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Knowledge Production in a Territorial Network of Organizations: Identifying the Determinants in the Case of Moroccan Technopole

Adriana Burlea-Schiopoiu [1,*] and Zineb Znagui [2]

[1] Department Management, Marketing, Business Administration, University of Craiova, 200585 Craiova, Romania
[2] Mathematical Modeling and Economic Calculation Laboratory, Hassan First University, Settat 260000, Morocco; z.znagui@uhp.ac.ma
* Correspondence: adriana.burlea@edu.ucv.ro

Abstract: Globalization has led to a geographical concentration of economic activities, known as territorialized networks of organizations, especially technopoles. That is why the knowledge process takes on new dimensions and requires a multidimensional and dynamic approach. This study aims to analyze factors of knowledge production dynamics in technopoles based on a conceptual model that is elaborated based on the literature review and tested in a technopole's environment, knowledge creation, knowledge transfer, and knowledge utilization processes. We used partial least squares structural equation modeling confirmatory composite analysis techniques to test the validity and reliability of the model. The technopole actors' heterogeneous nature allowed us to use a stratified sampling technique. The data were collected from 303 respondents from four technopoles in Morocco. Our findings indicate the existence of a strong influence of the factors presented in the research model on knowledge production dynamics in technopoles. Moreover, the technopole actors' contribution to the creation, transfer, and utilization of knowledge is more likely to be effective in increasing knowledge production dynamics within the network. The technopoles are likely to be more successful in regions that have the properties of a large, diversified, and well-established metropolitan economy, a robust research base, and an entrepreneurial culture where stakeholders are actively engaged. Our study is the first to analyze the dynamics of knowledge production in Moroccan territorialized networks of organizations (i.e., technopoles). This study provides insights to managers in formulating efficient knowledge production strategies in technopoles and offers suggestions at three levels: actors of technopoles, technopoles, and regional actors.

Keywords: territorial networks of organizations; knowledge production; technopoles; Morocco

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1. Introduction

In the research field of the new geographic economy, interest in territorial networks of organizations has grown in recent years, as well as their role in creating and commercializing new knowledge in the economy. However, the multiplicity of the network forms leads to ambiguity in their designation (Pelkonen 2019). In general, territorial networks of organizations designate the embodiment of a common doctrine related to networking heterogeneous organizations and creating synergies between them (Autant-Bernard 2018). The synergy generated in the networks represents the effects of proximity and the services provided, consequently promoting the cross-fertilization of knowledge and skills.

The accumulation of collective knowledge and expertise in a single geographical space is supposed to establish a dynamic of knowledge production, and that is one reason for a critical approach to knowledge production dynamics in territorial networks of organizations (i.e., in technopoles).

While the existing literature recognizes the importance of proximity and service provision effects on knowledge production, a comprehensive understanding of the dynamic interplay between knowledge creation, transfer, and utilization processes within technopoles needs to be more present. The need for a theoretical framework that systematically addresses the factors shaping knowledge production in these environments still needs to be fulfilled.

Our study aims to bridge this gap by delving into the key theoretical constructs that elucidate knowledge production in technopoles. Specifically, we seek to explore the outcomes of the dynamic interplay of knowledge creation, transfer, and utilization processes. Although rich in qualitative insights, the existing body of literature needs a robust quantitative approach to systematically discern and measure these dynamics.

Based on the common understanding that knowledge-intensive industries as technopoles represent heterogeneous knowledge production spaces, researchers have yet to formally specify theoretically the determinants of knowledge production in territorial networks of organizations, particularly in technopoles.

To address this gap, we conducted a two-phase quantitative study. In the first phase, we conducted an in-depth literature review to develop a conceptual model, which was further refined based on feedback from experts and key stakeholders in the technopole environment. In the second phase, we conducted a survey using structured interviews and questionnaires. We employed a stratified sample of technopole actors to gather data to analyze the factors influencing knowledge production in these environments. Our methodology allowed us to combine theoretical insights with empirical findings to understand knowledge production dynamics in technopoles better.

The main focus of our study is to understand the key theoretical constructs that explain knowledge production in technopoles. In particular, we aim to explore the output resulting from the dynamic interplay of knowledge-creation, knowledge-transfer, and knowledge-utilization processes. To achieve this, we adopted a quantitative approach that involved two phases. We conducted an in-depth literature review in the first phase to develop a conceptual model. We then refined the model based on feedback from experts and key stakeholders in the technopole environment. In the second phase, we conducted a survey using structured interviews and questionnaires. We employed a stratified sample of technopole actors to gather data to analyze the factors influencing knowledge production in these environments. Our methodology allowed us to combine theoretical insights with empirical findings to understand knowledge production dynamics in technopoles better.

Our study will contribute to the debate on the geographic economy and innovation systems by providing a modeling approach to define knowledge production dynamic variables in technopoles. Moreover, the study empirically evaluates the role of internal and external environments in the dynamic of knowledge production in technopoles. In addition, the study assesses the influence of knowledge-creation, knowledge-transfer, and knowledge-utilization processes on knowledge-production dynamics in technopoles.

The paper is structured as follows. The Section 2 presents a literature review of knowledge production dynamics in technopoles. The Section 3 presents the methodological framework of the empirical study and the research protocol adopted. Indeed, we justify the choice of the field of analysis and our data collection and analysis methods within the quantitative study's framework. Finally, the Section 4 presents a discussion of the results of our study.

2. Literature Review

2.1. Technopole as a Territorial Organizational Network

Economic geography theory has presented various geographic concentration concepts specialized in economic and technological activities, and Ehlinger et al. (2015) considered these forms of agglomeration as heterogeneous actors involved in a production process. Therefore, this definition connotes three main characteristics: the heterogeneous nature of

the network actors, their location in a geographically defined territory, and the generation of externalities.

Among the several forms of economic and technological agglomerations, they were advanced in the literature, such as industrial districts, localized productive systems, innovative environments, clusters, competitiveness clusters, technopoles, and science and technology parks. These neighboring concepts and terms have points of convergence, such as dealing with local and regional techno-economic development and innovation, but they also have clear differences in terms of the size of the companies hosted, the specialization of the network, and governance mode.

The literature defines technopole as a concentration of geographically innovative companies close to scientific research and training centers to form an innovative microsystem (Huet et al. 2012).

In the optic of highlighting the characteristics of technopoles in contrast to other organizational forms, the literature presents distinctions from clusters, industrial districts, and science and technology parks (Assens and Abittan 2012). While clusters typically emphasize geographic proximity, technopoles exhibit a concentrated presence of technology-intensive industries, underscoring their specialized focus on innovation (Di Minin and Rossi 2016). Unlike industrial districts, which often revolve around a single industry, technopoles foster diverse technology-focused enterprises, promoting cross-sector collaboration and knowledge exchange (Grandori et al. 2011). Additionally, technopoles deviate from science and technology parks by encompassing a broader spectrum of economic activities, seamlessly integrating research and development with technology commercialization.

According to Pelé (2009), the technopole provides an environment where productive relationships are born to boost economic and technological development, where its actors are developing around an environment of interrelated knowledge and skills. However, if the network is not managed correctly, a technopole may hamper collaboration between universities and industry by strengthening mutual prejudices. Moreover, a theoretical critique of the technopole model underlines that technopoles adopting an early linear innovation model are considered insufficient since innovation is a much more complex and systemic process (Znagui 2021). In this sense, studies specify three components to characterize technopoles: the first is structural, described by the accommodation of companies in quality spaces and facilities; the second is productive, represented by the impact on the growth of companies' production; and the third is scientific, which concerns the stimulation of knowledge transfer between companies, universities, and research centers (Castells 2014).

In the intricate framework outlined for technopoles, attention is required for an unexplored aspect: the complex dynamics of knowledge production within these innovation ecosystems. Indeed, exploring knowledge production within technopoles has been relatively limited, requiring a more in-depth investigation. Addressing this gap requires a focused examination of the variables influencing the dynamics of knowledge production. Specifically, researchers need to examine the interplay between the internal and external environments of technopoles and their impact on the intricate processes that drive knowledge generation within these innovation ecosystems. This nuanced analysis is crucial for gaining a holistic understanding of how technopoles contribute to creating and disseminating knowledge in the fields of technology, science, and innovation.

2.2. Internal and External Environment of Technopoles

The performance of a technopole is influenced by the internal environment (services provided and governance policy) and external environment (economic and institutional regime and regional innovation system). Therefore, it is agreed that services provided by technopoles play an active role in generating benefits for their actors. In their research, Calvo et al. (2017) categorize the technopoles services by the following.

- General infrastructure services: represent essential services (logistics and infrastructure, catering, security) and advanced services (telecommunications infrastructure, voice and data networks, media services).
- Specialized services: refer to consulting and training services, information and innovation support services, and promoting cooperation.

