CASE STUDY ON THE CONCEPTION AND IMPLEMENTATION OF KNOWLEDGE MANAGEMENT IN A BRAZILIAN INNOVATION INSTITUTE

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Abstract: *This case study paper outlines the approach and experiences gained in a KM project conducted between two continents. The project scope comprises the systematic initiation, design and implementation of a comprehensive knowledge management system at a SENAI Innovation Institute in Rio de Janeiro, Brazil. The practical business process-oriented KM methodology of the Berlin-based Competence Center Knowledge Management at Fraunhofer IPK, was used to define KM goals, to analyze strengths and weaknesses in knowledge handling and to set up customized KM action programs.*

Keywords: case study, diagnosis, KM solutions, monitoring, SENAI

Resumo: *Este estudo de caso descreve a abordagem e as experiências adquiridas em um projeto de gestão do conhecimento realizado entre dois continentes. O âmbito do projeto inclui o início sistemático, o desenho e a implementação de um sistema abrangente de gestão do conhecimento num Instituto SENAI de Inovação no Rio de Janeiro, Brasil. A metodologia prática de GC orientada para o processo empresarial do Centro de Competência de Gestão do Conhecimento do Fraunhofer IPK, sediado em Berlim, foi utilizada para definir objetivos, analisar os pontos fortes e fracos no tratamento do conhecimento e criar programas de ação de GC personalizados.*

Palavras-chave: estudo de caso, diagnóstico, soluções GC, monitoramento, SENAI

Resumen: *Este estudio de caso expone el enfoque y las experiencias adquiridas en un proyecto de gestión del conocimiento llevado a cabo entre dos continentes. El alcance del proyecto comprende el inicio sistemático, el diseño y la implementación de un sistema integral de gestión del conocimiento en un Instituto de Innovación SENAI en Río de Janeiro, Brasil. Se utilizó la metodología práctica de gestión del conocimiento orientada a los procesos empresariales del Centro de Competencia de Gestión del Conocimiento del Fraunhofer IPK, con sede en Berlín, para definir los objetivos, analizar los puntos fuertes y débiles, y establecer programas de acción de gestión del conocimiento personalizados.*

Palabras clave: estudio de caso, diagnóstico, soluciones de gestión del conocimiento, supervisión, SENAI

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1 INTRODUCTION

Since 2012, Fraunhofer IPK has been supporting the Brazilian industrial training service SENAI in setting up 26 innovation institutes based on the Fraunhofer model of applied research in order to strengthen the competitiveness of Brazilian companies (Kohl, Will, Prim & Pavim, 2020). The SENAI Innovation Institute (ISI) for Biosynthetics and Fibres (BF) in Rio de Janeiro is one of the most successful institutes of the SENAI ISI network. After a phase of rapid growth up to 100 researchers and employees in roughly five years of operation, the ISI BF began to face typical challenges of knowledge management (KM). When starting a respective initiative internally, the ISI in Brazil asked Fraunhofer IPK's Competence Center Knowledge Management (CCKM) in Germany for methodological support. This case study describes the conceptual approach used, from the definition and analysis of the KM goals to the solution, the measures and the KM controlling. The process is characterized by a participatory approach in which institute staff have been extensively involved in the different phases of the KM initiative.
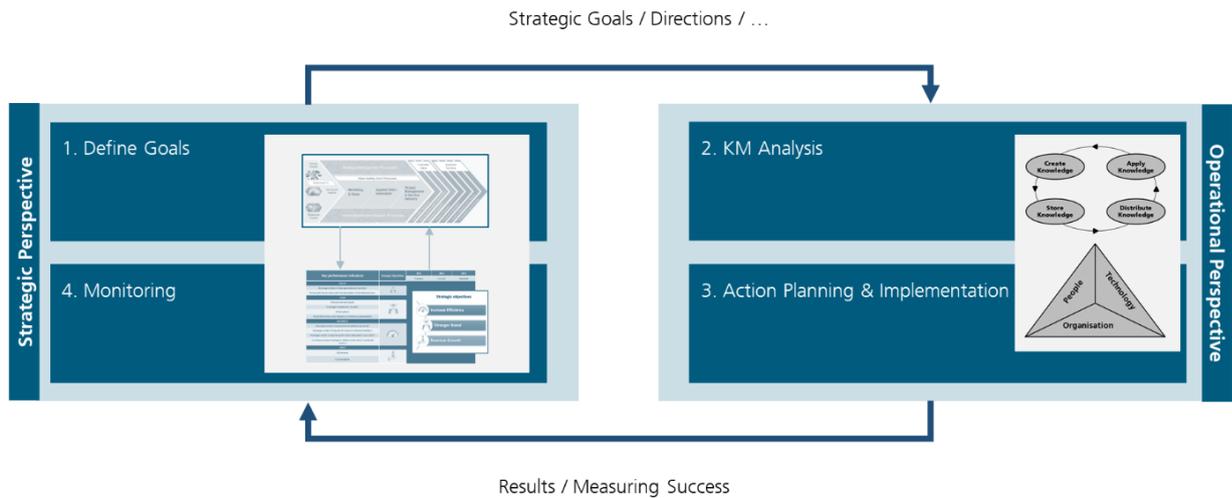
2 CONCEPTUAL APPROACH

