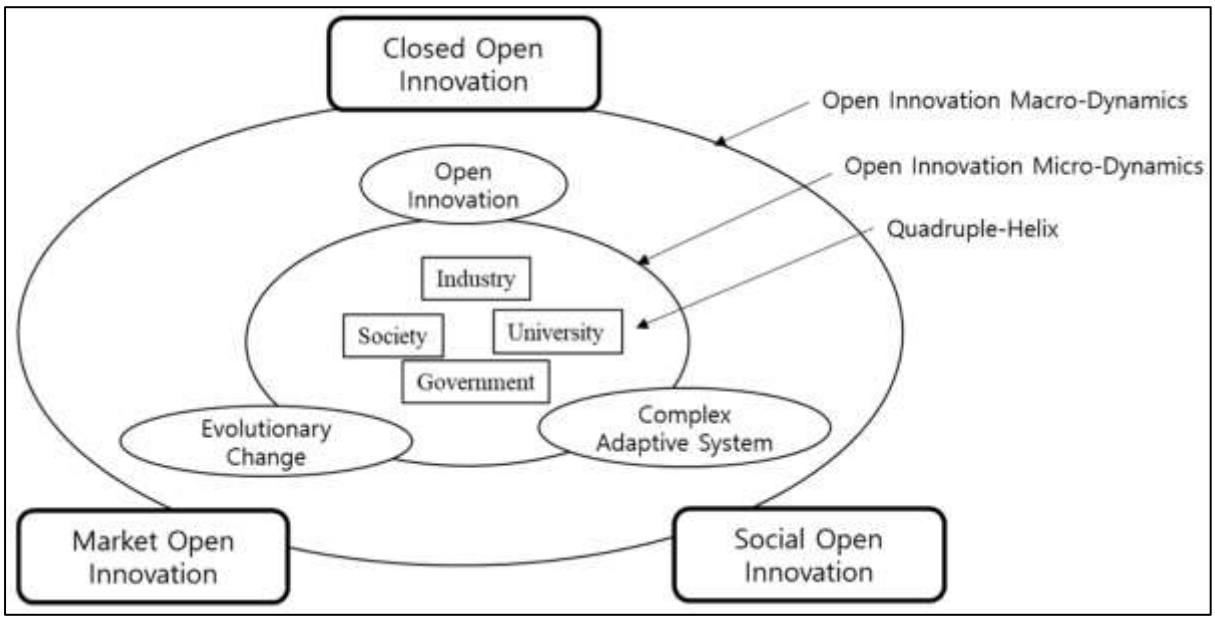
Source: Leydesdorff, 2012

THE QUADRUPLE HELIX MODEL

At its inception, the triple helix model of the knowledge production system was developed by Etzkowitz and Leydesdorff (2000) as a macro-level model of innovation. Its primary purpose was to symbolize the research and development process within three traditional domains. This domain includes participation from academia, industry, and the government. The formal and informal institutions that are present in each of these spheres are distinct from one another. 'Industry operates in the Triple helix as the locus of production; government is the source of contractual relations that guarantee stable interactions and exchange; and academia is a source of new knowledge and technology, which come together to form the fulcrum of knowledge-based economies' (Kolade et. al, 2022). The generative principle of knowledge-based economies' (Etzkowitz & Leydesdorff, 2000; Lew et al., 2018; Meyer et al., 2019) are some examples of institutions that traverse multiple sectors (Etzkowitz, 2003).

Since it fosters innovation in the R&D process, the knowledge production system is, in fact, at the center of conceptual considerations in the helix models (Hülsbeck & Pickavé, 2014). The triple helix model describes two primary modes of the knowledge production system: "Mode 1, an academic-based knowledge production system, and "Mode 2," problem-solving for promoting innovation (Borgh et al., 2012). Mode 2 prioritizes the application of the created knowledge from a shorter-term viewpoint, whereas Mode 1 aims at an environment regulated by academia from a long-term perspective. Economic activity is fueled by Modes 1 and 2's knowledge production systems (Carayannis & Campbell, 2013).

