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SPINNER INNOVATION: INTEGRATED MODEL FOR THE DEVELOPMENT AND PREDICTION OF INNOVATION

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Abstract:

Innovation stands as a pivotal process for small and medium-sized enterprises (SMEs) committed to investing resources into pioneering and impactful solutions, thereby enhancing their competitive edge both domestically and internationally. Nonetheless, many SMEs overlook the true potential for innovation within their own operations and how they can effectively navigate the innovation landscape when deciding to allocate resources to it. Innovation is essential for SMEs to thrive in competitive markets, adapt to change, and achieve sustainable growth. By fostering a culture of innovation and investing in creative ideas, SMEs can unlock new opportunities, overcome challenges, and position themselves for long-term success. For numerous SMEs, innovation resembles a trial-and-error endeavor, often leading to feelings of anxiety and frustration, as resources are seemingly squandered. In response, the Spinner Innovation model aims to forecast an organization's innovation potential and provide a structured pathway to guide the innovation investment process, thus minimizing risks. The objective of this study is to introduce the Spinner Innovation model and delve into its empirical applications within various economic sectors, focusing on SMEs. This research is underpinned by an analysis of scientific publications sourced from the Scopus database.

Key words: *Spinner Innovation, Model, Economic Sectors, Management, Business*

1. Introduction

Innovation serves as a cornerstone for the growth and sustainability of Small and Medium-sized Enterprises (SMEs), driving competitiveness, productivity, and adaptability in dynamic business environments. As SMEs navigate the complexities of innovation, the need for robust frameworks to forecast and facilitate innovative endeavors becomes increasingly paramount. Among these frameworks, the Spinner Innovation Model emerges as a promising avenue, offering a structured approach to understanding and predicting innovation within SME contexts (Figueiredo *et. al*., 2023).

The primary aim of this study is to delve into the Spinner Innovation model, fostering a deeper comprehension of its capabilities and utility in forecasting innovation within SMEs. Through a thorough examination of scientific literature, the study elucidates the components integral to the Spinner Innovation framework. Furthermore, it presents empirical applications and outcomes of employing this model in SME settings. Ultimately, the study underscores the significance of Spinner Innovation as a rigorously developed and tested model for innovation prediction (Figueiredo *et. al*., 2023).

Innovation within SMEs is often characterized by resource constraints, limited access to specialized knowledge, and heightened risk aversion. Consequently, SMEs face unique challenges in navigating the innovation landscape, necessitating tailored approaches that accommodate their distinct needs and circumstances. The Spinner Innovation Model, with its emphasis on practicality, adaptability, and scalability, offers a promising solution to address these challenges.

By investigating the Spinner Innovation Model, this study seeks to provide SMEs with actionable insights and strategic guidance for fostering innovation within their organizations. Through an in-depth analysis of the model's components and empirical applications, this study aims to illuminate the pathways through which SMEs can leverage the Spinner Innovation framework to drive transformative change and achieve sustainable growth (Figueiredo *et. al*., 2023).

Moreover, by exploring the empirical outcomes of employing the Spinner Innovation Model in SME settings, this study aims to validate its efficacy and relevance in real-world contexts. By examining the tangible impacts and success stories associated with the model's implementation, this study endeavors to reinforce its credibility as a valuable tool for innovation prediction and management within SMEs.

This study embarks on a journey to unravel the intricacies of the Spinner Innovation Model, shedding light on its potential to revolutionize innovation practices within SMEs. Through a comprehensive exploration of its components, empirical applications, and outcomes, this study underscores the importance of the Spinner Innovation Model as a robust and reliable framework for forecasting innovation in the SME landscape.

2. Theorical Background

To understand innovation in different business contexts, different models, methods, processes, theories and frameworks are needed and modified, both for the adoption of technologies and for innovation forecasting.

First, the UTAUT model describes the intention to use technology based on the synthesis of theoretical models from psychological and sociological theories used in the literature to explain this behavior (Azma Nasrudin *et al*., 2024). This model was developed by Venkatesh and integrated several differenties models, namely, theory of reasoned action, technology acceptance model (TAM), motivational model, theory of planned behaviour (TPB), a model combining TAM and TPB model of personal computer utilisation, innovation diffusion theory as well as the social cognitive theory (Chiparausha *et al.,* 2024).