The underlying conceptual approach of KM implementation is based on an integrative view of the strategic and operational perspectives of knowledge management. This is based on the understanding that KM is not an end in itself, but must make a clear, comprehensible contribution to the overarching organizational goals (DIN ISO, 2021).

The challenge for organizations is to link knowledge management to the corporate and business strategy and to continuously review the effectiveness and goal achievement of knowledge management measures. Only in this way can the central questions of the implementation and control of knowledge management in the organization be clarified: Where is it most worthwhile to invest? What contribution does knowledge management make to the organization's success? (Orth & Mertins, 2016).

The presentation and measurement of the achievement of objectives and the contribution to success of measures enable effective controlling in the phase of implementation and ongoing control of knowledge management. This connection can be depicted as a cycle that links the strategic level with the operational level of knowledge management (Mertins & Orth, 2006) in the context of knowledge-oriented corporate management (figure 1).

Figure 1 – Conceptual Approach

Source: own illustration (2023)

Strategically oriented knowledge management creates transparency about the relationship between an organization's intellectual capital and its business success (Will, 2015). This clarity enables management to derive clear goals, to invest more effectively and with more foresight, and leads internally to a constructive discussion of the strengths and weaknesses of the organization.

At the operational level, the comparison of the uncovered deficits with the originally set goals of the organization opens up the space for action for the use of knowledge management methods. Here, the business process as the "place" of knowledge creation and use is the central starting point for the introduction of knowledge management (Mertins, Kohl & Orth, 2016).

At the operational level, the comparison of the identified deficits with the goals of the organization opens up the scope for the use of knowledge management methods. When planning and implementing KM solutions, it is important to consider that they contribute to a closed loop of KM core activities (Voigt, 2016). Accordingly, it is crucial that the right knowledge is developed internally or obtained from the external environment of the company (create knowledge), that existing knowledge is secured and is available at the right time in the right places (store knowledge, distribute knowledge), so that it can be used there in a targeted manner to fulfil tasks (apply knowledge) (Will, Orth & Budde, 2023).

Since the handling of knowledge is partly beyond direct control, the organizational context must be designed when introducing knowledge management. Organizations should therefore consider the three design dimensions of KM: people, organization and technology (Finke & Will, 2005).

The combination of both knowledge management perspectives closes the gap between one-sided strategically oriented procedures on the one hand and operationally oriented procedures on the other. This results in a closed, holistic concept whose strength lies in the expansion of the knowledge-based view to the entire organization.
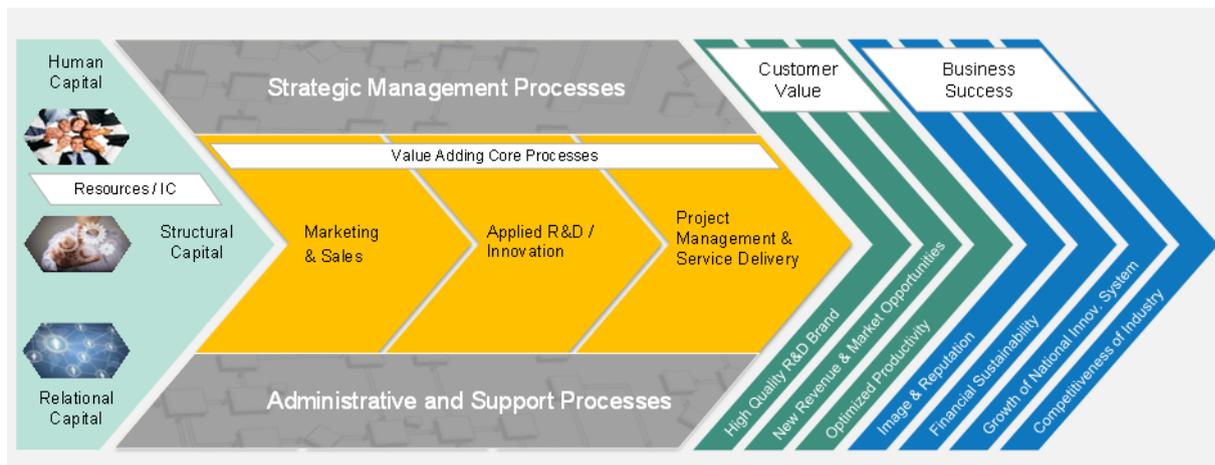
Based on this understanding, this paper describes a case study that presents methods and solutions for dealing with knowledge at the strategic and operational levels and illustrates them with selected solutions and experiences (Will, Orth, Budde, Neumann & Santos, 2022).

