Proposed Extensions to the Methodology of Technology Scouting

Diego Lasso-Lazo[a], Francisco Álvarez-Arévalo[b], Javier Patiño-Chuni[c], Javier Valdiviezo-Ortiz[d], Jorge Bermeo-Conto[e] and Juan Pablo Carvallo[f]

CEDIA, Gonzalo Cordero 2-122 y J. Falardo, Cuenca, Ecuador

Keywords: Technology Scouting, Strategic Intelligence, Knowledge Discovery.

Abstract: An extended framework for the Technology scouting process is developed. The developed framework proposes the use of a series of screening mechanisms and verification instruments that extend the process already described in UNE 166006:2018. The extended framework was implemented in two cases of study for Technology scouting services provided by CEDIA to innovation stakeholders. The results demonstrated the effectiveness of using the extended framework, reducing stagnation points and the risk of information bias, two main issues often reported in the techonology scouting process.

1 INTRODUCTION

The flow of information for strategic intelligence cannot be an ad-hoc exercise. Instead, it must be the result of applying a systematic approach covering the information requirements of the institution (Savioz, 2006). In light of the rapid advancements in technology across all human endeavors, efficient information management is vital for the wellbeing of organizations.

These information retrieval systems must adapt to technology changes, identify business threats, and uncover innovation opportunities. The process of collecting data on technology trends plays a pivotal role in strategic decision-making and in acquiring essential information for the enterprise (Phaal et al., 2004).

Technology scouting (TS), also referred to as technology monitoring or technology landscaping, is the process of collecting and analyzing key information for the early identification of technological and commercial trends. The aim is to preemptively identifying potential threats and opportunities for the organization (Stute et al., 2021).

When conducting TS, the biggest challenges are the lack of a well-defined scope of the expected information from TS, and failing to identify the right data sources to scout (Simpson, 2018). Such challenges can result in 'stagnation points,' where the flow of beneficial information ceases. This not only inflates operational time but also leads to team fatigue and may ultimately cause the failure to meet the organization's informational requirements.

Another significant hurdle that organizations face in TS is the presence of information bias. This occurs when the filtration of relevant data is not guided by an objective, systematic process, especially when it comes to disruptive information, critical for decision-making. This often relates to a TS process that lacks filtering mechanisms for reducing the volume of information while at the same time ensuring the objectiveness of the data obtained. When information bias arises, the conclusions and recommendations extracted from TS lose their value. This can have far-reaching implications, compromising the quality of strategic decisions that rely on such information (ul Hasnain Kazmi, 2016) (Comai, 2011).

Numerous methodologies for TS exist, each with its own merits and drawbacks. For the technology scouting projects conducted at CEDIA, we have opted for the UNE 166006:2018 methodology (UNE, 2018). This is the third iteration of the Spanish standard for an R&D&I (Research and Development and Innovation) management monitoring and intelligence system. While this standard provides a systematic approach for TS, it falls short in several key areas. Specifically, it lacks robust filtering mechanisms and verification tools to ensure the objectivity and rele-

[a] https://orcid.org/0009-0005-4629-933X
[b] https://orcid.org/0009-0000-1526-8307
[c] https://orcid.org/0009-0003-8347-709X
[d] https://orcid.org/0000-0002-5763-3648
[e] https://orcid.org/0000-0002-5455-0716
[f] https://orcid.org/0000-0001-6678-4774

Lasso-Lazo, D., Álvarez-Arévalo, F., Patiño-Chuni, J., Valdiviezo-Ortiz, J., Bermeo-Conto, J. and Carvallo, J.
Proposed Extensions to the Methodology of Technology Scouting.
DOI: 10.5220/0012211200003598
In *Proceedings of the 15th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management (IC3K 2023) - Volume 3: KMIS*, pages 256-264
ISBN: 978-989-758-671-2; ISSN: 2184-3228

vance of the data collected. Additionally, although the standard acknowledges the value of insights gleaned from the TS process, it lacks a discrete step for generating prospective information. These shortcomings can result in stagnation points or information bias. To address these limitations, we propose an "Extended Framework for Technology Scouting."