Figure 2: Micro- and Macro- Dynamics of Open Innovation with a Quadruple-Helix Model



Source: Yun & Liu, 2019

QUADRUPLE HELIX MODEL: THE EXPECTED ROLE OF ACTORS

To provide a comprehensive understanding of the quadruple helix, it is important to consider the various roles that the actors may play within the ecosystem. Below are the expected roles:

ACADEMIA

Knowledge Generation and Research

It has been known for a long time that academia is the main engine for the production of new knowledge and research. Within the framework of the quadruple helix, the academic world is expected to play an essential role in the progression of scientific and technical understanding (Van Horne & Dutot, 2017). Universities and other types of research institutes are the center of cutting-edge research and are responsible for expanding the limits of knowledge in a variety of academic fields (Jacobs, 2014). This knowledge creation acts as a foundation for innovation, giving the essential skills and insights to meet the complex social issues that entrepreneurs face.

Collaboration and Knowledge Transfer

The capacity of academic institutions to work with and share their expertise with other stakeholders in the innovation ecosystem is one of the most important advantages that they possess. Within the context of the quadruple helix, academic institutions not only cooperate

with the private sector and public institutions but are expected to also actively engage with members of civil society. This collaboration makes it easier for academic institutions and other sectors to share ideas, areas of expertise, and resources, which ultimately results in research that is more relevant to real-world issues. In addition, academic institutions are expected to turn scientific information into practical applications that are of service to society.

Education and Human Capital Development

Education and the development of the next generation of innovators, entrepreneurs, and leaders are critical responsibilities expected of the academic community (Klofsten et. al, 2019). Students are equipped with the requisite skills, information, and critical thinking abilities to contribute to the innovation ecosystem by the academic community. The academic community does this by providing students with education and training at a high level. Within the framework of the quadruple helix model, educational institutions not only train students for conventional professional pathways, but they are also expected to instill an entrepreneurial attitude in students, a sense of social responsibility, and an in-depth comprehension of the requirements of society (Morawska-Jancelewicz, 2022). Graduates who have completed academic training will be better prepared to actively engage in the co-creation of innovations.

Social Impact and Responsiveness

In the context of the quadruple helix, academic institutions are expected to take on a role that is more socially engaged and responsive. Academics are becoming more engaged in solving societal issues, working with organizations that serve civil society, and interacting with local communities (Lerner et. al, 2000). This involvement guarantees that academic research is connected with the needs and goals of a larger community, which ultimately leads to outputs that have a greater effect and are more socially relevant. The inclusion of academic institutions in the quadruple helix contributes to the democratization of knowledge by making the findings of research more easily available and adaptable to a broader range of stakeholders (Carayannis & Campbell, 2011).

Policy and Governance

Within the context of the quadruple helix paradigm, academia is also expected to also make contributions to the processes of policy formulation and governance (Bellandi et. al, 2021). Academics are considered experts in their respective fields and offer recommendations and insights that are based on evidence in order to inform governmental policies. The academic community is expected to contribute to the formation of an environment that is amenable to innovation by actively engaging in policy debates and dialogues. This helps to ensure that laws and regulations support stakeholders. Because of this engagement, the

efficacy of policy choices is improved, which in turn promotes innovation that is both sustainable and inclusive.

Open Science and Collaboration Platforms

Further amplification of academia's position within the quadruple helix has occurred as a result of the growth of open science and collaborative platforms. Open-access publishing, data sharing, and open innovation approaches are all becoming increasingly popular in the academic world (Beck et. al, 2022). These programs promote openness, inclusion, and cooperation; as a result, they make it possible for a greater number of people from academia, business, the government, and civil society to participate and share their expertise. Open science platforms also make it easier for citizens to participate in scientific endeavors by enabling them to make contributions to ongoing research and to take an active role in the innovation process.

In conclusion, it could be said that, within the context of the quadruple helix model, academic institutions are expected to occupy a pivotal role thanks to the contributions they provide to the areas of knowledge production, cooperation, teaching, social impact, policy development, and open scientific efforts. Academic institutions, by actively engaging with various stakeholders, including members of civil society, improve both collective intelligence as well as the relevance of innovation.

INDUSTRY

The contributions that industry are expected to make in promoting economic expansion, bringing new ideas to market, and bolstering technical development cannot be overstated. In the following paragraphs, we will discuss the precise position that industry plays within the quadruple helix model, as well as the consequences this role has for innovation and the general advancement of society.

Innovation and Technology Commercialization

The business community is at the forefront of adapting scientific findings and technical advances into useful applications and products that can be sold. In the context of the quadruple helix, the private sector is expected to play a crucial role in the process of generating innovation by utilizing the findings of academic research and developing those findings into practical solutions (Bhattacharjya et. al, 2023). The industry is expected to make investments in research and development, which promotes the commercialization of new technology. This, in turn, stimulates economic growth and the creation of new job opportunities.