On the other hand, studies focuses of the development processes of open innovations and the smartization of society with the involvement of special methods

(Kirillova *et al.,* 2023). Otherwise, the concept of open innovation has garnered interest among companies due to its potential for generating new models and practices. Thats the reason to Portuguez-Castro, (2023) explore the potential of open innovation for co-creation in entrepreneurship in the study. In addition, Widiyasmoko *et al.,* (2023) describes that by promoting open innovation and the interaction of actors in the context of space ports, they can foster sustainable development, taking into account infrastructural, social and economic considerations.

However, another approach as Knowledge-Intensive Business Services (KIBS) was applied in the field of innovation. As an example, Cabrera Pereyra *et al.,* (2024) analyzes the integration between KIBS and manufacturing companies, assuming that this integration generates greater economic growth and competitiveness at the local level. In addition, Seclen-Luna *et al.*, (2022) evaluate the effects of KIBS on innovation outcomes in micro firms that build machine tools according to the categories of KIBS. Also, Marino-Romero *et al.,* (2023) analyzed the success of digital transformation (DT) in the management and performance of organizations based on the role of IT companies and their ability to integrate into organizations that provide professional services with high added value to their clients.

Even though, the triple helix model of "university-industry-government" (TH) relationships, was developed in collaboration by Etzkowitz and Leydesdorff to support innovation systems (Ivanova, 2024). As example, D'Itria & Colombi, (2023) explores how innovation can be enabled by design-driven actions in the context of the quadruple helix, a evolution of triple helix. They propose a conceptual framework to understand the micro- and macro-dynamics of open innovation with a quadruple helix model to implement sustainability practices in the fashion sector through design-driven actions—reuse, repair, recycle, and refashion. In particular, Shyiramunda & Bersselaar, (2024) explore local community development issues in Rwanda, based on the triple helix model. Understanding that an extended quadruple helix model that includes the local community as a unit of analysis, along with higher education institutions (HEIs), the private sector and the government.

3. Understanding the Spinner Innovation

The Spinner Innovation®, an *"Integrated Model for Development and Prediction of Innovation"*, is the breakthrough and innovative work of international scientist Dr. Ronnie Figueiredo, designed to provide a structured framework for organizations to foster innovation, drive growth and evaluates the progression of knowledge-intensive solutions (KIS) and their influence on innovation within the services sector (Figueiredo and Bahli (2021; Figueiredo *et. al*., 2023). Leveraging conceptual frameworks and theories such as Open Innovation, UTAUT, Triple Helix, and Knowledge-Intensive Business Services (KIBS), this model aims to offer a pragmatic approach to innovation. It focuses on key factors and contingencies essential for forecasting innovation and the advancement of knowledge-intensive services, particularly within organizational contexts. Empirically verified and validated, the Spinner Innovation accounts for approximately 70% of variability (see Figure 1).