The remainder of this paper is organized as follows: Section 2 offers a literature review of existing approaches to technology scouting methodologies. Section 3 details our proposed modifications to the UNE standard. Finally, Section 4 presents the results of applying this extended framework in two case studies, both examples of services provided by CEDIA.

2 LITERATURE REVIEW

The merit of technology scouting is vested in its ultimate yield: information. This information transforms into actionable insights illuminating future paths, crucial for strategic intelligence. Levine et al., through a series of methodically controlled experiments, confirmed that strategic intelligence offers a significant competitive advantage in dynamic market environments, effectively differentiating successful entities from their unsuccessful counterparts (Levine et al., 2017). These findings mirror real-world observations where institutions that invest resources in future preparedness consistently outperform those with less emphasis on foresight (Rohrbeck and Kum, 2018). Similarly, empirical studies have revealed a clear advantage for companies with high absorptive capacity for emerging technologies. Such companies often reap substantial benefits from their TS efforts (Wang and Quan, 2021).

The benefits form TS extend beyond manufacturing enterprises. Service-providing entities also reap substantial benefits from TS, given that they navigate an even more dynamic innovation landscape (Mina et al., 2014). Thus, it is of paramount importance for enterprises situated within technologically advanced and highly competitive sectors to allocate resources towards TS. Nonetheless, TS methodologies require continual refinement to address the challenges of the modern technology landscape effectively.

Various approaches for TS have been proposed and successfully implemented. Rohrbeck examined the practice of technology scouting in three companies of the ICT industry: BT, Telefonica, and DT. The study explored each of the technology scouting methodologies adopted by the companies and highlighted the importance of networks for information discovery. Furthermore, Rohrbeck's research examined the interplay between stakeholders, technology scouts, and experts, offering valuable insights into how technology scouting functions within large multinational corporations (Rohrbeck, 2010).

Arman and Foden contributed with the development of a methodology aimed at assessing related technology developments. This approach involves capturing and identifying technology-based threats and opportunities and was tested in a UK aerospace manufacturing firm. It allowed the development of a process to identify technology base knowledge, opportunities and risks. It can also be used to report findings, visualize results, and to conduct technology threat and opportunity analyses (Arman and Foden, 2010).

Similarly, Ashton et al. designed a structured approach for international technology monitoring. Their methodology outlines various types of information needs, knowledge sources, and monitoring methods. Implemented in the International Research Monitoring Program of the US Department of Energy, this approach offered valuable insights for making research and development (R&D) decisions related to energy conservation. This, in turn, brought several benefits to technology organizations in the US (Ashton et al., 1991).

Having assessed the different standards available, CEDIA has worked with the standard by the Spanish Normalization Association (UNE), which offers a standardized framework for TS, known as UNE 166006:2018. While this standard provides a robust and universally applicable methodology for TS, it could benefit from refinements to better address challenges like stagnation points and information bias.

3 METHODOLOGY

3.1 Methodology and Information Needs

We propose modifications to complement the existing UNE 166006:2018 framework in the context of Technology Scouting and Strategic Intelligence. These modifications introduce targeted tools designed to address identified gaps and challenges, while still adhering to a systematic and objective approach.

The current UNE 166006:2018 framework outlines five key steps for Technology Scouting: Identification, Planning, Information Search and Treatment, Added Value of Information, and Distribution and Storage. Our work particularly attends to "Information Search and Treatment" and "Added Value of Information," the third and fourth steps in this sequence. While the framework offers general guidelines for data search, analysis, and extraction, it leaves room for more specific processes that can improve the extraction and verification of strategically useful insights.

To fill this gap, we suggest a set of filtering mechanisms and verification criteria grounded in specific questions. These aim to bolster the quality and reliability of the gathered information. For this aspect, we draw upon the work of Ashton et al., who outline various types of information commonly sought in the Technology Scouting process (Ashton et al., 1991). A categorization of this information can be found in Table 1.

Table 1: Major types of information needs.