Market-driven Perspective

The quadruple helix approach benefits from industry's input because it offers a viewpoint that is market driven. Because of industry's focus on making a profit, companies have a deep awareness of the requirements of the market, the requirements of their customers, and the latest trends (Parida & Wincent, 2019). This point of view complements the academic institutions' research-oriented strategy and makes it possible to match innovation with market demands. The participation of industry guarantees that innovations are not only scientifically valid but also financially feasible, increasing the likelihood that they will be successfully implemented to influence society.

Industry-Academia Collaboration

Within the context of the quadruple helix model, one of the most important drivers of innovation is collaboration between industry and academic institutions. Industry and academia are expected to leverage their respective strengths to generate outcomes that are advantageous to both parties by cooperating to achieve their goals. In the process of scaling up inventions, the private sector contributes funding for research and development, while academia provides knowledge, research capabilities, and practical insights (Guindalini et. al, 2021). These types of partnerships lead to the exchange of technologies, the co-development of research initiatives, and the birth of spin-off businesses, all of which contribute to the growth of an innovative ecosystem.

Entrepreneurship and Job Creation

Industry, as an actor within the quadruple helix model, is expected to contribute to the development of new businesses and the production of new jobs. Companies have the capability to recognize business opportunities in the market and make use of resources in order to launch new initiatives. Innovation, the creation of new jobs, and overall economic growth are all significantly influenced by the activities of start-up companies as well as small and medium-sized businesses (SMEs) (Gherghina et. al, 2020). The business sector is able to promote the expansion of innovative companies and ease the translation of research findings into applications that can be used in the real world because it encourages an entrepreneurial culture.

Industry Engagement with Civil Society

Industry is expected to interact with civil society as part of the quadruple helix model, which acknowledges the significance of the requirements of society and the norms of the public. The expected engagement of industry with civil society guarantees that innovations that are produced do not have a detrimental impact on society and the environment (Roman

& Fellnhofer, 2022). The private sector is in a unique position to tackle societal issues, advance sustainable development, and bolster its commitment to social responsibility if it works in close partnership with non-governmental organizations, community organizations, and citizen stakeholders.

Industry-led Initiatives and Technological Solutions

Because of its knowledge base and access to resources, industry is frequently in the driver's seat when it comes to the creation and application of technological solutions to social problems. The private sector is expected to produce cutting-edge technology that may contribute to a variety of fields, including healthcare, energy, transportation, and communication when it makes investments in research and innovation (Noori et. al, 2020). Initiatives spearheaded by businesses are essential to the acceleration of technological progress, the enhancement of quality of life, and the resolution of urgent global challenges such as climate change and the depletion of natural resources.

In conclusion, industry is expected to play a vital role within the quadruple helix model, driving innovation, commercializing technologies, and contributing to economic growth. Through collaboration with academia, industry can leverage research outcomes and transform them into marketable products and services. Moreover, industry engagement with civil society ensures that innovations are developed with societal needs in mind. The active participation of industry in the quadruple helix model fosters a dynamic ecosystem of innovation where research, entrepreneurship, and societal impact are intricately intertwined.

CIVIL SOCIETY

By acknowledging the significance of civil society as an active player in the innovation process, the quadruple helix model signals a departure from the more typical triple helix model. The diverse viewpoints, local knowledge, and social values that civil society is expected to contribute benefit the innovation ecosystem (Carayannis & Morawska-Jancelewicz, 2022). Civil society comprises people, communities, and non-governmental organizations. In the following paragraphs, we will discuss the unique function that civil society is expected to play within the quadruple helix model, as well as its implications for the promotion of inclusive and environmentally responsible innovation.

Citizen Engagement and Co-Creation

The participation of civil society in the context of the quadruple helix places an emphasis on the active engagement and empowerment of people in the role of co-creators of innovation. Citizens have unique perspectives, experiences, and requirements that may serve as the impetus for the innovation process. Problem-solving, idea generation, and the identification of social concerns are all areas in which civil society is expected to make

contributions through the use of participatory methodologies such as citizen science, crowdsourcing, and co-creation projects (Panori et. al, 2021). Because of this participation, innovations will be more responsive, relevant, and aligned with the objectives of the larger community.