Several authors have conducted impact studies of the services offered by technopoles (Corrocher et al. 2019; McAdam and McAdam 2008), whose respective results confirm the positive impact on commercial activities and the networking of technopoles' actors. On the contrary, some studies argue that technopole actors depend on more extensive networks than those provided by the technopole in practice.

The strong heterogeneity of technopole members represents a difficulty for the network. Technopoles are induced to establish adequate governance of a shared vision, which describes a commitment to the cooperation process of each organization and supports internal interactions.

Governance in a technopole represents a set of internal coordination mechanisms for ensuring cooperation, the conduct of actors, and the improvement of collective efficiency and effectiveness (Gadille et al. 2021). In this sense, several models managing network governance have been described in the literature as decentralized governance, governance by a focal firm, and territorial governance. In practice, the governance of a technopole may evaluate from one type to another or even coexist within the same system (Berthinier-Poncet 2015; Idowu et al. 2017). This notion of mixed governance describes a beneficial dynamic character for a technopole and creates a dynamic according to internal and external contingencies.

A good governance policy guarantees the network's stability, competitiveness, and survival, and as a result, we formulated the first hypothesis of our research:

Hypothesis 1. *The internal environment of the technopole influences its knowledge production dynamic.*

Research on technopoles shows that each initiative and development is different, and the success factors and potential of an individual technopole depend very much on context factors. The actors of a technopole presuppose permanent external exchanges with public and private actors and organizations. In this sense, Tsamis (2009) asserts that a favorable institutional framework for cooperation is an important contextual factor for technopoles.

Comins and Rowe (2008) concluded that technopoles would likely succeed better in regions with a large, diversified, well-established metropolitan economy, a solid research base, and a culture of entrepreneurship where many stakeholders are engaged, including universities and research centers. According to Poonjan and Tanner (2020), establishing an environment stimulating innovation and local development is conditioned by establishing an economic and institutional regime.

The regional innovation system also represents the external environment and describes an interaction of institutions, organizations, networks, and actors to foster innovation at the national, regional, or sectoral level or in a geographical space around technology development (Touzard et al. 2014). The projection of innovation systems in a global dimension has allowed the deployment of the regional innovation system concept, which represents an effective interaction between a set of actors and resources in order to promote innovation in a region (Casadella and Uzunidis 2020).

Through support and networking with various regional actors, technopoles seek to strengthen knowledge production (Burlea-Schiopoiu 2011). Consequently, the regional innovation system is fundamental to ensuring the innovation dynamics of the actors of the technopoles (Laspia et al. 2021).

The previous literature review leads us to assume the following hypothesis:

Hypothesis 2. *The external environment of a technopole influences the knowledge production dynamics.*

2.3. Technopoles' Knowledge Production Process and Knowledge Creation

Knowledge production within organizations proved to be a complex process, specifically in a dynamic environment as technopoles. Therefore, understanding the knowledge production process' major steps forms the basis for determining the factors influencing its dynamics. In our study, knowledge creation, transfer, and utilization define the process relating to knowledge production in technopoles.

Before analyzing knowledge creation in technopoles, it is crucial to introduce a distinction in the literature regarding various typologies of knowledge. Among these classifications, explicit knowledge is the formally articulated and codified variant, easily conveyed through documented sources such as manuals and educational materials. In contrast, tacit knowledge resides in personal experiences, intuition, and practical skills, eluding easy articulation and codification (Collins 2012). The scholarly discourse surrounding these knowledge types underscores their unique contributions to the broader landscape of knowledge creation (Lynch and Jin 2016). In this study, the analysis of knowledge creation intentionally avoids a specific categorization into explicit or tacit forms. The approach seeks to offer a comprehensive view of the knowledge-generation processes within the chosen context. By opting not to distinguish between explicit and tacit knowledge, this study aims to capture these knowledge types' interconnected and often coexisting nature. This decision is rooted in the practical application of research findings and the acknowledgment that, in many real-world scenarios, knowledge creation is a unified process.

In a specific context, knowledge creation in territorial networks of organizations is based on debates on the possible interactions between economic systems in space and how knowledge is created. In this sense, debates lead authors to set the following three assumptions.

- Knowledge is created through various forms of inter-organizational, collaborative interactions.
- Knowledge in networks is created through increased competition and intensified rivalry.
- Knowledge is created through spillover effects resulting from individuals' local mobility and sociability.

Considering the heterogeneous nature of the actors composing a technopole, knowledge is created through various inter-organizational collaborative interactions. In his conceptualization of knowledge creation in the case of a territorial network of organizations, Arikan (2009) presented a model that evaluates a network's knowledge creation capability. The model presents the factors that help to create opportunities for inter-organizational knowledge exchange and increase its effectiveness among the network actors. According to the author, the capacity to create knowledge is calculated based on the extent of knowledge, the degree of modularity in product technologies, the level of technological dynamism linked to products, the number of firms adopting an exploration-based research strategy, and the number of industries sharing the same technology (Arikan 2009).

However, some research has pointed to gaps in knowledge creation within organizations. For example, in the technopole environment, characterized by geographical and organizational proximity between actors, some authors have concluded that this proximity could have a negative impact on the knowledge creation process. For Du Chatenier et al. (2009), a reduced proximity between actors in the case of open innovation could represent a challenge for them regarding the effective organization and content of collaborative knowledge-creation processes. Furthermore, Rothaermel and Alexandre (2009) and Wadhwa and Kotha (2006) argue that increasing the dependence on partners for knowledge can have a diminishing and ultimately negative effect on knowledge creation.

Knowledge-creation processes expand a firm's knowledge base and increase performance (Chung et al. 2019), consequently influencing knowledge production dynamics. This leads us to formulate the following hypothesis:

Hypothesis 3. *The capability of knowledge creation by the actors of technopoles influences the knowledge production dynamics.*

2.4. Knowledge Transfer

Knowledge transfer represents a process by which one individual or group is affected by the experience of another. In a territorial network of organization context, knowledge transfer is defined as a process of sustainable interactions between actors, which allows the recombination of specific knowledge (Sabbado da Rosa 2012).

In her conceptualizing work of the knowledge transfer process, Minbaeva (2007) classified ninety determinants into four groups: nature of transferred knowledge, knowledge senders, knowledge receivers, and the relationships between knowledge transmitters and knowledge receivers.

Explicitly, Adama (2020) argues that transferred knowledge is determined by its tacitness, complexity, and specificity. Many researchers consider the tacit aspect of knowledge a primary source of ambiguity and rank it among the obstacles to knowledge transfer in addition to the complexity and specificity of the knowledge transferred (Saulais and Ermine 2020).

The knowledge transfer process relies on the willingness of knowledge senders to transfer knowledge and their ability to disseminate it. Indeed, to ensure effective knowledge transfer, the sender must be able to express the intention to transfer it within the organization. Moreover, the modalities for disseminating knowledge could be designated by teamwork, implementing training programs, staff exchanges, advanced communication tools, and weekly meetings (Burlea-Schiopoiu 2009).

In addition, an operative knowledge transfer depends on knowledge receivers' absorptive capacity and learning capacity. Zahra and George (2002) describe an organization's absorptive capacity as several processes by which organizations acquire, assimilate, transform, and exploit knowledge to produce dynamic organizational strength. Studies argue that the absorptive capacity of knowledge receivers is a significant determinant of the knowledge transfer process: the greater the absorptive capacity, the greater the degree of knowledge transfer (Imbert 2014). In addition, learning capacity within an organization represents a strategic element in the knowledge transfer process. It implies acquiring several types of technical and professional experiences and skills as technical and scientific knowledge; the ability to interpret knowledge through information decoding; tacit skills; and reticular and hierarchical human relations (Koubaa 2014).

The knowledge transfer process may only succeed with proximity and mutual trust between knowledge senders and receivers. Indeed, geographical proximity helps to mitigate the complications associated with the transfer of tacit knowledge since it increases the frequency of interactions (Casadella and Uzunidis 2020). In this sense, the frequency of face-to-face interactions between organizations that share the same activity influences the diffusion of new tacit knowledge. The relationship between knowledge senders and receivers is based on trust, which expresses expectations shared by all the stakeholders involved in exchanges. It constitutes a central element in exchanges between actors in the same network and is a source of competitive advantage (Domínguez Sánchez et al. 2019).

Minbaeva (2007) argues that knowledge transfer requires balanced relations between knowledge senders and receivers based on proximity and trust. Furthermore, a successful knowledge transfer depends on the senders' attitude, which translates into motivation, a will to share their knowledge, and the receivers' absorptive and learning capacity. According to the approaches, knowledge transfer contributes to knowledge creation, leading to innovation in the network. This leads us to formulate the following hypothesis:

Hypothesis 4. *The knowledge transfer between the actors of the technopole influences the knowledge production dynamics.*

2.5. Knowledge Utilizations

Once knowledge is generated, this intellectual capital becomes a vital resource, necessitating effective utilization to drive development in technopoles. The interplay between knowledge creation and utilization is pivotal for translating intellectual outputs into tangible applications (Ortega-Egea et al. 2014). Utilizing knowledge in technopoles contributes to individual enterprise growth and catalyzes broader regional development, fostering innovation-driven economies (Rao and Thakur 2019). This exploration aims to provide valuable insights into the strategies, mechanisms, and collaborative dynamics optimizing the transformative potential of intellectual capital in these innovation-driven environments.