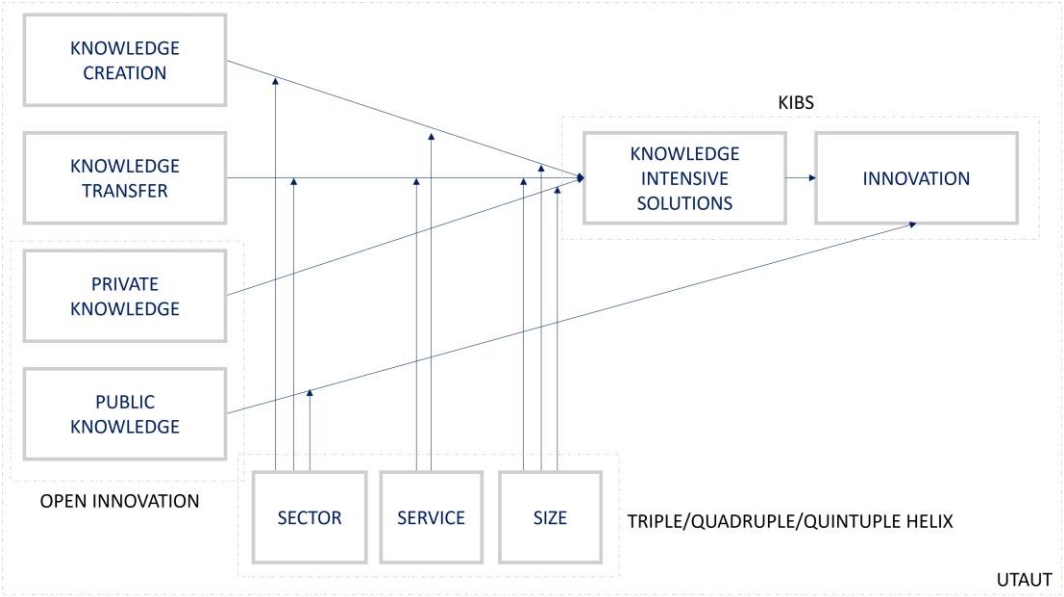

Figure 1. The Integrated Model for the Development and Prediction of Innovation
Source: Author

The Spinner Innovation, recognized as the predictive and contributory innovation model, provides proven techniques for validating and nurturing innovation. It discerns critical elements that impact organizations in foreseeing innovation and nurturing knowledge-intensive solutions—be they professional (p-KIS) or technological (t-KIS)—to drive value creation. Spinner Innovation validates four crucial factors and identifies three moderating conditions pivotal for predicting and fostering innovation within organizations. These determinants encompass knowledge creation, transfer, public and private knowledge, as well as knowledge-intensive solutions and innovation (Figueiredo and Ferreira, 2020).

The Spinner Innovation introduces moderating conditions, specifically economic sector, business services, and enterprise size (MSMEs - Micro, Small, Medium-sized Enterprises), which impact the prediction and development of innovation within organizations. These conditions indirectly affect factors within the Spinner Innovation, serving as moderating elements for innovation prediction and development. According to the Figueiredo *et al*., (2020) model, these indirect factors play a role in influencing the primary factors determining innovation prediction and development. They are designated as moderators or moderating conditions in research, exerting influence on factors such as sector, services, and size, (Figueiredo *et. al*., 2021), (see Figure 2)

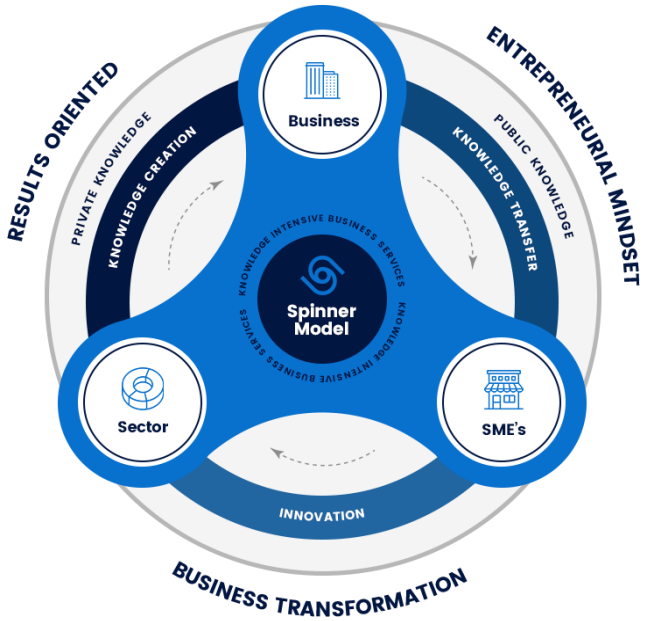

Figure 2. Spinner Innovation Model

Source: Author

2.1 Private Knowledge

Private knowledge pertains to internal factors that contribute to a company's innovation capacity. The Spinner Innovation embodies an analytical framework for executing a strategic open innovation process by enhancing engagement levels with stakeholders, whether internal or external to the company.

2.2 Public Knowledge

Public knowledge assesses the effects of a range of external factors on SMEs. The Spinner Innovation acknowledges available resources and incorporates theories of business internationalization to enhance their impact within the framework of international SME development.

2.3 Economic Sector

A economic sector encompasses businesses offering similar or related products or services, akin to an industry or market sharing common operational traits. The segmentation of an economy into distinct sectors facilitates comprehensive analysis of its overall dynamics. (Sector Dimension).

2.4 Business

An entity utilizing productive resources to acquire products and/or services for profit in the market is termed an organization. What sets a firm apart from a company or

establishment is its usual involvement in providing professional services. (Service Dimension)

2.5 SME's

An enterprise encompasses any entity involved in economic activities, regardless of its legal structure. This encompasses self-employed individuals, family-owned businesses engaged in craftsmanship or other endeavors, as well as partnerships or associations consistently involved in economic activities. (Size Dimension).