Type of Information	Topics
Scientific research and technology development activities	Information on basic and applied research activities, R&D objectives, technical results, technology developments
Technology application characteristics	Descriptions of features, components, costs, or performance data for technology-based products, processes, or applications
Science and technology institutional characteristics	Information on key personnel, organizations, and budgets for R&D activities
Economic or market performance and trends	Information on levels and trends for industrial production, imports, exports, and other indicators
Business or industry news	Reports on new events or actions involving technology-based firms and technology products, including key personnel and business decisions
Government science and technology policy characteristics or trends	Descriptions of government S&T funding, regulations, standards, incentives, and other policy actions

3.2 Screening Mechanisms

The vast amount of currently available data creates a challenge for identifying and managing valuable information. A screening mechanism or filtering system, serves as a tool with which it is possible to separate relevant from non-relevant data for the organization. By implementing such screening mechanisms, we can systematically filter the collected data based on predefined criteria. Thus, irrelevant or unreliable data can be removed, ensuring only high-quality and trustworthy information as the final product. (Timimi and Chaudiron, 2008).

In our proposal, these screening mechanisms are divided into 4 different information monitoring dimensions. Each dimension will yield valuable information from a specific perspective. The description of each dimension and their filtering questions are presented next.

3.2.1 Academic Monitoring

It refers to the systematic review of the latest and most relevant research on the field of interest. Scientific research is an indispensable source of information and acts as a driver of innovation in the business world. (Randieri, 2023). This stage sets the ground for the process of technology scouting, specifying information needs by answering the following questions:

- What major problems is the scientific community studying?
- What possible solutions have and have not been researched?
- What are the most relevant researchers and institutions working on the filed of interest?

3.2.2 Technology Monitoring

Technology monitoring involves a systematic and consistent review of technologies that have already been protected or licensed. A key resource for this process is patent data, currently the most up-to-date and comprehensive source for tracking technology development (EPO, 2007). In this context, the screening filter distinguishes between theoretical possibilities and technologies that have been sufficiently developed to warrant intellectual property protection. The goal of this technology monitoring screening process is to address the following questions:

- What related technologies have already been protected?
- What technologies have been transferred to the market?
- What are the most relevant developers and owners of technology?

3.2.3 Commercial Monitoring

Constant monitoring of the market is necessary for the successful application of any technology to its commercial environment. This monitoring does not merely focus on the internal performance of a company, but also keeps a systematic record of the external business environment, specially the evolution of innovation and intellectual property objects related to the institution (Kosenko et al., 2017) (Best, 2010). Once a technology trend has been identified, it is essential to understand its market and potential for growth. This filter looks to answer the following questions:

- What are the markets for the technologies identified?
- What is the evolution of these markets?

3.2.4 Competitive Monitoring

During the process of technology scouting, it is common to find developments and research that are still out of the scope of local markets. Hence, the competitive monitoring serves as a filter to obtain relevant information regarding external actors who are perceived as current or potential competitors (Aguirre, 2020). This monitoring can also be extended for a self analysis focusing on the competitiveness of the institution. This filter looks to answer the following questions:

- Are any of my competitors currently implementing these technologies? Is this a potential threats?
- Does my institution have the necessary technical, economic and human capital resources to implement these new technologies?

Based on our experience, Commercial Monitoring and Competitive Monitoring can often be combined into a single screening mechanism that monitors the commercial aspect of the researched technology. However, if the nature of the technology under investigation requires separate analysis of its commercial and competitive aspects, then both types of monitoring would be performed. For the sake of covering all possible scenarios, we have specified these as distinct mechanisms in this paper.

3.3 Verification Instruments

Verification instruments involve cross-referencing the information previously filtered against multiple criteria based on relevance, feasibility, and economic value. By subjecting the information to such scrutiny, we can minimize the risk of relying on inaccurate or misleading information, thus strengthening the overall reliability of our findings. By using verification instruments we expect to reduce the likelihood of stagnation points, which usually appear once relevant information has been filtered but still needs to be evaluate in terms of feasibility and applicability in the own technology ecosystem.