In our study, knowledge utilization in a technopole is represented by the strategies of knowledge exploration and exploitation, considered as two models of organizational learning, which develop different structures, processes, strategies, and capacities. Exploration represents the experimentation of new development alternatives that are different from the usual and constitutes the initiation stage of new practices, while exploitation concerns using skills and technologies to create new products and improve productivity (González 2019).

According to Garel and Rosier (2008), exploration aspires to experiment with new and unusual development alternatives. Moreover, it seeks to improve existing skills, technologies, and procedures. At the organizational level, knowledge exploration strategies are based on the application of external knowledge in order to create new products and technologies encouraged through formal meetings, informal meetings, or the creation of external communities of practice where customers interact together.

On the other hand, knowledge exploitation strategies aim to refine the organization's existing products and improve its processes, and the leading role of knowledge exploitation is to increase a firm's ability to create improved or new outcomes (Bierly et al. 2009). In addition, knowledge exploitation enables an organization to improve and use skills and technologies to create new products while incorporating the knowledge required and transforming its operations to improve the productivity of the goods and capital used (Ortega-Egea et al. 2014). In addition, knowledge exploitation at the organizational level aims to foster stakeholder engagement and training programs and focus on using what has already been learned within the organization (Ambroise et al. 2020).

Favre-Bonté et al. (2015) argue that it is essential for organizations to maintain an appropriate balance between exploration and exploitation to increase their competitiveness and to thrive in a competitive market; it must be both an exploiter and an explorer. Rao and Thakur (2019) affirm that maintaining a combination of both practices represents a challenge for organizations. Organizations that can create a balance between exploitation and exploration are considered competent at developing innovative ideas and institutionalizing and valuing individual learning. Knowledge exploration and exploitation in organizations represent interdependent processes that must be combined to obtain collective results. Organizations that balance knowledge exploitation and exploration are considered capable of knowledge production. Therefore, we assume that:

Hypothesis 5. *Knowledge utilization by the actors of a technopole influences the knowledge production dynamics.*

Knowledge production within organizations is a complex process, specifically in a dynamic environment as a technopole. First, defining notions and clarifying semantic differences are essential in assimilating knowledge production concepts. Secondly, identifying the critical stages in the knowledge production process forms the basis for understanding the factors influencing its dynamics. In addition, the literature provides a series of works that designate and measure the outputs of this dynamic. According to Buesa et al. (2010), patents and scientific publications are appropriate for measuring innovation and knowledge production.

Expanding on the complexities of knowledge production dynamics in technopoles, the involvement of various actors emerges as a transformative force in the transition from a

conceptual idea to a tangible product or service, as highlighted by Lyytinen et al. (2015). This transformative process extends to creating new production processes, aligning with the insights of Coghlan et al. (2019), who emphasize the development of innovative approaches to knowledge production. Furthermore, the technopole's capacity for knowledge production is intricately linked to the quantity and expertise of knowledge workers, as emphasized by Hislop et al. (2018). Considering these multifaceted perspectives, it becomes evident that the collaborative efforts of diverse actors, the evolution of production processes, and the critical role of knowledge workers collectively contribute to the rich tapestry of knowledge production in technopoles.

In this dynamic context, the significance of knowledge protection mechanisms becomes critical. The robust securing of intellectual property, underscored by intellectual property rights and confidentiality measures, plays a pivotal role in shaping the innovation landscape within technopoles. As elucidated by Hurmelinna-Laukkanen (2011), adequate knowledge protection not only serves as an incentive for substantial investments in research and development but also ensures the exclusivity and commercial viability of proprietary knowledge. This protective environment is particularly crucial in fostering the growth of knowledge-intensive industries, aligning with the broader dynamics of knowledge production within technopoles. The intersection of these insights underscores the delicate balance between collaborative knowledge creation and the protection mechanisms essential for sustaining innovation in technopoles.

3. Methodology

3.1. Research Design and Variable Measurement

Our study aims to determine the main factors influencing the dynamics of knowledge production in technopoles in the Moroccan context. The selection of the Moroccan context for this study is driven by several key considerations aligning with the research objectives. Morocco's distinctive socio-economic and geopolitical characteristics, ongoing economic transformations, and a growing emphasis on knowledge-based industries and innovation make it a compelling case study. The diverse and dynamic landscape of Moroccan technopoles, with various stakeholders and institutions, offers an opportunity to explore the in-depth interactions between research centers, universities, and industry players. Additionally, Morocco's strategic geographical location, as a bridge between Europe, Africa, and the Middle East, should be considered a hub for regional collaboration and global innovation networks. By focusing on Morocco, this study aims to provide practical insights for policymakers, industry leaders, and researchers, addressing specific challenges and leveraging opportunities in a developing economy. Based on the literature review, we formulated the hypotheses that helped us to construct the following conceptual model (Figure 1).

3.2. Sample and Data Collection

Starting from the conceptual model, we developed an empirical analysis of primary quantitative data, which are collected based on a survey designed for a sample of Moroccan technopole actors located in Casablanca Technopark, Rabat Technopark, Tangier Technopark, and Agadir Technopark.

The selection of these technopoles is based on strategic considerations. Indeed, they are actively operational, allowing for real-time insights into the functioning innovation ecosystems. They represent Morocco's diverse geographical regions and economic hubs, offering a comprehensive understanding of the country's innovation landscape. Each technopole exhibits unique characteristics and strategic focuses, contributing to a rich dataset for a nuanced analysis of knowledge production dynamics. The choice of these technopoles ensures the relevance and applicability of the study's findings, providing insights that can inform current policies, guide industry practices, and contribute to the ongoing development of these innovation ecosystems.

The survey questionnaire is structured into two main sections focusing on knowledge production dynamics within the technopole. The first section delves into the technopole's environment, while the second section explores the knowledge production process. Before full-scale implementation, the questionnaire underwent a rigorous pilot test involving a small group of actors from Moroccan technopoles. This preliminary testing aimed to identify and rectify any potential weaknesses in the questionnaire's structure and content while minimizing the plausibility of common method bias, as MacKenzie and Podsakoff (2012) recommended.

The feedback obtained during the pilot test proved instrumental in refining the questionnaire, ensuring clarity, relevance, and cultural appropriateness for the specific context of Moroccan technopoles. The choice of a five-point Likert scale as the primary question modality was deliberate, providing a balanced range for respondents to express their opinions, from strongly disagree to strongly agree. This scale offers a nuanced measurement approach, allowing for a more granular analysis of perceptions and attitudes within the surveyed population.

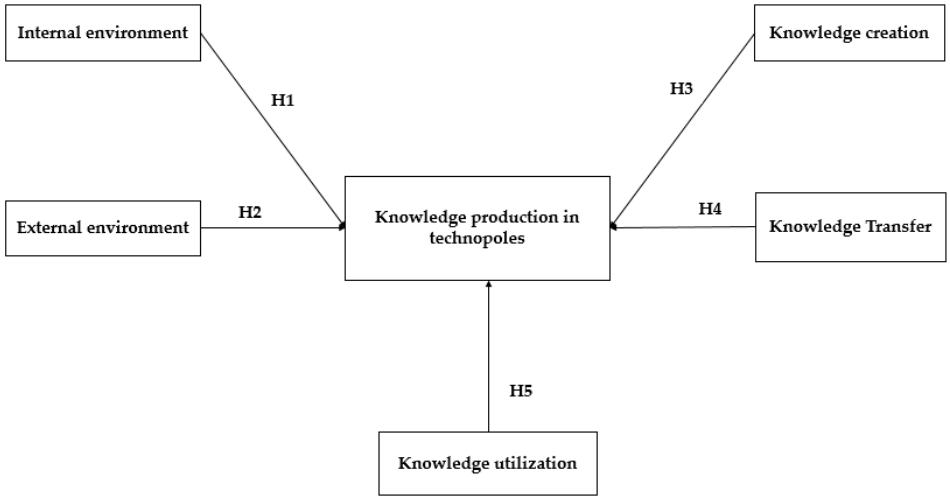

Figure 1. Research conceptual model.

Additionally, the questionnaire incorporates open-ended and dichotomous questions to capture qualitative insights and facilitate a comprehensive understanding of knowledge production dynamics in Moroccan technopoles. In this study, we delineate the structure and dimensions of each construct as follows.