2.6 Knowledge Creation

This constitutes an ongoing process of generating and exchanging novel ideas via social interactions, collaboration, education, and practical application. Knowledge creation typically relies on the sharing of information and data to inform decisions and act as foundational elements in problem-solving endeavors.

2.7 Knowledge Transfer

It involves the transfer of practical or theoretical knowledge, acquired within an academic setting, to the entrepreneurial sphere. This transfer aims to enhance production techniques and increase financial returns, among other objectives.

2.8 Knowledge Solution

Knowledge solutions emerge from the collaboration among business entities engaged in the co-creation process, aimed at generating value and offering solutions that bolster innovation within economic sectors. Consequently, their strategies prioritize the broader components of the innovation ecosystem, generating value for all stakeholders, particularly fostering economic and social advancement within the region.

2.9 Innovation

New services generated through innovation processes that hold value for customers. As the services sector continues to gain economic prominence, service innovation assumes an increasingly vital role in propelling growth within today's knowledge-intensive economy.

3. Spinner Innovation Applications

i. The objective of the study on ***"The Spinner Innovation Model: Understanding the Knowledge Creation, Knowledge Transfer, and Innovation Process in SMEs"*** is to investigate how the Spinner Innovation Model facilitates knowledge creation, transfer, and innovation within small and medium-sized enterprises (SMEs). The results reveal

insights into the effectiveness of the model in fostering these processes, shedding light on its practical implications for SMEs.

ii. In ***"Service Business Growth: A Spinner Innovation Model Approach"*** the objective is to examine how the Spinner Innovation Model can be applied to drive growth in service businesses. The results showcase the model's efficacy in promoting business growth within the service sector, offering valuable strategies for service-oriented enterprises.

iii. ***"The Spinner Innovation and Knowledge Flow for Future Health Scenarios Applications"*** aims to explore the application of the Spinner Innovation Model in the context of future health scenarios. The results demonstrate how the model facilitates knowledge flow and innovation within the healthcare sector, providing valuable insights for future health scenario planning.

iv. ***"Could the 'Spinner Innovation' and 'Triple Helix' Models Improve System Innovation?"*** seeks to investigate the potential of integrating the Spinner Innovation and Triple Helix models to enhance system innovation. The results highlight the synergies between these models and their potential to drive innovation at the systemic level.

v. The objective of ***"The Spinner Innovation: Factors for Inclusion and Advocating in Sustainable Ecosystems"*** is to identify factors that contribute to the inclusion and advocacy of the Spinner Innovation Model within sustainable ecosystems. The results offer valuable insights into the factors influencing the adoption and promotion of the model within sustainable development contexts.

vi. ***"Innovation and Co-Creation in Knowledge Intensive Business Services: The Spinner Model"*** aims to explore how the Spinner Model facilitates innovation and co-creation within knowledge-intensive business services. The results demonstrate the model's effectiveness in fostering collaborative innovation processes within this sector.

vii. The objective of the study on ***"Spinner Model: Prediction of Propensity to Innovate Based on Knowledge-Intensive Business Services"*** is to predict the propensity of organizations to innovate using the Spinner Model. The results provide valuable predictive insights into innovation behavior within knowledge-intensive business services.

viii. ***"Applying Deep Learning to Predict Innovations in Small and Medium Enterprises (SMEs): The Dark Side of Knowledge Management Risk"*** aims to apply deep learning techniques to predict innovations in SMEs, focusing on the potential risks associated with knowledge management. The results highlight the importance of addressing knowledge management risks in innovation prediction processes.

ix. ***"How to Predict the Innovation to SMEs? Applying the Data Mining Process to the Spinner Innovation Model"*** seeks to predict innovation in SMEs by applying data mining techniques to the Spinner Innovation Model. The results offer valuable predictive capabilities for identifying innovative SMEs.

x. ***"Predicting the Intention to Adopt Innovation in Supply Chain Finance: Determinants of Brazilian FinTech"*** aims to predict the intention to adopt innovation in supply chain finance, focusing on Brazilian FinTech companies. The results provide insights into the determinants influencing the adoption of innovation in this specific context.

xi. ***"Spinner Model: Prediction of Propensity to Innovate Based on Knowledge-Intensive Business Services"*** proposes a model for the prediction of propensity to innovate based on KIBS in the service sector of an emerging country (Brazil). The results revealing elements such as the relationship of knowledge creation and transfer with innovation in KIBS, and their relationships in the assessment prediction of propensity to innovate.