Social Needs and Value Alignment

Within the context of the quadruple helix concept, civil society is responsible for bringing attention to social needs, values, and ethical issues. Civil society may more effectively advocate for solutions to urgent social challenges, including inequality, environmental sustainability, and social justice if it is actively involved in the process of innovation and participates on a regular basis (Fox & Macleod, 2023). Civil society organizations serve as intermediaries, reflecting the interests and concerns of underrepresented groups, to guarantee that new ideas are accessible to all people and are distributed fairly. Their participation contributes to the development of a more holistic knowledge of the effects that innovation have on society.

Democratizing Knowledge and Access

The function that civil society plays within the quadruple helix is about contributing to the democratization of information as well as access to innovation. Civil society may support the free flow of information and empower individuals to interact with scientific research and technological breakthroughs through the promotion of open science, open data, and knowledge-sharing programs (Trojan et. al, 2019). This access to knowledge enables individuals to engage in discussions, make informed decisions, and offer their skills, which helps bridge the gap between academic institutions, private enterprises, and the government.

Accountability and Governance

Within the framework of the quadruple helix concept, the role that civil society plays in maintaining accountability and good governance is of utmost importance. Civil society groups are expected to keep various stakeholders accountable for their activities, encourage openness, and advocate for ethical standards through the checks and balances that they provide (Zaman, 2023). Their participation contributes to reducing the risk of innovation being misapplied or leading to unintended effects, protecting the public interest, and fostering responsible innovation.

Social Innovation and Grassroot Initiatives

Within the framework of the quadruple helix concept, civil society is expected to serve as an incubator for social innovation and grassroot initiatives (Calzada, 2020). Projects led by the community, social enterprises, and non-profit organizations frequently originate from civil

society with the goals of tackling the problems facing society and fostering social transformation. These projects, which are driven by the knowledge and requirements of the community, lead to innovation that is both inclusive and sustainable. Organizations that are part of civil society can serve as catalysts for bottom-up innovation, community empowerment, and the creation of beneficial social effects (Pandey, 2023).

Collaboration and Partnerships

The inclusion of civil society in the quadruple helix model is conducive to the formation of partnerships and collaborations among the many stakeholders. Civil society groups are able to use their local expertise and networks to facilitate multi-stakeholder cooperation through partnerships with academic institutions, private enterprises, and public sector organizations (Petrevska Nechkoska et. al, 2023). These relationships increase the collective intellect and the diversity of ideas, which ultimately results in solutions that are more comprehensive and successful. Within the context of the innovation ecosystem, the participation of civil society also helps to cultivate trust, legitimacy, and social cohesion.

In conclusion, the expected role of civil society in the context of the quadruple helix is crucial because it ensures citizen participation, attends to social needs, democratizes information, encourages accountability, fosters social innovation, and promotes cooperation. The quadruple helix model welcomes inclusion, diversity, and social responsibility in the realm of the innovation process. This is accomplished by acknowledging the significance of civil society as an active participant in the innovation ecosystem. The participation of members of civil society groups contributes to the formation of an innovative ecosystem that is more sustainable, ethical, and responsive, which ultimately results in a positive influence on society.

GOVERNMENT

Within the confines of the quadruple helix structure, the government is expected to play a significant role in the formulation of policies, the provision of resources, and the promotion of an environment that is conducive to innovation. In the following paragraphs, we will discuss the expected function that governments play within the quadruple helix model, as well as the consequences of this role in fostering innovation that is both inclusive and sustainable (Masuda et. al, 2022).

Policy Formulation and Regulation

In the context of the paradigm of the quadruple helix, the function of the government is expected to include the creation of policy and the control of business activities. Governments have the ability to foster innovation, safeguard intellectual property, and ensure ethical business practices through the implementation of various policies and regulations (Fatima et. al, 2020). The government is able to promote an atmosphere that encourages collaboration

and innovation by providing clear policies and frameworks. This environment may be beneficial for academics, industry, and civil society. In addition, the policies of the government may be used to solve problems that confront society, encourage sustainable practices, and promote research and development in important fields.

Funding and Resource Allocation

The provision of financing and the distribution of resources for research, development, and innovation are all critical roles that the government is expected to perform. The government is expected to provide support for projects in academia, business, and civil society by making investments in research infrastructure as well as providing grants and financing schemes (Mazzucato, 2019). These investments contribute to the development of new technologies, the promotion of entrepreneurial endeavors, and the stimulation of economic growth. The government's financing is also a factor in the development of significant infrastructure (Kholiavko, 2021). This includes research facilities and information communication technology (ICT) infrastructure that spurs digitalization, which are all necessary for the innovation process.