The initial construct, the internal environment, is evaluated through five dimensions. These specific metrics have been previously employed in scholarly works, notably in the studies conducted by Hsu et al. (2003) and Aligod (2015). Following the specifications of our study, we reduced the item number proposed by both authors, which represents a redundancy with the other present items in the model. The second construct encapsulates the external environment, assessed across three dimensions. This framework aligns with the established study by Aligod (2015), where we combined two items given the scope of our study. The third construct pertains to the knowledge creation and is evaluated through two dimensions. Similar measurement criteria have been applied in prior research, as Arikan (2009) exemplified. Rather than employing all dimensions proposed by the author, we opted to restrict the measurement of the third construct to two dimensions, as the remaining dimensions overlap redundantly with other constructs. The fourth construct encompasses knowledge transfer, evaluated across four dimensions by the approach taken by Minbaeva (2007). We employed the same items suggested in the author's study. The fifth construct concerns knowledge utilization, adapted from González (2019) and evaluated through six dimensions. Indeed, we limited dimensions following the particularities of our

study area. Finally, the last construct, the dynamics of knowledge production, is appraised through three dimensions, following the methodology employed by Wagner (2006).

Table 1 presents the instruments for measuring all the constructs.

Table 1. Questionnaire constructs and their corresponding items.

Variables	Items
Internal environment adapted from Hsu et al. (2003) and Aligod (2015)	
IE1	Basic services
IE2	Advanced and specialized services
IE3	Innovation support service
IE4	Mode of governance
IE5	Innovation policy
External environment adapted from Aligod (2015)	
ENV1	The regional innovation system
ENV2	The economic environment
ENV3	Innovation legislation
Knowledge creation adapted from Arikan (2009)	
CREA1	Knowledge exchange opportunities
CREA2	Knowledge exchanges completed
Knowledge Transfer adapted from Minbaeva (2007)	
TRANS1	Nature of knowledge
TRANS2	The dissemination capacity of knowledge transmitters
TRANS3	The absorptive capacity of knowledge receivers
TRANS4	Proximity between actors
Knowledge utilization strategies adapted from González (2019)	
Knowledge exploration strategies	
EXPLOR1	Progressive improvement
EXPLOR2	Troubleshooting
EXPLOR3	Promoting progressive improvements
Knowledge exploitation strategies	
EXPLOI1	Access to new technologies
EXPLOI2	Investment in NICT R&D
EXPLOI3	Introduction of new technologies in its production processes
Dynamics of knowledge production adapted from Wagner (2006)	
PROD1	Patents
PROD2	New products or services
PROD3	New production processes

Source: authors.

After six months, we received 325 responses to the survey, and after we carefully crosschecked them, we eliminated incomplete responses and retained 303 complete questionnaires without missing values. The heterogeneous nature of the technopole's actors allowed us to use a stratified sampling technique, and the stratification variables are the following: Companies, Research and Training Organizations, Professional Associations, and Financial Organizations. After applying random sampling at each stratum, the size of the samples per stratum is presented in the following table (Table 2).

The analysis of the sample reveals distinct trends across the components. Predominantly, individuals in the sample tend to hold positions as Heads of Department (n = 184), outnumbering those in Junior Management (n = 69) and Directors (n = 50). Companies represent the most prevalent organizational type (n = 238), with a significant lead over Research and Training Organizations (n = 39), Professional Associations (n = 14), and Financial Organizations (n = 12). Furthermore, the majority of respondents work in organizations with 1–50 employees (n = 225), followed by those with 51–100 employees (n = 58) and 101 and above (n = 20). In terms of activity fields, IT Solutions emerge as the most common (n = 60), followed by E-business (n = 67) and Education (n = 45). Additionally, the majority of respondents have less than 5 years of experience (n = 150), with 5–15 years

(n = 96) and more than 15 years (n = 57) following suit. Furthermore, individuals under 36 years old constitute the largest group (n = 182), followed by those between 36–55 years (n = 95) and more than 55 years (n = 26). Lastly, males (n = 207) outnumber females (n = 96) within the sample. These insights underscore the diverse demographics and professional characteristics within the surveyed population, with notable variations observed across different parameters.

Table 2. The structure of the sample.

Layering Variables		Frequency
Position	Junior management	69
	Head of department	184
	Director	50
Organization Type	Companies	238
	Research and Training Organizations	39
	Professional Associations	14
	Financial organizations	12
Organization size	1–50 employees	225
	51–100 employees	58
	101 and above	20
Activity fields	Management Consulting	25
	Digital marketing	17
	IT solutions	60
	Green-Tech	39
	Med-Tech	23
	Education	45
	E-business	67
	Social economy	27
Years of experience	Less than 5 years	150
	5–15 years	96
	More than 15 years	57
Age Group	Less than 36 years	182
	36–55 years	95
	More than 55 years	26
Gender	Female	96
	Male	207

4. Results and Discussion

We used SEM-PLS confirmatory composite analysis techniques to test the validity and reliability of the indicators of the model (Hair et al. 2020, p. 2). First, to evaluate the convergent validity, we measured the loading factor and observed that loading values were above 0.700. Cronbach's alpha values are above 0.700, and the discriminant validity as the square root values of average variance extracted (AVE) is above 0.500 (Fornell and Larcker 1981). Table 3 and Figure 2 present the results of item loadings, Cronbach's alpha values, composite reliability (CR), and average variance extracted (AVE).

These results show a high reliability in the measurement model and good consistency among all of the study's variables. We also examined the discriminatory validity of the constructs using the Heterotrait–Monotrait Ratio (HTMT) (Table 4). The values were below 0.9, which shows adequate discriminatory validity (Henseler et al. 2015).

Table 3. Construct reliability and validity.

Construct	Items	Loadings	Cronbach's Alpha	Composite Reliability (rho_c)	Average Variance Extracted (AVE)
Internal environment	IE1	0.873	0.848	0.886	0.566
	IE2	0.803			
	IE3	0.802			
	IE4	0.873			
	IE5	0.915			
External environment	ENV1	0.968	0.860	0.915	0.782
	ENV2	0.680			
	ENV3	0.957			
Knowledge creation	CREA1	0.792	0.874	0.940	0.887
	CREA2	0.890			
Knowledge transfer	TRANS1	0.877	0.767	0.848	0.584
	TRANS2	0.846			
	TRANS3	0.935			
	TRANS4	0.784			
Knowledge utilization strategies	EXPLOR1	0.873	0.869	0.902	0.605
	EXPLOR2	0.803			
	EXPLOR3	0.802			
	EXPLOI1	0.873			
	EXPLOI2	0.912			
	EXPLOI3	0.876			
Dynamics of knowledge production	PROD1	0.852	0.856	0.912	0.775
	PROD2	0.910			
	PROD3	0.877			

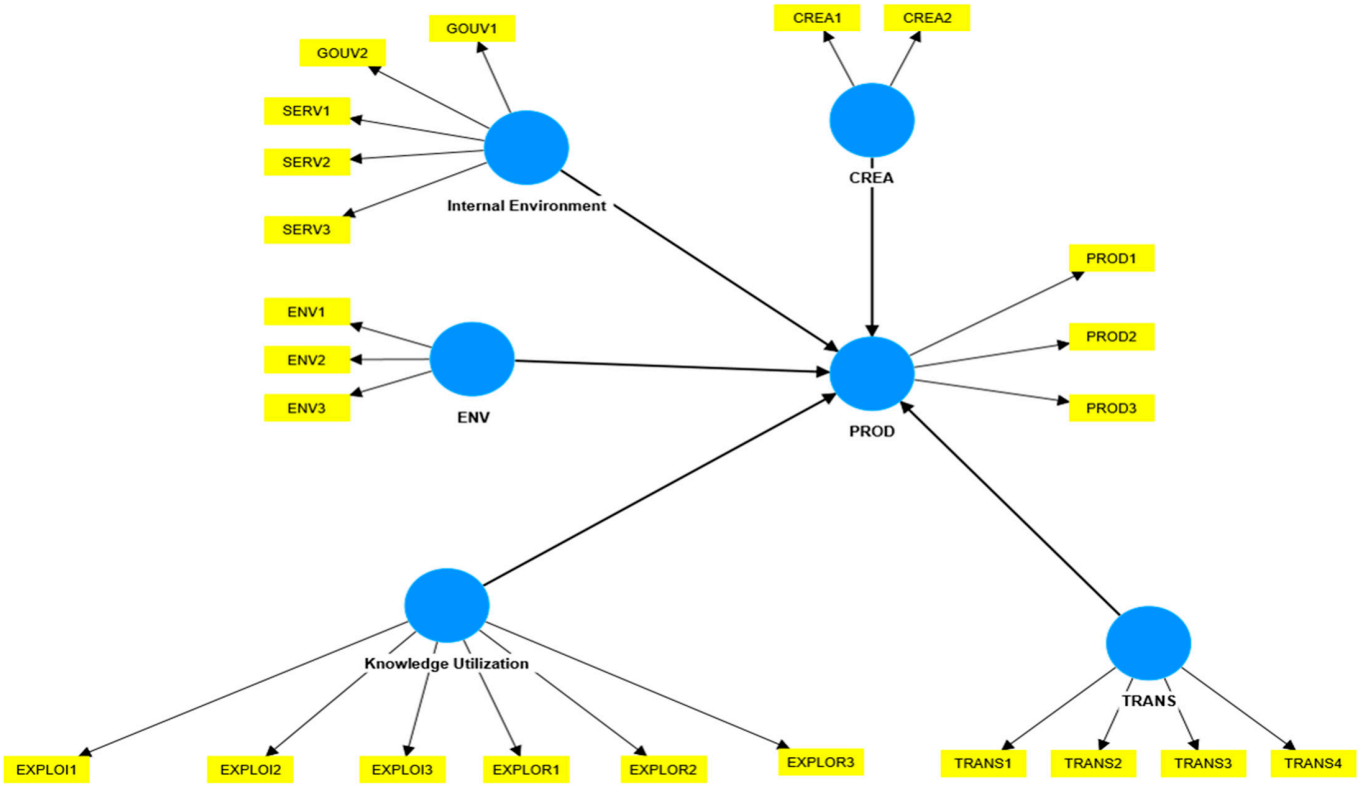

Figure 2. Model after PLS-SEM analysis.