4. Spinner Innovation Flow (Roadmap)

The Spinner Innovation Flow (see Figure 3), coupled with the Technology Readiness Level (TRL) Scale, offers a comprehensive framework for guiding organizations through the innovation journey while assessing the maturity and readiness of solutions (Figueiredo *et. al*., 2022; Figueiredo *et. al*., 2021). Its represents the structured process outlined by the Spinner Innovation Model, which guides organizations through various stages of innovation. Here's how they intertwine:

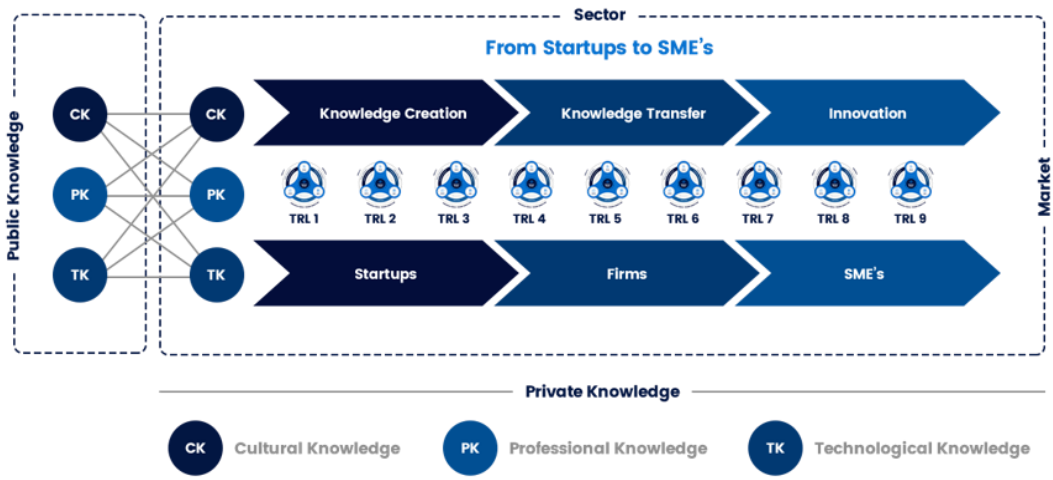

Figure 3. The Spinner Innovation Flow (Roadmap)
Source: Author

1) ***Identification of Innovation Opportunities (TRL 1-2):*** The process begins with identifying potential areas for innovation, aligning with the early stages of technology development on the TRL scale. This involves exploring emerging technologies or market trends that could offer opportunities for advancement.

2) ***Knowledge Creation and Transfer (TRL 2-3):*** As innovation opportunities are identified, organizations focus on generating new knowledge and transferring existing knowledge to support the innovation process. This corresponds to the early stages of technology development on the TRL scale, where basic principles are formulated and initial experiments are conducted.

3) ***Development of Innovative Solutions (TRL 3-4):*** *With knowledge in hand, organizations move to develop innovative solutions to address the identified opportunities. This aligns with the transition from basic research to applied research on the TRL scale, where concepts are validated through experimentation and feasibility studies**.***

4) ***Testing and Validation (TRL 4-7):*** Before implementing the solutions, it's essential to test and validate them to ensure they meet the intended objectives. This corresponds to the mid to late stages of technology development on the TRL scale, where prototypes are tested in relevant environments and performance is assessed***.***

5) ***Implementation and Integration (TRL 7-9*****):** Once the solutions are validated, they are implemented into the organization's operations. This aligns with the later stages of technology development on the TRL scale, where technologies are integrated into operational systems and demonstrated in real-world settings.

6) ***Monitoring and Evaluation (TRL 9):*** Throughout the implementation process, organizations monitor the performance of the innovations and evaluate their impact. This corresponds to the highest level of technology readiness on the TRL scale, where technologies are fully matured and ready for widespread adoption.

7) ***Knowledge Sharing and Continuous Improvement:*** Finally, organizations emphasize knowledge sharing and continuous improvement to foster a culture of innovation. Lessons learned from the innovation process are documented and shared, contributing to the advancement of technology readiness and driving future innovation efforts.