Collaboration and Partnerships

Within the framework of the quadruple helix concept, the expected role of government as a facilitator of collaboration and partnership is essential. Creating forums for sharing information, establishing collaborative research endeavors, and providing funding for innovation clusters or hubs are all ways that governments may encourage collaboration between academic institutions, the private sector, and civil society (Surana et. al, 2020). By bringing together many stakeholders, the government supports multidisciplinary collaboration, which may be used to address complex social concerns by utilizing varied knowledge and resources.

Public Procurement and Demand Stimulation

The role that the government plays in public procurement has the potential to accelerate innovation by increasing the demand for novel approaches (Uyarra et. al, 2020). The government is able to incentivize firms and research institutes to produce new goods and services by creating rules and criteria that promote sustainability, efficiency, and social effect. In addition to supporting innovation and entrepreneurship, the establishment of a market for new ventures and smaller companies can result from public procurement.

Education and Skills Development

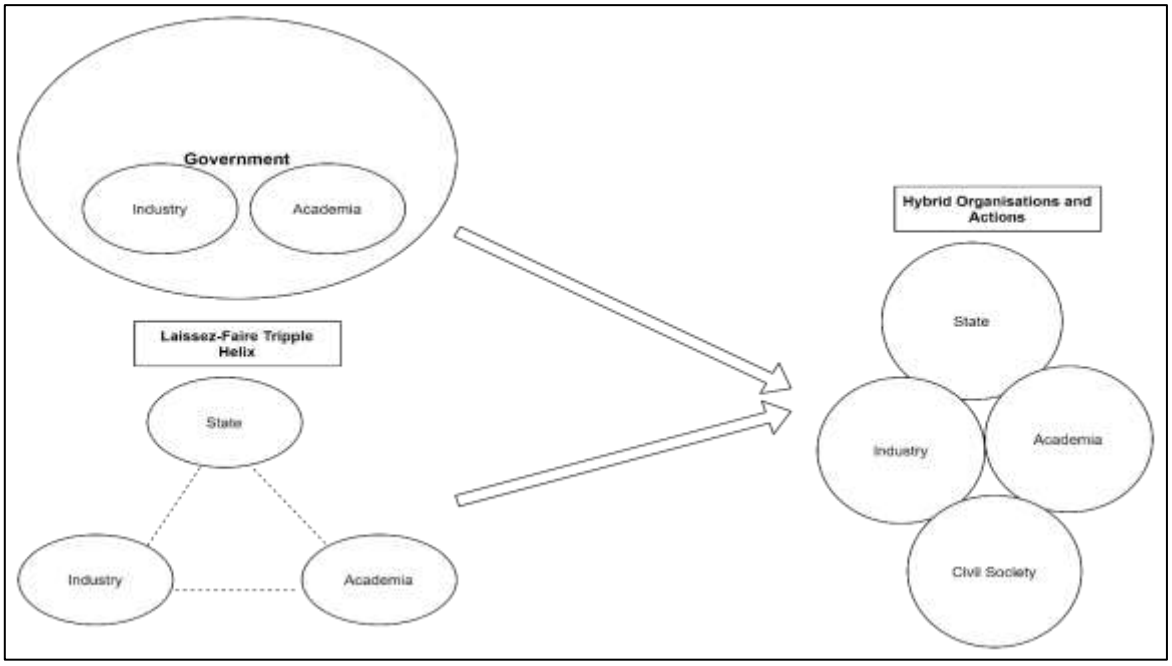
Within the context of the quadruple helix concept, the government is expected to play an essential role in advancing educational opportunities and professional growth. The government is able to guarantee a competent labor force that is able to drive innovation by investing in educational institutions and programs that provide vocational training. Education in the STEM fields (science, technology, engineering, and mathematics), digital literacy, and possibilities for lifelong learning can all benefit from policies enacted by the government (Barakabitze et. al, 2019). Education and the development of skills are given primary importance by the government in order to better equip its population for active participation in the innovation ecosystem.

Public-Private Partnerships for Societal Impact

Through its participation in the quadruple helix model, the government places an emphasis on public-private collaborations for the purpose of improving society. The government is in a better position to handle social issues such as healthcare, energy, climate change, and the alleviation of poverty if it works in conjunction with the private sector and civil society. Public-private partnerships may make it easier to share information, resources, and expertise, which can then result in the creation of fresh solutions that are advantageous to society as a whole (Saruna et. al, 2020). The engagement of government helps to create fair development and guarantees that innovations are in line with the interests of the general public.