3.3.1 Success Cases

Certain technological development and implementation opportunities may have been seized by competitors or analogous institutions. As such, performing a success case study helps to confirm their relevance and potential, thereby diminishing uncertainty and enhancing the likelihood of successful development. This phase acts as a validation technique for the feasibility of new technologies, and either present an opportunity of successful implementation or raise the alert for a potential threat. It seeks to address the following questions:

- Has anyone developed or implemented these technologies?
- In doing so, were they successful and to what extend?

3.3.2 Environment Monitoring

The adoption of new technologies hinges not only on their commercial potential or a company's resources, but is also significantly influenced by the ecosystem's requirements, incentives, and constraints. As such, it is important to conduct an in-depth review of the political, economic, and social contexts in which the technologies identified during the technology scouting process exist. This verification instrument could validate the feasibility of developing new technologies, services, or products within the existing legal framework. This stage aims to address the following questions:

- Does the ecosystem in which these technologies could be implemented have any specific requirements or offer any particular incentives?
- Are there any restrictions, legal or otherwise, that could prevent the adoption of new technologies?

3.4 Prospective

The final phase of the extended framework generates a forward-looking outlook for the institution. In involves identifying opportunities and threats related to the implementation of the technology. This stage is guided by earlier screening and verification steps. These insights provide initial guidance for the institution's technological path.

Table 2 contrasts our extended technology scouting framework with the existing UNE 166006:2018 standard, while Figure 1 provides a detailed illustration of our approach, particularly focusing on steps 3 and 4 of the standard. It's crucial to note that the effectiveness of this framework largely depends on the

Table 2: Diferences between UNE 166006:2018 and Extended methodology.

UNE 166006:2018	Extended methodology
1. Identification	1. Identification
2. Planning	2. Planning
3. Search and Treatment 3.1 Search 3.2 Information Treatment 3.3 Information Analysis	3. Search and Treatment 3.1 Search **3.1.1 Filtering Mechanisms** **3.1.2 Verification Instruments** 3.2 Information Treatment 3.3 Information Analysis
4. Added Value of Information 4.1 Generation of the final product	4. Added Value of Information **4.1 Prospective** 4.2 Generation of the final product
5. Storage and Distribution	5. Storage and Distribution

available information. Therefore, certain screening methods and verification tools may vary in applicability based on the data at hand and the institution's specific needs. Nonetheless, our framework serves as a versatile guide, offering various combinations of screening and verification options that can be tailored to fit different needs and budgets. This adaptability makes it a valuable addition to existing standards and a useful resource for organizations of all types.

4 RESULTS

Next, we showcase two instances where the extended framework proposed in this paper was put into practice. We highlight the benefits reaped and the challenges encountered during the implementation of this extended framework. These two cases of study belong to the services provided by CEDIA, a pioneer in the provision of TS services in Ecuador. (CEDIA, 2023).

4.1 Technology Scouting as a Service for Higher Education Institutions

CEDIA has been providing TS reports to Ecuador's academic and industrial sectors since November 2019. As of the time of writing this paper, twenty reports have been published, along with several others created on demand. These reports are designed for a broad audience, including researchers, corporate

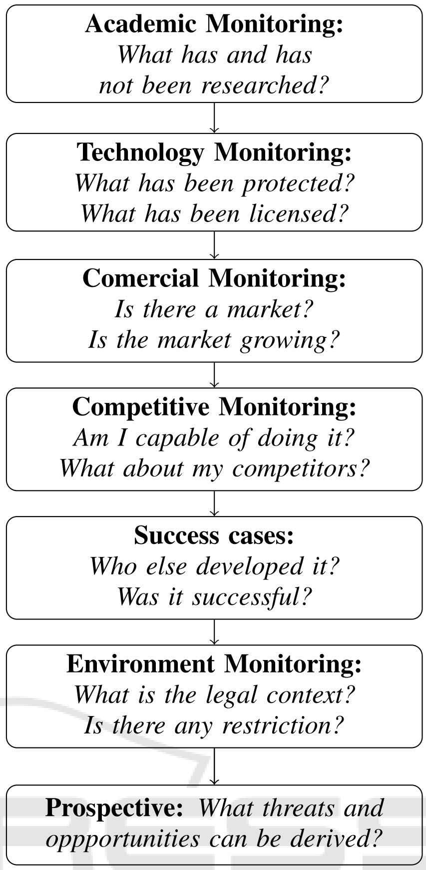

Figure 1: Extended framework: Screening mechanisms and Verification instruments.