By combining the Spinner Innovation Flow with the TRL Scale, organizations can effectively navigate the innovation journey while assessing the maturity and readiness of technologies at each stage. This integrated approach ensures that innovations are developed, tested, and implemented in a systematic and effective manner, ultimately driving successful outcomes. Overall, the Spinner Innovation Flow provides a systematic approach to innovation, guiding organizations through the entire process from idea

generation to implementation and beyond. It emphasizes the importance of knowledge creation, collaboration, and continuous learning in driving successful innovation outcomes (Figueiredo *et. al*., 2023).

5. Spinner Innovation Scale Measurement

The scale measurements are composed by 58 factors and 7 dimensions, as follows:

5.1 KNOWLEDGE CREATION (KC)

- Planning strategies by using published literature, computer simulation and forecasting
- Creating manuals and documents on products and services
- Building databases on products and service
- Building up materials by gathering management figures and technical information
- Transmitting newly created concepts
- Creative and essential dialogues
- The use of deductive and inductive thinking
- The use of metaphors in dialogue for concept creation
- Exchanging various ideas and dialogues
- Enactive liaison activities with functional departments by cross-functional development teams
- Forming teams as a model and conducting experiments, and sharing results with entire departments
- Searching and sharing new values and thoughts
- Sharing and trying to understand management visions through communications with fellows
- Gathering information from sales and production sites
- Sharing experience with suppliers and customers
- Engaging in dialogue with competitors
- Finding new strategies and market opportunities by wandering inside the firm
- Creating a work environment that allows peers to understand the craftsmanship and expertise

5.2 KOWLEDGE TRANSFER (KT)

- Employees in my organization frequently share existing reports and official documents with members of my organization
- Employees in my organization frequently share reports and official documents that they prepare by themselves with members of my organization
- Employees in my organization frequently collect reports and official documents from others in their work

- Employees in my organization are frequently encouraged by knowledge sharing mechanisms
- Employees in my organization are frequently offered a variety of training and development programs
- Employees in my organization are facilitated by IT systems invested in knowledge sharing
- Employees in my organization frequently share knowledge based on their experience
- Employees in my organization frequently collect knowledge from others based on their experience
- Employees in my organization frequently share knowledge of know-where or know-whom with others
- Employees in my organization frequently collect knowledge of know-where or know-whom with others
- Employees in my organization frequently share knowledge based on their expertise
- Employees in my organization frequently collect knowledge from others based on their expertise
- Employees in my organization will share lessons from past failures when they feel that it is necessary

5.3 PRIVATE KNOWLEDGE (PRKM)

- Our company collaborates with external institutions or organizations in R&D
- Our company tends to solve problem with the help of external experts
- Our company prefers acquiring new knowledge from outside media such as the Internet
- Our company emphasizes gaining new knowledge from customers and alliance

5.4 PUBLIC KNOWLEDGE (PUBKM)

- Our company prefers internal knowledge to R&D
- Our company trusts internal knowledge when faced with troubles
- Our company encourages employees to bring forward work-related suggestions
- Our company cultivates professionals from inside

5.5 KNOWLEDGE-INTENSIVE SOLUTIONS (KIS)

- Our company supports the customers in solving problems
- Our company offers new tools for innovation
- Our company facilitates process management
- Our company adds value to the services provided
- Our company is part of an innovation ecosystem

- Our company invests in technological evolution
- Our company contributes to economic development
- Our company supports customers in the learning process
- Our company shares solutions between customers
- Our company promotes innovation support actions for customers

5.7 INNOVATION (INN)

- We are innovative in coming up with ideas for new service concepts
- We find it hard to translate raw ideas into detailed services
- Our organization experiments with new service concepts
- We align new service offerings with our current business and processes
- We are able to stretch a successful new service over our entire organization
- In the development of new services, we take into account our branding strategy
- Our organization is actively engaged in promoting its new services
- We introduce new services by following our marketing plan
- We find it difficult to scale up a successful new service

6. Discussion

The objective of this study was to introduce the Spinner Innovation model and delve into its empirical applications within various economic sectors, focusing on SMEs. This research is underpinned by an analysis of scientific publications sourced from the Scopus database. This demonstrates the simplicity and variety of Spinner Innovation's applications. The Spinner Innovation comes as a several forms and there is a very simple solutions to understanding application of innovation prediction Figueiredo *et. al.,* (2020).