Table 4. Discriminant validity testing by Heterotrait–Monotrait Ratio (HTMT) values.

Variables	CREA	ENV	Internal Environment
CREA			
ENV	0.066		
Internal Environment	0.061	0.807	
Knowledge Utilization	0.033	0.630	0.610
PROD	0.111	0.365	0.568
TRANS	0.093	0.717	0.826

Furthermore, the variance inflation factors (VIFs) assessed the collinearity among the constructs, and the values are presented in Table 5.

Table 5. The variance inflation fac tors (VIFs) values.

Variables/Items	VIFs
CREA1	2.511
CREA2	2.510
ENV1	2.442
ENV2	1.954
ENV3	2.306
EXPLOI1	2.765
EXPLOI2	2.892
EXPLOI3	1.874
EXPLOR1	1.795
EXPLOR2	1.960
EXPLOR3	2.860
GOUV1	2.770
GOUV2	2.377
GOUV3	2.060
PROD1	2.147
PROD2	1.959
PROD3	2.446
SERV1	1.846
SERV2	2.239
SERV3	1.979
TRANS1	1.571
TRANS2	1.531
TRANS3	1.992
TRANS4	1.455

The results indicated that there were no collinearity issues because the values ranged between 1.455 (TRANS4) and 2.892 (EXPLOI2) and did not exceed the recommended threshold of 3 (Hair et al. 2020).

The model fit measurement of the variables proves they are satisfactory because the value of the SRMR is 0.058, and the value of the NFI is 0.921. Therefore, there are no collinearity problems between the variables.

Evaluating the structural model involves examining the significance and validity of relationships and interactions among constructs. This assessment explores the underlying mechanisms connecting variables, providing insights into the coherence of the theoretical framework. We used a boot-strapping procedure to analyze the relevance of our model's path coefficients and to measure the study's hypotheses (Table 6).

Table 6. The status of hypotheses.

Hypotheses	Path Coefficient (β)	Standard Deviation (STDEV)	T statistics (|O/STDEV|)	*p* Values	Decision
IE -> PROD	0.673	0.077	2.620	0.002	Supported
ENV -> PROD	0.511	0.055	3.570	0.000	Supported
CREA -> PROD	0.602	0.047	1.844	0.003	Supported
TRANS -> PROD	0.271	0.077	4.292	0.000	Supported
KU -> PROD	0.384	0.062	5.885	0.000	Supported

Note: IE = internal environment, ENV = external environment, CREA = knowledge creation, TRANS = knowledge transfer, KU = knowledge utilization, PROD = dynamics of knowledge production.

The main objective of our study is to explore the factors influencing knowledge production dynamics in technopoles. The quantitative analysis has relied on t-values and a significance level to accept or reject hypotheses. All hypotheses with t-values exceeding 1.64 and *p*-values below 0.05 have been deemed acceptable. Explicitly, this study found that the internal environment of a technopole, detailed as the services it offers and its governance mode, positively affects knowledge production dynamics (β = 0.673, t = 2.620, $p < 0.005$).

Our findings are consistent with some prior works, such as the analysis developed by Calvo et al. (2017), which examined the impact of services that the territorial network offers to its actors, explicitly knowledge-intensive companies. Results show that such services enable them to develop their business model in favorable conditions. In a different context, Corrocher et al. (2019) emphasized in their study of Italian science parks that advisory and legal services contribute to the performance of firms compared to others localized outside the parks. Furthermore, Balle Andrea et al. (2019) argue the importance of technical consulting, human resources training, and product and process innovation in favor of technopole actors and consider that these services influence the development of knowledge-production mechanisms.

Our study stresses the importance of the governance mode since it sets an environment of engagement for coordination between actors and improves knowledge production. Such findings align with other studies, such as Berthinier-Poncet (2015) and Ehlinger et al. (2015), that argue the importance of governance in developing a dynamic production in a network.

The internal environment in Moroccan technopoles plays a pivotal role in shaping the dynamics of knowledge production. These technopoles, exemplified by the Casablanca Technopark, offer essential services such as infrastructure, networking, financing access, and collaborative spaces, fostering an environment conducive to innovation. Governance structures, often involving partnerships between government entities, industry players, and educational institutions, provide strategic direction and support. For instance, the Rabat Technopole has effectively utilized its governance framework to establish collaborative research initiatives between universities and businesses, enhancing knowledge production. In Agadir's technopole, the focus on sustainable agriculture is supported by governance structures that encourage partnerships between agricultural businesses and research institutions, influencing knowledge dynamics. The interplay of comprehensive services and effective governance enhances the collaborative ecosystem, facilitating knowledge exchange and driving innovation across diverse sectors within Moroccan technopoles.

On the other hand, our results prove that the external environment of a technopole, which represents the economic environment, the regional innovation system, and the innovation legislation, influences knowledge production dynamics in a technopole (β = 0.511, t = 3.570, $p < 0.005$). In this sense, Gomes et al. (2023) report that regional innovation inputs positively influence regional innovation outputs, which are represented by activities resulting from knowledge production in technopoles. According to Zhang et al. (2023), innovation cohesion is considered an influencing factor of territorial network dynamics, which promotes a strong innovation association between the network's actors.

Morocco's regional innovation system significantly shapes knowledge production in technopoles, with tangible examples illustrating its impact. For instance, the Casablanca Technopark benefits from its proximity to academic institutions like the University of Hassan II, fostering collaborative research projects that translate into innovative solutions. In parallel, the technology in Rabat has successfully integrated government-supported initiatives, such as creating a seed capital fund, promoting entrepreneurship, and accelerating the development of cutting-edge technologies. Additionally, the technopole in Tangier has strategically partnered with local industry players, forming a dynamic ecosystem where knowledge flows seamlessly, leading to advancements in various sectors. Similarly, the technopole in Agadir has capitalized on its regional innovation system, leveraging collaborative networks to boost knowledge production, particularly in areas such as agriculture and renewable energy. These concrete examples illustrate how Morocco's regional innovation system catalyzes transformative knowledge production within its technopoles through targeted collaborations and initiatives.

Furthermore, our study underlines that the capacity of actors for knowledge creation ($\beta = 0.602$, $t = 1.484$, $p < 0.005$), knowledge transfer ($\beta = 0.271$, $t = 4.292$, $p < 0.005$), and knowledge utilization ($\beta = 0.384$, $t = 5.885$, $p < 0.005$) to influence the dynamics of knowledge production within the technopole.

These findings are consistent with Lynch and Jin's (2016) and Chung et al.'s (2019) results that the ability of knowledge creation may expand the knowledge base and increase the network actors' performance. In their study, Lehyani et al. (2023) assert the significance of knowledge transfer in enhancing employee effectiveness. This process relies on sharing tacit and explicit employee knowledge within an organization, leading to the generation, design, and development of more brilliant ideas.

The overarching goal is to enrich workers' knowledge and enhance the organization's overall management effectiveness, directly impacting employee performance and, consequently, their motivation to work. Furthermore, Favre-Bonté et al. (2015) argue that it is essential for actors to maintain an appropriate balance between exploration and exploitation to increase their competitiveness. Kurtoğlu (2016) explains that the knowledge production process is based on knowledge exploration, which means using the potential firm-specific knowledge through value creation activities, followed by knowledge exploitation using the knowledge produced by the company or the knowledge received from external open sources.

Our findings show that spillover effects from the proximity and collaborative culture of high-tech industries and research institutions shape knowledge production dynamics in technopoles. The concentration of talent fosters local mobility and face-to-face interactions, facilitating unintentional knowledge transfer. Collaborative projects, innovation culture, and knowledge networks continuously exchange insights, amplify synergies, and sustain the technopole as a hub for innovation and cutting-edge developments (Neves and Sequeira 2018).