3 STRATEGIC PERSEPCTIVE

3.1 STRATEGIC KM GOALS

Even if, as in many organizations, there is no formulated corporate strategy, it is essential for the success of knowledge management initiatives that a clear content link to organizational goals is established. In this case, the existing model for the strategic management of the SENAI Innovation Institutes (Will, 2020) was used. It links an organization's business strategy with the intangible resource base and value-adding business processes as drivers of customer value and business success (figure 2).

Figure 2 – Management Model of ISI

Source: own illustration (2022)

Especially the "business success" dimension operationalizes the key strategic objectives and served as a starting point for the discussion with the directorate and KM team to link the need for KM to these overall business objectives. Against this background, an initial set of strategic KM objectives for the institute was derived:

- *Develop our business and boost revenue growth* by (1) combining knowledge and fostering synergies between our technological platforms and research groups, (2) creating new application ideas to trigger demand ("tech. push projects"), (3) leveraging our potential to produce breakthrough innovations with higher added value for our customers.
- *Increase efficiency and reduce costs* by (1) using existing knowledge systematically to avoid double work, (2) re-using newly created knowledge and transferring competencies from one project to the next application context, (3) retaining crucial knowledge when key people leave and (4) increasing speed in administrative processes, harmonize procedures.
- *Strengthen our brand and reputation* by (1) building up new knowledge and showcasing pre-work to reduce R&D risks for our clients, (2) showing "hidden" competencies to build confidence and to communicate the "unknown", (3) institutionalizing reputation through professional handling of knowledge.

3.2 MONITORING (KPI SYSTEM)

The framework outlined above helps to be able to constantly refer back to the overall objectives in the later course of KM initiatives. This also makes it possible to examine the impact of individual KM measures, align them and derive appropriate controlling instruments for the implementation and operational phases. KPIs or other instruments for measuring success then form the bridge between individual KM measures, the improvements they achieve at the operational level and the higher-level organizational goals.

Against this background, ISI BF has developed its own monitoring system, which on the one hand uses the strategic KM objectives as a reference, and on the other hand, takes into account the KM core activities (create, store, distribute and apply knowledge). This makes it possible to continuously monitor selected KM measures, define target values and continuously monitor the actual status (figure 3).

The selected indicators were chosen according to distinctive inputs and outputs of the research institute, such as the number of articles and patents applied, participation in scientific events, revenue and sustainability, parameters that are directly monitored to assess the maturity of these institutions. Other parameters, such as lessons learned reports and data referring to the use of the knowledge platform to be developed, seek to bring perspectives of the KM tools.

It is important to point out that all the indicators are still being evaluated and tested to understand their adherence. Thus, new parameters can also be raised throughout the project.

Figure 3 – KM Monitoring System of ISI BF

KM Core Activity	Key Performance Indicators (KPI)	Strategic KM Objective
Create knowledge	# average number of ideas generated per semester # external/internal events with participation of the technical team	Strengthen our brand and reputation
Store knowledge	# lessons learnt reports % average competences on "alert" # filed patents # scientific articles, book chapters or conference presentations	Strengthen our brand and reputation
Distribute knowledge	# average number of accesses to the KM platform per month # average number of requests for access to information/folders # average number of searches on the KM platform per month % of lessons learnt meetings in relation to total projects completed	Increase efficiency and reduce costs
Apply knowledge	R$ revenue % Financial sustainability	Develop our business and boost revenue growth

Source: own illustration (2023)

4 OPERATIONAL PERSPECTIVE

4.1 KM ANALYSIS

The analysis of the strengths and weaknesses in dealing with knowledge at the ISI BF was carried out via an online survey. Following the KM approach outlined above, the survey was divided into three parts: (1) knowledge domains, (2) KM core activities, (3) KM framework conditions. For this purpose, a well-proven questionnaire from Fraunhofer IPK was used (Kohl, 2016). In order to adapt this to the requirements of the ISI BF in advance, a knowledge map was first created in which the most important knowledge domains of the institute were captured and described. Furthermore, short descriptions of the central value-adding business processes were created, which were derived from the management model (cf. figure 1).

More than 100 employees of the institute from different areas and functional levels took part in the survey. The key results of the survey are described below.

4.1.1 Knowledge domains and business processes

Figure 4 shows an assessment of the relevance of specific knowledge domains based on the institute's core business processes. It is obvious that the Marketing & Sales Process and the Innovation Process (Applied R&D) are particularly knowledge-intensive and require the integrative use of different knowledge areas.