The study found that collaboration is one of the main activities in the context of innovation, for which the approach of interaction with public knowledge and private knowledge can support the structure of more components such as (i) knowledge creation, (ii) knowledge transfer, (iii) knowledge-intensive solutions and (iv) innovation. Furthermore, the evolution of innovation models is promising, based on the creation and integration of theories, frameworks, models..., and above all on co-creative collaboration between all the actors involved in an innovation ecosystem.

Widiyasmoko *et al.,* (2023) describes the importance by promoting open innovation and the interaction of actors while Portuguez-Castro, (2023) explore the potential of open innovation for co-creation in entrepreneurship in the study for generating new models and practices. Its relatead with Figueiredo *et. al*., (2023) in the context to explore how the Spinner Innovation facilitates innovation and co-creation within knowledge-intensive business services.

Another important common point is the triple helix model of “university-industry-government” (TH) relationships, was developed in collaboration by Etzkowitz and Leydesdorff to support innovation systems (Ivanova, 2024). These theory agree with the proposition made by Figueiredo et. al., (2021) that the potential of integrating the Spinner

Innovation and Triple Helix models highlight the synergies between these models and their potential to drive innovation at the systemic level.

Considering the intention to use technology based on the synthesis of theoretical models from psychological and sociological theories used in the literature to explain this behavior (Azma Nasrudin et al., 2024) the UTAUT model was aligned with the innovation diffusion theory to facilitates knowledge creation, transfer, and innovation within small and medium-sized enterprises (SMEs), shedding light on its practical implications for SMEs (Figueiredo *et. al.,* 2022)

Regarding the another approach Knowledge-Intensive Business Services (KIBS) in the field of innovation, Cabrera Pereyra *et al.,* (2024) analyzes the integration between KIBS and manufacturing companies, assuming that this integration generates greater economic growth and competitiveness at the local level. Figueiredo and Ferreira (2020); Figueiredo and Bahli (2021) agree that model's efficacy in promoting business growth within the service sector, offering valuable strategies for service-oriented enterprises, and provide valuable predictive insights into innovation behavior within knowledge-intensive business services.

7. Conclusion

The Spinner Innovation Model holds significant relevance in predicting innovation due to several key factors.

Firstly, the model places a strong emphasis on understanding the dynamics of knowledge creation and transfer within organizations. By recognizing the critical role of knowledge in driving innovation, the model provides insights into how ideas are generated, shared, and leveraged to fuel the innovation process. This deep understanding of knowledge dynamics allows organizations to anticipate where innovation is likely to occur and how it can be effectively harnessed.

Secondly, the Spinner Innovation Model promotes collaboration and co-creation among stakeholders. By involving both internal and external actors in the innovation process, the model fosters diverse perspectives and expertise, leading to more innovative outcomes. This collaborative approach enables organizations to tap into a broader range of ideas and resources, increasing the likelihood of predicting and implementing successful innovations.

Furthermore, the model acknowledges the importance of contextual factors in shaping innovation outcomes. By considering factors such as industry sector, business size, and market conditions, the model provides a nuanced understanding of the unique challenges and opportunities facing organizations. This contextual awareness allows organizations to tailor their innovation strategies to align with specific circumstances, increasing the accuracy of innovation predictions.

Overall, the Spinner Innovation Model's holistic approach to understanding knowledge dynamics, fostering collaboration, and considering contextual factors makes it highly relevant for predicting innovation. By leveraging these insights, organizations can anticipate emerging trends, identify promising opportunities, and stay ahead of the curve in today's rapidly changing business landscape.

In conclusion, the Spinner Innovation Model stands as a robust and versatile framework that empowers organizations to navigate the complex landscape of innovation with confidence and precision. Through its emphasis on knowledge creation, transfer, and collaboration, the model fosters a culture of continuous improvement and forward-thinking, driving sustainable growth and competitive advantage.

By guiding organizations through the entire innovation journey, from idea generation to implementation and beyond, the Spinner Innovation Model equips them with the tools and insights needed to thrive in today's rapidly evolving business environment. As we continue to embrace the transformative power of innovation, the Spinner Innovation Model serves as a beacon of innovation excellence, paving the way for future breakthroughs and discoveries across industries and sectors.

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