executives, entrepreneurs, and public officers. Aimed at providing valuable insights for each type of audience described in Table 3, the primary goal of these reports is to offer a foundation for each audience to progress in their projects based on relevant trends and information.

From 2022 onward, the institution adopted the methodology proposed in UNE: 166006:2018 for the TS process. However, a significant challenge was encountered in the generation of report number 18, published in August 2022, and titled "Innovando el Sector de los Superalimentos" (Innovations in the field of Superfoods) (Lasso and Burbano, 2022) [1]. Moreover, the problem of stagnation points was highly reported in the creation of the report, given the broad spectrum of the topics covered, that are aimed to a highly diverse audience. Additionally, there was no instrument that addressed the risk of information bias. Those issues were encountered given that the standard does not provide specific actions for carrying out the steps 3.1 *"Search"* and for the step 4: *"Added Value of In-*

[1]For access to the report, please write to the authors of this paper

formation".

Table 3: Information needs for each type of target audience of the technology scouting reports.

Stakeholder	Information needs
Academia (Authorities, Researchers, students)	Research opportunities
Technology developers and owners	Technology trends and opportunities
Corporate and industrial executives	Commercial and investment opportunities
All stakeholders	Restriction and incentives
All stakeholders	Innovation and entrepreneurship opportunities

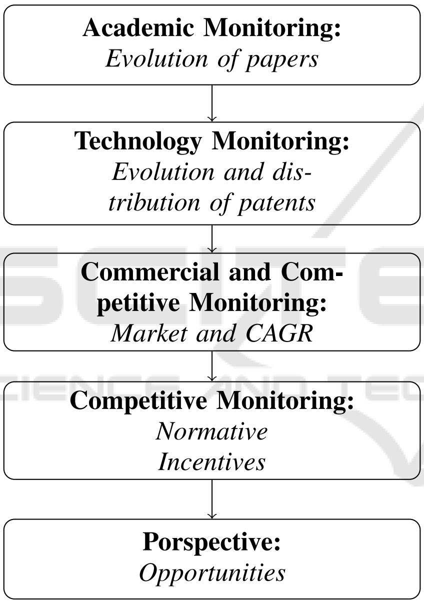

Figure 2: Extended framework implemented for Technology scouting reports as a service by CEDIA.

Consequently, we implemented the extended framework proposed in this paper to adress these shortcomings. We parted form the same information baseline, hence, the original scope of the report developed by (Lasso and Burbano, 2022) is maintained. The scope of the original report focused on gathering and analysing information of 10 superfoods: quinoa, goji berry, dragon fruit, yaca/jackfruit, chia seed, acai berry, turmeric, maca, amaranth and taro root.

Table 3 defines the information needs that the TS had to cover. Therefore the original information needs are used as the benchmark for the exercise using the extended framework proposed in this paper.

The extended framework proposed in this paper adapts its screening mechanisms and verification instruments to the specific needs of the institution. For the report discussed here, we follow the workflow outlined in Figure 1, except for omitting the "Competitive Monitoring" screening mechanism and the "Case of Success" verification instrument. These steps are skipped because the report targets a broad audience rather than a specific institution. As such, it doesn't focus on gathering competitive intelligence or success case studies. Figure 2 elaborates on the screening mechanisms and verification instruments used in this context, based on our extended framework.

Table 4 describes the results from the Technology scouting process of the original report and of the extended framework.