Nonetheless, some research has pointed to gaps in knowledge creation's influence on knowledge production within technopoles. For example, Du Chatenier et al. (2009) concluded that a reduced proximity between actors in the case of technopoles might represent a challenge for them regarding the effective organization and content of collaborative knowledge-creation processes.

Moreover, Ode and Ayavoo (2020) argue that knowledge sharing does not significantly influence firm innovation. They add that knowledge sharing is more relevant to innovation when mediated by knowledge application. Our findings also deviate from some studies on knowledge utilization; for example, Ganzaroli et al. (2016) assert that an excessive focus on exploration leads to organizational 'myopia' and excessive exploitation is equally destructive, as organizations can enter a cycle of failure–research–change–failure.

As concrete examples of knowledge creation, transfer, and utilization in Moroccan technopoles, inter-organizational knowledge exchange significantly influences innovation dynamics. For instance, collaborations between established businesses and startups accelerate technological development at the Casablanca Technopark, illustrating successful

knowledge transfer. Tangier's technopole excels in partnerships within the automotive sector, fostering advancements in design and production. Simultaneously, Agadir's technopole demonstrates fruitful collaborations in agriculture and renewable energy, driving innovation in sustainable solutions. These instances highlight how inter-organizational collaboration enriches the collective knowledge pool, propelling sustained innovation across diverse sectors. The knowledge transfer and utilization dynamics, exemplified in Casablanca and Tangier, play a crucial role in sustaining ongoing innovation and technological advancements within Moroccan technopoles.

The research establishes connections between the factors influencing knowledge production within the context of territorialized networks of organizations, with a specific focus on technopoles in Morocco. The proposed conceptual model revealed a substantial influence of various variables. The findings highlight a noteworthy impact of macro- and micro-level factors on the dynamics of knowledge production in Moroccan technopoles. In light of these results, the contributions of internal and external environments, along with the involvement of technopole stakeholders in creating, transferring, and utilizing knowledge, are considered highly effective in enhancing the dynamics of knowledge production within the Moroccan network.

4.1. Implications of the Research

From a theoretical perspective, our contribution is twofold. Firstly, we need to fill a gap in the literature on technopoles because our study is set in the New Geographical Economics theory (Krugman 1991; Krugman and Venables 1995), where an abundant literature describes and analyzes the phenomenon of a spatial concentration of economic and technological activities starting from the work of Alfred Marshall (2013). Indeed, a vast amount of the literature has developed around the various forms of territorialized networks of organizations, and concepts have since followed one another in academic work and public action, leading to ambiguity in their designation (Bourbousson 2018).

Among the different forms of economic and technological agglomeration identified in the literature (industrial districts, local production systems, clusters, competitive poles, innovative milieu, and science and technology parks), the current research highlights the case of technopoles and extends the comprehension of their particularities. A comparison of studies analyzing different agglomeration forms reveals that the technopoles phenomenon is less frequently mentioned, despite its worldwide presence, and as a result, our study advances the field of innovation activities agglomeration with an emphasis on technopoles.

Secondly, the study identifies the factors influencing knowledge production dynamics in a technopole and presents a conceptual model describing relations between factors. Moreover, the technopole refers to the incarnation of a shared vision that focuses on networking heterogeneous organizations and creating synergies that result from the effects of proximity and the services provided by the technopole, which consequently encourages the cross-fertilization of knowledge and skills. As a result, the collective accumulation of knowledge and expertise in a single geographical territory is supposed to create dynamics for knowledge production. Despite theoretical studies and practical experience in determining the factors that may influence the dynamics of knowledge production in an economic agglomeration, researchers corroborate the complexity of this process and the addition of new factors due to the rapid changes in today's economies and societies. In this sense, our study fills the gap by presenting a conceptual model to delimit the concepts used in the context of abundant literature. This model visually represents the links between the concepts and notions identified and cited in the literature review. That said, the model provides a clear articulation of the research problem.

4.2. Managerial Implications

Based on these findings, our study generates suggestions for managers at three levels: actors of technopoles, technopoles, and regional actors.

First, at the level of the technopole actors, our suggestions focus on the importance of knowledge creation, transfer, and utilization vitalization. The results reveal the importance of the knowledge-creation process within actors. It represents a pillar of growth support and innovation for organizations and a source of competitive advantage for wealth creation. Knowledge creation should therefore be placed in the foreground of knowledge production initiatives within organizations. In addition, knowledge transfer should be promoted within technopoles, through events that may lead to the establishment of several types of proximity between the actors of technopoles (physical, organizational, and institutional). Moreover, the technopole actors should create a balance between knowledge exploration and knowledge exploitation (Thanos et al. 2023). Indeed, exploration without exploitation is not economically viable in the long term, and exploitation without exploration results from using ancient knowledge in the long term (González 2019).

Second, a technopole should focus on improving the interaction of all its actors and intensifying the implementation of activities that generate interaction situations for the better use of performative knowledge production (Burgess et al. 2017). In addition, skilled workers influence the deployment of an innovative process of knowledge production within technopoles. With this in mind, we recommend that a technopole's stakeholders map their needs and skills to facilitate the recruitment of knowledge workers. The dynamics of knowledge production in technopoles also depend on their role in monitoring the programs and ensuring the integration of common objectives and collective actions. Stakeholders are expected to play an influential lobbying role. In addition, the ongoing assessment of results via localized monitoring and evaluation systems would help to quantify the outputs of the technopole's knowledge production dynamic and enable better decision-making.

Third, our findings show that the technopolitan activity is influenced by the effective partnerships between the territory and the technopole. Our evidence suggests that technopoles act in synergy within innovation ecosystems by fostering innovation locally through collaboration with active external actors of the region (El m'hadi and Cherkaoui 2023). In this sense, it is required to establish partnerships with the different regional actors oriented toward innovation and fostering a knowledge search (Landoni et al. 2023). Furthermore, Morocco should develop a political and economic strategy for integration into the knowledge economy through strengthening the innovation incentive system and strengthening the regulatory protection system to create an attractive implementation of industrial policies to create and support technopoles. This transformative approach encourages research and development, protects intellectual property rights, and invests strategically in advanced technology poles. By encouraging innovation, attracting investment, and providing advanced infrastructure, these actions collectively position Morocco to thrive in the dynamic landscape of the global knowledge-based economy.

5. Conclusions

This paper attempts to develop a conceptual framework of knowledge production dynamics in technopoles. In doing so, it relies on the existing studies to develop the research based on the research question: How can we define the factors influencing the dynamics of knowledge production in technopoles? This study has assessed the effectiveness of various factors on knowledge production dynamics within a technopole based on the results of hypothesis testing. It argues that the internal and external environment of a technopole, and the actors' ability for knowledge creation, knowledge transfer, and knowledge utilization influence knowledge production dynamics in a technopole.

Our paper has clear theoretical and managerial implications for the research community and practitioners. Theoretically, the study identifies the factors influencing knowledge production in a technopole. Considering the heterogeneous nature of the actors composing the technopole and the network's multiple activation modes, our study's results provide a first refined conceptual model for knowledge production dynamics. Therefore, this study generates managerial implications. At the level of the activation of knowledge production dynamics in Moroccan technopoles, our analysis points to the need to intensify the imple-

mentation of activities that generate interactions between the actors. Moreover, our findings show that the technopole activity is influenced by the effective partnerships between the territory and the technopole. In this sense, it is required to establish partnerships with the different regional actors oriented toward innovation and knowledge. In this sense, Morocco should develop a political and economic strategy for integration into the knowledge economy through strengthening the innovation incentive system and the regulatory protection system to create an attractive implementation of industrial policies to create and support technopoles.

This study has several areas for improvement that may lead to further research opportunities. First of all, our study was confronted by the absence of econometric data, which made using the spatial econometric models unfeasible. In addition, this study was confronted with the generalization of the findings to other types of territorial networks of organizations.

Certain limitations are associated with this research, which provide a gap for future studies. First, we intended to quantify the technopole's knowledge production with one of the spatial econometric models, the knowledge production function as an example (Neves and Sequeira 2018). However, we needed more econometric data. In addition, we can cite the difficulty of generalizing the results obtained to other types of territorial networks of organizations due to their different nature. Indeed, the data necessary for the Moroccan technopoles case need to be more comprehensive to propose a general model.

As suggestions for future research, we emphasize the importance of conducting econometric studies to understand knowledge production mechanisms better. Indeed, it would be interesting to study the effect of the collaboration of research and development actors on the creation of knowledge at the regional level, especially if we take into account the fact that further research could lead to the quantification of the territorial externalities of the Moroccan technopoles using spatial econometric models. Analyzing the spillover effects, the distribution of knowledge transfer, and the impact on the local economy is promising, as the use of spatial models can reveal spatial relationships, thus contributing to evidence-based policymaking, especially if we consider that these external factors guide future research on the impact of technopoles in the Moroccan context. It is also interesting to explore the econometric modeling of the regional knowledge production function for the case of the African continent. However, future studies will also be oriented towards analyzing other forms of territorial networks of organizations established in Morocco to compare with the results obtained in the present research.