In conclusion within the context of the quadruple helix, the involvement of the government in formulating legislation, supplying financing and resources, supporting education and skill development, and fostering collaboration is very important. The engagement of the government creates an atmosphere that is conducive for collaboration among academics, industry, and civil society, which in turn drives innovation that is both inclusive and sustainable. The government has the ability to drive social advancement, handle complicated issues, and guarantee that innovation benefits the larger society by utilizing its regulatory authority and financial capabilities.

Figure 3: From Tripple Helix Model to Quadruple Helix Model



Source: Author's own conceptualization, 2023

CONCLUSION

When it comes to fostering innovation and advancing societal and economic development, the "quadruple helix" model places a strong emphasis on the necessity of collaboration between many sectors, including business, civil society, and government. Through interdisciplinary collaboration and an environment that encourages entrepreneurial thought, the first helix, which consists of academic institutions, is responsible for driving innovation and technological advances. Investing in research and development (R&D), the transfer of technology, and the commercialization of newly developed technologies are the three pillars that comprise the second helix, which is industry. Businesses are able to make their ideas a reality and make profit because of the industry's extensive market knowledge, resources, and specialized skill sets. The third helix is composed of civil society, and its primary concerns are social inclusion, environmental sustainability, and ethical problems.

It fosters public engagement as well as creativity, and the government plays an important role in the process of establishing an environment that is favorable to innovation. On the other side, the quadruple helix approach places an emphasis on inclusive involvement, honest communication, and collaborative accountability in order to resolve difficult issues and create sustainable futures. Nevertheless, implementation and maintenance are difficult tasks because of issues such as the need to strike a balance between competing interests,

guarantee equitable participation, and find a solution to power dynamics. The quadruple helix approach provides a solid framework for innovative problem-solving, attending to social problems, and making progress toward sustainable development. Through ongoing acceptance and development of the quadruple helix concept, it may be possible to construct future civilizations with a greater capacity for inclusiveness, resilienc, and creative potential.

REFERENCE

1. Barakabitze, A. A., William-Andey Lazaro, A., Ainea, N., Mkwizu, M. H., Maziku, H., Matofali, A. X., & Sanga, C. (2019). Transforming African education systems in science, technology, engineering, and mathematics (STEM) using ICTs: Challenges and opportunities. *Education Research International*, *2019*, 1-29.
2. Beck, S., Bergenholtz, C., Bogers, M., Brasseur, T. M., Conradsen, M. L., Di Marco, D., & Xu, S. M. (2022). The Open Innovation in Science research field: a collaborative conceptualisation approach. *Industry and Innovation*, *29*(2), 136-185.
3. Bellandi, M., Donati, L., & Cataneo, A. (2021). Social innovation governance and the role of universities: Cases of quadruple helix partnerships in Italy. *Technological Forecasting and Social Change*, *164*, 120518.
4. Bhattacharjya, B. R., Bhaduri, S., & Kakoty, S. K. (2023). Co-creating community-led frugal innovation: An adapted Quadruple Helix? *Technovation*, *124*, 102752.
5. Borgh, M., Cloodt, M., & Romme, A. G. L. (2012). Value creation by knowledge-based ecosystems: evidence from a field study. *R&D Management*, *42*(2), 150-169.
6. Calzada, I. (2020). Democratising smart cities? Penta-helix multistakeholder social innovation framework. *Smart cities*, *3*(4), 1145-1172.
7. Carayannis, E.G. (2008) Knowledge-driven creative destruction, or leveraging knowledge for competitive advantage: strategic knowledge arbitrage and serendipity as real options drivers triggered by co-opetition, co-evolution and co-specialization. *Industry and Higher Education*, 22, 6, 343– 353.
8. Carayannis, E.G. & Campbell, D.F.J. (2009) 'Mode 3′ and 'Quadruple Helix': toward a 21st century fractal innovation ecosystem. *International Journal of Technology Management*, 46, 3/4, 201– 234.
9. Carayannis, E. G., & Campbell, D. F. (2011). Open innovation diplomacy and a 21st century fractal research, education and innovation (FREIE) ecosystem: building on the quadruple and quintuple helix innovation concepts and the “mode 3” knowledge production system. *Journal of the Knowledge Economy*, *2*, 327-372.
10. Carayannis, E.G. & Campbell, D.F.J. (2013) Mode 3 knowledge production in quadruple helix innovation systems: quintuple helix and social ecology. In: E.G. Carayannis (ed.), *Encyclopedia of Creativity, Invention, Innovation and Entrepreneurship*. New York: Springer. pp. 1293– 1300.
11. Carayannis, E.G. and Campbell, D.F.J. (2021) Democracy of climate and climate for democracy: the evolution of quadruple and quintuple helix innovation systems. *Journal of the Knowledge Economy*, **12**, 4, 2050– 2082.
12. Carayannis, E. G., Grigoroudis, E., Campbell, D. F., Meissner, D., & Stamati, D. (2018). 'Mode 3'universities and academic firms: thinking beyond the box trans-disciplinarity and nonlinear innovation dynamics within competitive entrepreneurial ecosystems. *International Journal of Technology Management*, *77*(1-3), 145-185.
13. Carayannis, E. G., & Morawska-Jancelewicz, J. (2022). The futures of Europe: Society 5.0 and Industry 5.0 as driving forces of future universities. *Journal of the Knowledge Economy*, 1-27.
14. Cloitre, A., Dos Santos Paulino, V., & Theodoraki, C. (2022). The quadruple/quintuple helix model in entrepreneurial ecosystems: an institutional perspective on the space case study. *R&D Management*.
15. Etzkowitz, H. (2003) Innovation in innovation: the triple helix of university-industry-government relations. *Social Science Information*, *42*(3), 293– 337.

16. Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: from National Systems and "Mode 2" to a Triple Helix of university–industry–government relations. *Research policy*, *29*(2), 109-123.
17. Fatima, S., Desouza, K. C., & Dawson, G. S. (2020). National strategic artificial intelligence plans: A multi-dimensional analysis. *Economic Analysis and Policy*, *67*, 178-194.
18. Fox, S., & Macleod, A. (2023). Localizing the SDGs in cities: reflections from an action research project in Bristol, UK. *Urban Geography*, *44*(3), 517-537.
19. Gherghina, Ș. C., Botezatu, M. A., Hosszu, A., & Simionescu, L. N. (2020). Small and medium-sized enterprises (SMEs): The engine of economic growth through investments and innovation. *Sustainability*, *12*(1), 347.
20. Guindalini, C., Verreynne, M. L., & Kastelle, T. (2021). Taking scientific inventions to market: Mapping the academic entrepreneurship ecosystem. *Technological Forecasting and Social Change*, *173*, 121144.
21. Hülsbeck, M., & Pickavé, E. N. (2014). Regional knowledge production as determinant of high-technology entrepreneurship: empirical evidence for Germany. *International entrepreneurship and management journal*, *10*, 121-138.
22. Jacobs, J. A. (2014). *In defense of disciplines: Interdisciplinarity and specialization in the research university*. University of Chicago Press.
23. Kholiavko, N., Grosu, V., Safonov, Y., Zhavoronok, A., & Cosmulese, C. G. (2021). Quintuple helix model: investment aspects of higher education impact on sustainability. *Management Theory and Studies for Rural Business and Infrastructure Development*, *43*(1), 111-128.
24. Klofsten, M., Fayolle, A., Guerrero, M., Mian, S., Urbano, D., & Wright, M. (2019). The entrepreneurial university as driver for economic growth and social change-Key strategic challenges. *Technological Forecasting and Social Change*, *141*, 149-158.
25. Kolade, O., Adegbile, A., & Sarpong, D. (2022). Can university-industry-government collaborations drive a 3-D printing revolution in Africa? A triple helix model of technological leapfrogging in additive manufacturing. *Technology in Society*, *69*, 101960.
26. Lerner, R. M., Fisher, C. B., & Weinberg, R. A. (2000). Toward a science for and of the people: Promoting civil society through the application of developmental science. *Child development*, *71*(1), 11-20.
27. Lew, Y.K., Khan, Z., & Cozzio, S. (2018) Gravitating toward the quadruple helix: international connections for the enhancement of a regional innovation system in Northeast Italy. *R&D Management*, 48, 1, 44– 59.
28. Leydesdorff, L. (2012). The triple helix, quadruple helix,…, and an N-tuple of helices: explanatory models for analyzing the knowledge-based economy? *Journal of the knowledge economy*, *3*, 25-35.
29. Mason, C., & Brown, R. (2013). Creating good public policy to support high-growth firms. *Small business economics*, *40*, 211-225.
30. Masuda, H., Kawakubo, S., Okitasari, M., & Morita, K. (2022). Exploring the role of local governments as intermediaries to facilitate partnerships for the Sustainable Development Goals. *Sustainable Cities and Society*, *82*, 103883.
31. Mazzucato, M. (2019). Governing missions in the European Union. *Independent Expert Report*.
32. Medeiros, M. M. D., Hoppen, N., & Maçada, A. C. G. (2020). Data science for business: Benefits, challenges and opportunities. *The Bottom Line*, *33*(2), 149-163.
33. Meyer, M., Kuusisto, J., Grant, K., De Silva, M., Flowers, S., and Choksy, U. (2019) Towards new triple helix organisations? A comparative study of competence centres as knowledge, consensus and innovation spaces. *R&D Management*, 49, 4, 555– 573.
34. Morawska-Jancelewicz, J. (2022). The role of universities in social innovation within quadruple/ quintuple helix model: Practical implications from polish experience. *Journal of the Knowledge Economy*, *13*(3), 2230-2271.
35. Noori, N., Hoppe, T., & de Jong, M. (2020). Classifying pathways for smart city development: Comparing design, governance and implementation in Amsterdam, Barcelona, Dubai, and Abu Dhabi. *Sustainability*, *12*(10), 4030.
36. Panori, A., Kakderi, C., Komninos, N., Fellnhofer, K., Reid, A., & Mora, L. (2021). Smart systems of innovation for smart places: Challenges in deploying digital platforms for co-creation and data-intelligence. *Land Use Policy*, *111*, 104631.