The original report categorizes the collected information into three major trends: Foodstuff, Pharmaceutical Products, and Farming Technologies. While it adequately addresses the information needs for "Research Opportunities" and "Technology Trends and Opportunities," it falls short in other areas. For instance, it provides only general information for "Restrictions and Incentives" and doesn't address "Commercial and Investment Needs" at all. Moreover, the original report's conclusions are based on broad trends and lack specific details for each superfood studied.

In contrast, the extended framework allows for a more granular analysis, focusing on individual types of superfoods. This approach meets all the information needs and will soon be published as an update to the original report. For comparison, Table 4 includes only the most pertinent data gathered through the extended framework. Notably, it identifies Quinoa and Acai as superfoods with the highest potential across research, technological development, and commercial sectors.

Therefore, the extended framework represents a significant improvement in the service provided.

4.2 Technology Scouting as a Service for Innovation

Another example of the extended methodology's aplication in TS is an on-demand project for a medium-sized financial institution in Ecuador. The project aimed to provide the institution with clear, succinct recommendations for implementing new technologies in the financial sector. They were interested in modernizing their services and attract new clients. The client specifically requested a report on the fintech sector's technology landscape, along with targeted recommendations applicable to their context. For the main process, we followed the primary methodol-

Table 4: Stakeholders' Information Needs for Technology Scouting Report "Innovation in Superfoods".

Information Needs	UNE 166006:2018 Standard	Extended framework
Research Opportunities	Most relevant research trend: Pharmaceutical products	Most Researched Superfoods: Turmeric, Amaranth and Quinoa / Superfoods with Greatest Research Growth: Quinoa, Goji and Dragonfruit
Technology Trends and Opportunities	Highest amount of patents: Trends of foodstuff and pharmaceutical products	Highest amount of patents: Turmeric, Quinoa and Goji / Fastest Growth in Patent Publication: Jaca, Quinoa and Acai
Commercial and Investment Opportunities	No specific information on the trends previously identified.	Biggest superfood markets: Quinoa, Dragonfruit and Acai / Superfood Markets with Faster Growth: Amaranth, Quinoa and Acai
Restrictions and Incentives	No specific information on the trends previously identified. Ecuadorian Cluster Superfood was developed to promote the development of the market.	In Ecuador, every crop must comply with the Organic Law on Agrobiodiversity, Seeds and Promotion of Agriculture (LOASFAS) and the National Agency for Regulation, Control and Health Surveillance (ARCSA). The Ecuadorian Cluster for Superfoods provides funding for the development of crops, with $76,000.00 spent in 2022 to promote the development of superfood companies.
Innovation and Entrepreneurship Opportunities	"No specific opportunities or threats extracted. Pharmaceutical products is the trend with the highest research and technology development. Foodstuff possesses a fair amount of research. No specific conclusions on farming products."	Results have been refined with filtering mechanisms and validated through verification methods. Among superfoods, Quinoa and Acai hold the most prominence in academia, intellectual property, and the market.

ogy outlined in UNE 166006:2018. The information needs for this project are detailed in Table 5.

Table 5: Information needs for TS in the Financial Sector.

Information Needs	Topic
Commercial Technologies	Which technologies have been adopted or developed that could be emulated to enhance our services and expand our client base?
Timeline	What is the expected implementation timeline for each of these new technologies?

Subsequently, we implemented the proposed modifications for the steps 3 and 4 of UNE 166006:2018. As previously noted, one notable advantage of our proposed methodology is its adaptability to adapt through different combinations of screening mechanisms and verification instruments. As this was an on-demand service, we align the scope and details of the exercise to the client's budget and expectations. This meant applying only the screening mechanisms and verification methods that would generate information within the scope requested by the client. The specific screening mechanisms and verification methods used for this exercise are illustrated in Figure 3.