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References

Adama, Tahirou Younoussi Meda. 2020. Acquisition des connaissances inter-organisationnelles des PME: Conditions de réalisation et implications dans un projet intégré au Niger. *Gestion 2000* 37: 149–77. [CrossRef]

Aligod, Laila. 2015. Dynamique et performance des clusters en innovation: Quel impact sur le développement économique des territoires d'implantation? Ph.D. thesis, Université Sidi Mohamed Ben Abdellah, Fez, Morocco; p. 96.

Ambroise, Laure, Céline Bérard, and Isabelle Prim-Allaz. 2020. Performance implications of exploration and exploitation in SMEs: The mediating role of interaction orientation. *Journal of Business & Industrial Marketing* 35: 1971–81.

Arikan, Andaç T. 2009. Interfirm Knowledge Exchanges and the Knowledge Creation Capability of Clusters. *Academy of Management Review* 34: 658–76.

Assens, Christophe, and Yoni Abittan. 2012. Le Management d'un bien commun: Le territoire. Le cas des pôles de compétitivité. *RIMHE: Revue Interdisciplinaire Management, Homme(s) & Entreprise* 1: 19–36. [CrossRef]

Autant-Bernard, Corinne. 2018. *Impacts économiques et territoriaux des pôles de compétitivité selon les territoires*. European Localized Innovation Observatory and Technopolis Group: 324p, Available online: https://shs.hal.science/halshs-03246310 (accessed on 2 February 2023).

Balle Andrea, Raymundo, Mário Oscar Steffen, Carla Curado, and Mírian Oliveira. 2019. Interorganizational knowledge sharing in a science and technology park: The use of knowledge sharing mechanisms. *Journal of Knowledge Management* 23: 2016–38. [CrossRef]

Berthinier-Poncet, Anne. 2015. Gouvernance et dynamiques d'innovation au sein d'un technopôle. Une analyse par les pratiques institutionnelles d'innovation. *Management International* 19: 94–112. [CrossRef]

Bierly, Paul E., III, Fariborz Damanpour, and Michael D. Santoro. 2009. The Application of External Knowledge: Organizational Conditions for Exploration and Exploitation. *Journal of Management Studies* 46: 481–509. [CrossRef]

Bourbousson, Celine. 2018. *La "mise en dispositif" de Réseaux Territorialisés d'Organisations: Quel travail institutionnel à l'oeuvre?* [Thèses, Aix-Marseille Université]. Available online: https://hal.archives-ouvertes.fr/tel-02285978 (accessed on 12 February 2023).

Buesa, Mikel, Joost Heijs, and Thomas Baumert. 2010. The determinants of regional innovation in Europe: A combined factorial and regression knowledge production function approach. *Research Policy* 39: 722–35. [CrossRef]

Burgess, Gemma, Mihaela Kelemen, Sue Moffat, and Elizabeth Parsons. 2017. Using performative knowledge production to explore marketplace exclusion. *Qualitative Market Research* 20: 486–511. [CrossRef]

Burlea-Schiopoiu, Adriana. 2009. Success Factors for an Information Systems Projects Team: Creating New Context, Innovation and Knowledge Management. In *Twin Track Economies: Challenges & Solutions*. Edited by K. S. Soliman. London: IBIMA, vols. 1–3, pp. 936–41.

Burlea-Schiopoiu, Adriana. 2011. The Relationship between the European Social Fund and Knowledge Management in Romanian Organizations. Paper presented at 12th European Conference on Knowledge Management, Passau, Germany, September 1–2; vols. 1–2, pp. 148–58.

Calvo, Nuria, David Rodeiro-Pazos, and Sara Fernández-López. 2017. Science and technology parks as accelerators of knowledge-intensive business services. A case study. *International Journal of Business and Globalisation* 18: 42–57. [CrossRef]

Casadella, Vanessa, and Dimitri Uzunidis. 2020. Propédeutique à la théorie des Systèmes Nationaux d'Innovation appliquée au développement économique. *Technologie et Innovation* 5: 1–23. [CrossRef]

Castells, Manuel. 2014. *Technopoles of the World: The Making of 21st Century Industrial Complexes*. London: Routledge.

Chung, Ting-Ting, Ting-Peng Liang, Chih Hung Peng, Deng-Neng Chen, and Pratyush Sharma. 2019. Knowledge Creation and Organizational Performance: Moderating and Mediating Processes from an Organizational Agility Perspective. *AIS Transactions on Human-Computer Interaction* 11: 79–106. [CrossRef]

Coghlan, David, Abraham B. (Rami) Shani, and Patricia C. Dahm. 2019. Knowledge Production in Organization Development: An Interiority-based Perspective. *Journal of Change Management* 20: 81–98. [CrossRef]

Collins, Harry. 2012. *Tacit and Explicit Knowledge*. Chicago: University of Chicago Press. Available online: https://press.uchicago.edu/ucp/books/book/chicago/T/bo8461024.html (accessed on 20 December 2022).

Comins, Neville, and David N E Rowe. 2008. *Success Factors for Science Parks in the Developed World and Emerging Economies*, Abstract for the 2008 IASP WORLD CONFERENCE—Johannesburg. Available online: https://www.warwicksciencepark.co.uk/wp-content/uploads/2011/03/SuccessFactorsforScienceParks.pdf (accessed on 15 September 2022).

Corrocher, Nicoletta, Francesco Lamperti, and Roberto Mavilia. 2019. Do science parks sustain or trigger innovation? Empirical evidence from Italy. *Technological Forecasting and Social Change* 147: 140–51. [CrossRef]

Di Minin, Alberto, and Marco Rossi. 2016. Open innovation and clusters: Why geographical proximity matters. In *Revolutionising EU Innovation Policy: Pioneering the Future*. London: Palgrave Macmillan, pp. 79–95. [CrossRef]

Domínguez Sánchez, Helena, Marc Huertas-Company, Mario Luca Bernardi, Sudipta Kaviraj, Johanna-Laina Fischer, Timothy Abbott, Filipe Abdalla, Jean Annis, Sandra Avila, Dana Brooks, and et al. 2019. Transfer learning for galaxy morphology from one survey to another. *Monthly Notices of the Royal Astronomical Society* 484: 93–100. [CrossRef]

Du Chatenier, Elise, Jos A. A. M. Verstegen, Harm J. A. Biemans, Martin Mulder, and Onno Omta. 2009. The Challenges of Collaborative Knowledge Creation in Open Innovation Teams. *Human Resource Development Review* 8: 350–81. [CrossRef]

Ehlinger, Sylvie, Véronique Perret, and Didier Chabaud. 2015. Quelle gouvernance pour les réseaux territorialisés d'organisations? *Revue Française de Gestion* 41: 369–86. [CrossRef]