37. Parida, V., & Wincent, J. (2019). Why and how to compete through sustainability: a review and outline of trends influencing firm and network-level transformation. *International Entrepreneurship and Management Journal*, *15*, 1-19.
38. Petrevska Nechkoska, R., Angeloska Dichovska, M., Angeleski, M., Koltovska Nechoska, D., & Bogdanoska Jovanovska, M. (2023). Multi Creation: Multi-Stakeholder Problem-Driven Approach: Entrepreneurship and Social Entrepreneurship. In *Facilitation in Complexity: From Creation to Co-creation, from Dreaming to Co-dreaming, from Evolution to Co-evolution.* 205-235. Cham: Springer International Publishing.
39. Rodríguez, R., Molina-Castillo, F. J., & Svensson, G. (2020). The mediating role of organizational complexity between enterprise resource planning and business model innovation. *Industrial Marketing Management*, *84*, 328-341.
40. Roman, M., & Fellnhofer, K. (2022). Facilitating the participation of civil society in regional planning: Implementing quadruple helix model in Finnish regions. *Land Use Policy*, *112*, 105864.
41. Stam, E. (2015). Entrepreneurial ecosystems and regional policy: a sympathetic critique. *European planning studies*, *23*(9), 1759-1769.
42. Surana, K., Singh, A., & Sagar, A. D. (2020). Strengthening science, technology, and innovation-based incubators to help achieve Sustainable Development Goals: Lessons from India. *Technological Forecasting and Social Change*, *157*, 120057.
43. Trojan, J., Schade, S., Lemmens, R., & Frantál, B. (2019). Citizen science as a new approach in Geography and beyond: Review and reflections. *Moravian Geographical Reports*, *27*(4), 254-264.
44. Uyarra, E., Zabala-Iturriagagoitia, J. M., Flanagan, K., & Magro, E. (2020). Public procurement, innovation and industrial policy: Rationales, roles, capabilities and implementation. *Research Policy*, *49*(1), 103844.
45. Van Horne, C., & Dutot, V. (2017). Challenges in technology transfer: an actor perspective in a quadruple helix environment. *The Journal of Technology Transfer*, *42*(2), 285-301.
46. Yasin, N., Khansari, Z., & Tirmizi, K. (2021). Exploring the challenges for entrepreneurship business incubator hubs in the United Arab Emirates. *International Journal of Globalisation and Small Business*, *12*(2), 190-212.
47. Yun, J. J., & Liu, Z. (2019). Micro-and macro-dynamics of open innovation with a quadruple-helix model. *Sustainability*, *11*(12), 3301.
48. Zaman, K. (2023). Navigating the paradox of democracy and military control: an analysis of an imaginary country's political landscape.

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