The proposed extended framework allowed us to:

- Identify potential technologies: The first screening mechanism allowed us to identify technology trends and relevant patents that are being protected and launched into the market.
- Identify markets with the highest potential: The second screening mechanism serves as a filter for technologies already established in markets with high value and growth rate.
- Validate the feasibility of their implementation: Through the study of success cases, we can confirm the succes of implementing these new technologies. While this may represent a non-disruptive approach, it is suitable for institutions that prefer a more conservative stance towards venture investments.
- Extraction of objective recommendations for technology implementation along with a timeline:

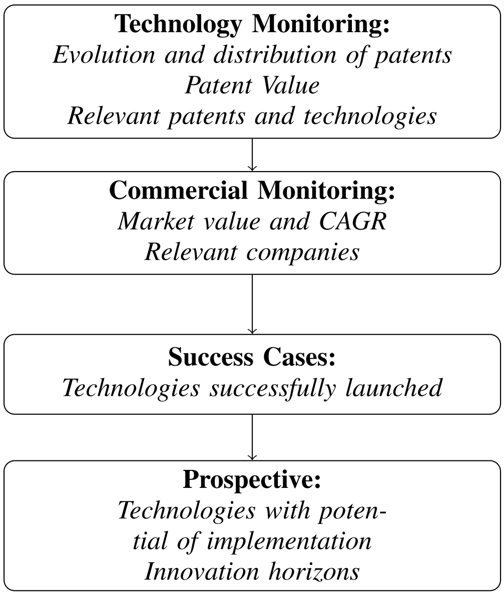

Figure 3: Extended framework applied to the case of TS for a finnacial institution.

Once these filters and the verification instrument are established, we extract insights that address the institution's information needs. The use of screening mechanisms and verification indeed reduce the level of information bias.

Through the utilization of the extended framework, we were able to cover the needs of the financial entity that requested the technology scouting report in a strictly objective manner, providing specific recommendations on which new technologies might be beneficial for them to implement. These recommendations were supported by an organized filtering process, which allows us to ensure the relevance of these technologies and their markets. In many cases, their effectiveness and success has already been proven.

5 CONCLUSIONS

We have presented an extended framework for the process of TS described in UNE 166006:2018. The extended framework aimed to address the issues of stagnation points and information bias previously identified during TS process. The extended framework was applied in two cases of study.

For the first case, the extended framework was applied a TS case done by CEDIA in order to validate its advantages. Report 18, called "Innovando en el sector de los superalimento" (Lasso and Burbano, 2022),was regenerated with the extended framework, which allowed to establish a clear pathway for collecting and filtering relevant information for the innovation ecosystem. The screening mechanisms allowed to collect specific information on each type of superfood, thus meeting each information need previously defined. Additionally the use of verification instruments identified specific technological insights, enabling the extraction of research, development, and innovation opportunities.

In the second case study, the extended framework was applied to a technology scouting service provided to a financial institution in Ecuador. Once again, the reduction of stagnation points was confirmed, and the extended framework effectively addressed the institution's information needs, enhancing the trustworthiness of the extracted recommendations. The final conclusions possess a high level of objectiveness.

Based on these two cases of study, the implementation of this extended framework has shown significant potential for enhancing the efficiency of the TS process in institutions that have already adopted the UNE 166006:2018 standard. Additionally, the screening mechanisms and verification instruments could theoretically be tailored to any field of knowledge and replicated in various types of organizations. The two main advantages of this extended framework are the reduction or elimination of stagnation points and the objective value derived from the information extracted, which is reflected in the prospective process's recommendations and conclusions. These advantages can enhance the effectiveness of the technology scouting process within institutions of the innovation ecosystem.

Further research is necessary to validate the efficacy of the extended framework in different environments and among various types of innovation actors. While theoretically, the extensions proposed in this paper could be applied to any field of knowledge, further research is needed to test the adaptability of the extended framework. More validation exercises are expected to be conducted in the future, however as the work developed by (Rottensteiner and Ploder, 2022) affirms, the benefits of extensions to methodologies described in international standards has been proven. It is imperative to state that the availability of information is still the critical factor when conducting TS. Limited information, particularly in disruptive technologies, can impede the clear combination of screening mechanisms and verification instruments. Moreover, for broad topics or ill-defined information needs, the combination of screening mechanisms may inadvertently exclude important information that could impact the TS outcomes. Thus, as recommended in UNE 166006:2018, a well-defined identification process and planning for technology scouting remain imperative. The use of this extended framework outside the scope of UNE 166006:2018, as well as the use of screening mechanism and verification instruments separately, is beyond the scope of this paper.