El m'hadi, Hajar, and Abdelghani Cherkaoui. 2023. Urban planning of business parks (BPs): Ecological challenges and commitment to sustainable development, the case study of the technopole 'CasaNearshore'. *Alexandria Engineering Journal* 67: 23–30. [CrossRef]
Favre-Bonté, Véronique, Elodie Gardet, and Catherine Thévenard-Puthod. 2015. Caractéristiques des réseaux inter-organisationnels développés pour l'innovation dans les services. Le cas des domaines skiables. *Management Avenir* 6: 95–114. [CrossRef]
Fornell, Claes, and David F. Larcker. 1981. Structural Equation Models with Unobservable Variables and Measurement Error: Algebra and Statistics. *Journal of Marketing Research* 18: 382–88. [CrossRef]
Gadille, Martine, Diane-Gabrielle Tremblay, and Alena A. Siarheyeva. 2021. How Can the Governance of the French Clusters (Pôles de Compétitivité) Improve SME's Competitiveness? *Open Journal of Social Sciences* 9: 118–46. [CrossRef]
Ganzaroli, Andrea, Ivan De Noni, Luigi Orsi, and Fiorenza Belussi. 2016. The combined effect of technological relatedness and knowledge utilization on explorative and exploitative invention performance post-M&A. *European Journal of Innovation Management* 19: 167–88. [CrossRef]
Garel, Gilles, and Rodolphe Rosier. 2008. Régimes d'innovation et exploration. *Revue Française de Gestion* 7: 127–44. [CrossRef]
Gomes, Sofia, Joao M. Lopes, Luis Ferreira, and Jose Oliveira. 2023. Science and technology parks: Opening the pandora's box of regional development. *Journal of the Knowledge Economy* 14: 2787–810. [CrossRef]
González, Rodrigo Valio Dominguez. 2019. Knowledge exploration and exploitation in team context. *Total Quality Management & Business Excellence* 30: 1654–74. [CrossRef]
Grandori, Anna, Laura Gaillard Giordani, and James Hayton. 2011. Organizing Environments for Entrepreneurship. In *Organizing Entrepreneurship*. London: Routledge, pp. 230–80. [CrossRef]
Hair, Joe F., Jr., Matt C. Howard, and Christian Nitzl. 2020. Assessing measurement model quality in PLS-SEM using confirmatory composite analysis. *Journal of Business Research* 109: 101–10. [CrossRef]
Henseler, Jörg, Christian M. Ringle, and Marko Sarstedt. 2015. A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academic Marketing Science* 43: 115–35. [CrossRef]
Hislop, Donald, Rachelle Bosua, and Remko Helms. 2018. *Knowledge Management in Organizations: A Critical Introduction*, 4th ed. Oxford: Oxford University Press.
Hsu, Po-Hsuan, Joseph Z. Shyu, Hsiao-Cheng Yu, Chao-Chen Yuo, and Ta-Hsien Lo. 2003. Exploring the interaction between incubators and industrial clusters: The case of the ITRI incubator in Taiwan. *R&D Management* 33: 79–90. [CrossRef]
Huet, Jean-Michel, Isabelle Viennois, Romain Striffling, and Amira Khediri. 2012. Les technopoles, moteurs de développement. *L'Expansion Management Review* 4: 112–19. [CrossRef]
Hurmelinna-Laukkanen, Pia. 2011. Enabling collaborative innovation–knowledge protection for knowledge sharing. *European Journal of Innovation Management* 14: 303–21. [CrossRef]
Idowu, Samuel O., Stephan Vertigas, and Adriana Burlea-Schiopoiu. 2017. Corporate Social Responsibility in Times of Crisis: A Summary. In *CSR, Sustainability, Ethics & Governance, Corporate Social Responsibility in Time of Crisis*. Edited by Samuel O. Idowu, Stephen Vertigans and Adriana Schiopoiu Burlea. Cham: Springer, pp. 154–96. [CrossRef]
Imbert, Guillaume. 2014. Le rôle des Knowledge Intensive Business Services dans la capacité d'absorption: Le cas des contrats d'innovation. Ph.D. thesis, Université de Grenoble, Saint-Martin-d'Hères, France.
Koubaa, Salah. 2014. Management stratégique des connaissances et capacité d'absorption dans le contexte des relations interentreprises. *La Revue des Sciences de Gestion* 2: 109–20. [CrossRef]
Krugman, Paul. 1991. Increasing Returns and Economic Geography. *Journal of Political Economy* 99: 483–99. Available online: https://www.journals.uchicago.edu/doi/abs/10.1086/261763 (accessed on 16 March 2022). [CrossRef]
Krugman, Paul, and Anthony J. Venables. 1995. Globalization and the Inequality of Nations. *The Quarterly Journal of Economics* 110: 857–80. [CrossRef]
Kurtoğlu, Yusuf. 2016. Knowledge Production, Knowledge Management and the Competitiveness. *International Journal of Managerial Studies and Research (IJMSR)* 4: 86–97. [CrossRef]
Landoni, Paolo, Simone Franzò, Davide Viglialoro, Alessandro Laspia, and Roberto Verganti. 2023. A taxonomy of competition-based approaches as innovation policy measures to foster external knowledge search. *Journal of Knowledge Management* 27: 136–56. [CrossRef]
Laspia, Alessandro, Giuliano Sansone, Paolo Landoni, Domenico Racanelli, and Emilio Bartezzaghi. 2021. The organization of innovation services in science and technology parks: Evidence from a multi-case study analysis in Europe. *Technological Forecasting and Social Change* 173: 121095. [CrossRef]
Lehyani, Fatma, Alaeddine Zouari, Ahmed Ghorbel, Michel Tollenaere, and José Carlos Sá. 2023. Knowledge management and total quality management impact on employee effectiveness in emerging industries: Case of Tunisian small and medium enterprises. *Sustainability* 15: 3872. [CrossRef]
Lynch, Richard, and Zhongqi Jin. 2016. Exploring the institutional perspective on international business expansion: Towards a more detailed conceptual framework. *Journal of Innovation & Knowledge* 1: 117–24. [CrossRef]
Lyytinen, Kalle, Youngjin Yoo, and Richard J. Boland, Jr. 2015. Digital product innovation within four classes of innovation networks. *Information Systems Journal* 26: 47–75. [CrossRef]
MacKenzie, Scott B., and Philip M. Podsakoff. 2012. Common Method Bias in Marketing: Causes, Mechanisms, and Procedural Remedies. *Journal of Retailing* 88: 542–55. [CrossRef]
Marshall, Alfred. 2013. *Principles of Economics*. London: Palgrave Macmillan.

McAdam, Maura, and Rodney McAdam. 2008. High tech start-ups in University Science Park incubators: The relationship between the start-up's lifecycle progression and use of the incubator's resources. *Technovation* 28: 277–90. [CrossRef]
Minbaeva, Dana B. 2007. Knowledge transfer in multinational corporations. *Management International Review* 47: 567–93. [CrossRef]
Neves, Pedro Cunha, and Tiago Neves Sequeira. 2018. Spillovers in the production of knowledge: A meta-regression analysis. *Research Policy* 47: 750–67. [CrossRef]
Ode, Egena, and Rajenthyran Ayavoo. 2020. The mediating role of knowledge application in the relationship between knowledge management practices and firm innovation. *Journal of Innovation & Knowledge* 5: 210–18. [CrossRef]
Ortega-Egea, M. Teresa, Antonia Ruiz Moreno, and M. Carmen Haro Domínguez. 2014. Determinants of innovative behavior of employees: Evidence from Spanish firms. *Employee Relations* 36: 606–21. [CrossRef]
Pelé, Martine. 2009. Les avantages concurrentiels des entreprises enracinées dans des systèmes productifs. In *Eska*. Paris: Master Stratégie, pp. 60–73.
Pelkonen, Antti. 2019. Technopole. In *The Wiley Blackwell Encyclopedia of Urban and Regional Studies*, 1st ed. Edited by Anthony M. Orum. New York: Wiley, pp. 1–6. [CrossRef]
Poonjan, Amonpat, and Anne Nygaard Tanner. 2020. The role of regional contextual factors for science and technology parks: A conceptual framework. *European Planning Studies* 28: 400–20. [CrossRef]
Rao, Indu, and Pragya Thakur. 2019. Knowledge workers, organisational ambidexterity and sustainability: A conceptual framework. *International Journal of Business Excellence* 19: 415–28. [CrossRef]
Rothaermel, Frank T., and Maria Tereza Alexandre. 2009. Ambidexterity in Technology Sourcing: The Moderating Role of Absorptive Capacity. *Organization Science* 20: 759–80. [CrossRef]
Sabbado da Rosa, L. 2012. *Pôles de compétitivité: Quelle place pour les PME dans les projets innovants?* halshs-00850352, version 1. Grenoble: Centre de Recherche et d'Etudes Appliquées à la Gestion, p. 21.
Saulais, Pierre, and Jean-Louise Ermine. 2020. *Knowledge Management in Innovative Companies. 2, Understanding and Deploying a KM Plan within a Learning Organization*. New York: John Wiley & Sons.
Thanos, Costantino, Carlo Meghini, Valentina Bartalesi, and Gianpaolo Coro. 2023. An exploratory approach to data driven knowledge creation. *Journal of Big Data* 10: 1–15. [CrossRef]
Touzard, Jean-Marc, Ludovic Temple, Guy Faure, and Bernard Triomphe. 2014. Systèmes d'innovation et communautés de connaissances dans le secteur agricole et agroalimentaire. *Innovations* 43: 13. [CrossRef]
Tsamis, Achilleas. 2009. *Science and Technology Parks in the Less Favoured Regions of Europe: An Evaluation of Their Performance and the Parameters of Success*. London: London School of Economics and Political Science.
Wadhwa, Anu, and Suresh Kotha. 2006. Knowledge Creation Through External Venturing: Evidence from the Telecommunications Equipment Manufacturing Industry. *Academy of Management Journal* 49: 819–35. [CrossRef]
Wagner, Joachim. 2006. *International Firm Activities and Innovation: Evidence from Knowledge Production Functions for German Firms*. HWWA Discussion Paper, No. 344. Hamburg: Hamburg Institute of International Economics (HWWA).
Zahra, Shaker A., and Gerard George. 2002. Absorptive capacity: A review, reconceptualization, and extension. *Academy of Management Review* 27: 185–203. [CrossRef]
Zhang, Hong, Lili Jiang, Jia Zhou, Nanchen Chu, and Fengjiao Li. 2023. The characteristics and influencing factors of spatial network of city-based innovation correlation in China: From the perspective of high tech zones. *Scientific Reports* 13: 16289. [CrossRef] [PubMed]
Znagui, Zineb. 2021. Impact of COVID-19 on Knowledge Production Case Study of a Knowledge Society. *Romanian Intelligence Studies Review* 25: 59–76.