ACKNOWLEDGEMENTS

This research was developed thanks to the support of CEDIA through the funding of the project ”Conformacion de una Unidad de VTIC y Red de Expertos” (Formation of a Technology Scouting and Intelligence Unit and Network of Experts).

REFERENCES

Aguirre, M. F. (2020). Vigilancia tecnológica: qué es, tipos y ventajas para la empresa.

Arman, H. and Foden, J. (2010). Combining methods in the technology intelligence process: application in an aerospace manufacturing firm. *R&d Management*, 40(2):181–194.

Ashton, W. B., Kinzey, B. R., and Gunn, M. E. (1991). A structured approach for monitoring science and technology developments. *International Journal of Technology Management*, 6(1-2):91–111.

Best, P. (2010). Delivering maximum strategic value with market monitoring.

CEDIA (2023). Vigilancia Tecnológica (VTIC).

Comai, A. (2011). Inteligencia competitiva: logros y desafíos. *Profesional de la información*, 20(5):489–494.

Kosenko, O. P., Kobielieva, T. O., and Tkachova, N. P. (2017). Monitoring the commercial potential of intellectual property. Науковий вісник Полісся, (1 (2)):140–145.

Lasso, D. and Burbano, A. (2022). Innovando el sector de los superalimentos.

Levine, S. S., Bernard, M., and Nagel, R. (2017). Strategic intelligence: The cognitive capability to anticipate competitor behavior. *Strategic Management Journal*, 38(12):2390–2423.

Mina, A., Bascavusoglu-Moreau, E., and Hughes, A. (2014). Open service innovation and the firm’s search for external knowledge. *Research Policy*, 43(5):853–866.

Phaal, R., Farrukh, C. J., and Probert, D. R. (2004). Technology roadmapping—a planning framework for evolution and revolution. *Technological forecasting and social change*, 71(1-2):5–26.

Randieri, C. (2023). Council Post: The Role Of Scientific Research In Driving Business Innovation. Section: Innovation.

Rohrbeck, R. (2010). Harnessing a network of experts for competitive advantage: technology scouting in the ict industry. *R&d Management*, 40(2):169–180.

Rohrbeck, R. and Kum, M. E. (2018). Corporate foresight and its impact on firm performance: A longitudinal analysis. *Technological Forecasting and Social Change*, 129:105–116.

Rottensteiner, A. and Ploder, C. (2022). Identifying and assessing knowledge gaps in iso 9001 certified smes using a knowledge audit framework. In *Proceedings of the 14th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management, Valletta, Malta*, pages 158–162.

Savioz, P. (2006). Technology intelligence systems: practices and models for large, medium-sized and start-up companies. *International Journal of Technology Intelligence and Planning*, 2(4):360–379.

Simpson, S. (2018). (5) The Three Biggest Challenges in Scouting New Tech and Emerging Trends | LinkedIn.

Stute, M., Sardesai, S., Parlings, M., Senna, P. P., Fornasiero, R., and Balech, S. (2021). Technology scouting to accelerate innovation in supply chain. *Next generation supply chains: A roadmap for research and innovation*, pages 129–145.

Timimi, I. and Chaudiron, S. (2008). Information filtering as a knowledge organization process: techniques and evaluation.

ul Hasnain Kazmi, S. (2016). 11 - managing common financial risks. In Green, P. E., editor, *Enterprise Risk Management*, pages 151–160. Butterworth-Heinemann, Boston.

UNE (2018). Gestión de la I+D+i: Sistema de vigilancia e inteligencia.

Wang, C.-H. and Quan, X. I. (2021). The role of external technology scouting in inbound open innovation generation: Evidence from high-technology industries. *IEEE Transactions on Engineering Management*, 68(6):1558–1569.