Figure 4 – Analysis Results of ISI

Source: own illustration (2022)

Considering the importance of the knowledge domains across all three business processes, the following areas can be identified as particularly critical to success of the organization:
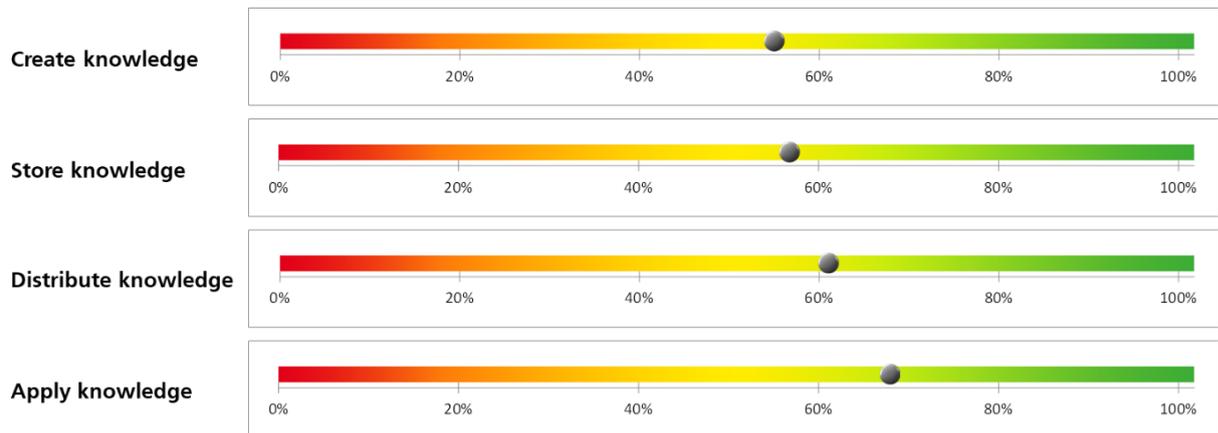
1. Expert knowledge
2. Knowledge about projects
3. Knowledge about customers
4. Knowledge about the own organization
5. Knowledge about product and services

4.1.2 KM core activities

The aggregated evaluation of the KM core activities shows that the respondents see particular strengths in the application of available knowledge. With regard to the creation and storage of knowledge, potential for improvement was identified in particular in the areas of knowledge about projects, customers and markets (e.g. lack of project reflections and market

analysis). Furthermore, storage of explicit knowledge (retrieval and provision of data) was rated as in need of improvement. With regard to knowledge distribution, synergies between research groups (cross-departmental exchange of experience) can be further expanded (figure 5).

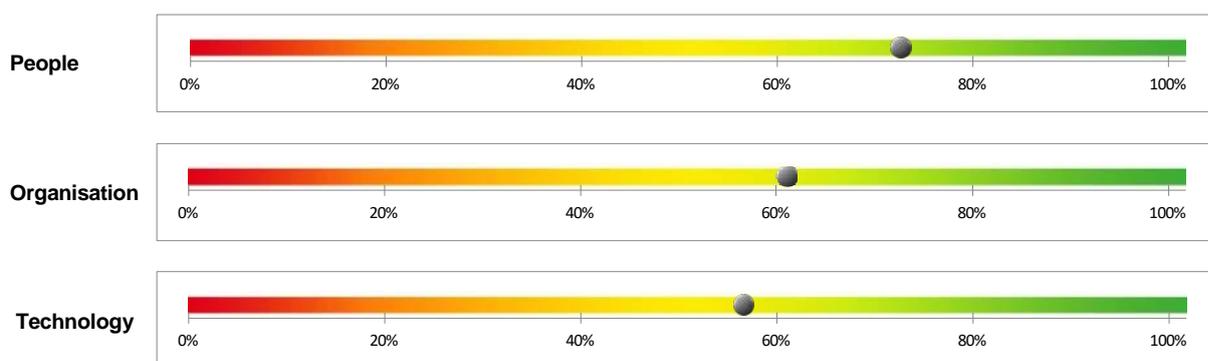Figure 5 – Analysis Results of ISI: KM Core Activities

Source: own illustration (2022)

4.1.3   KM framework conditions

With regard to the KM framework conditions, the knowledge sharing culture was identified as a particular strength of the institute, which is reflected in a strongly person-oriented KM approach. With regard to the dimension "organization", the transparency of processes and experts within the institute was rated as requiring improvement. The respondents saw the greatest need for action in the dimension "information technology". In addition to the fast retrieval of information, the training of employees in the use of the systems was rated as in need of improvement (figure 6).

Figure 6 – Analysis Results of ISI: KM Framework Conditions
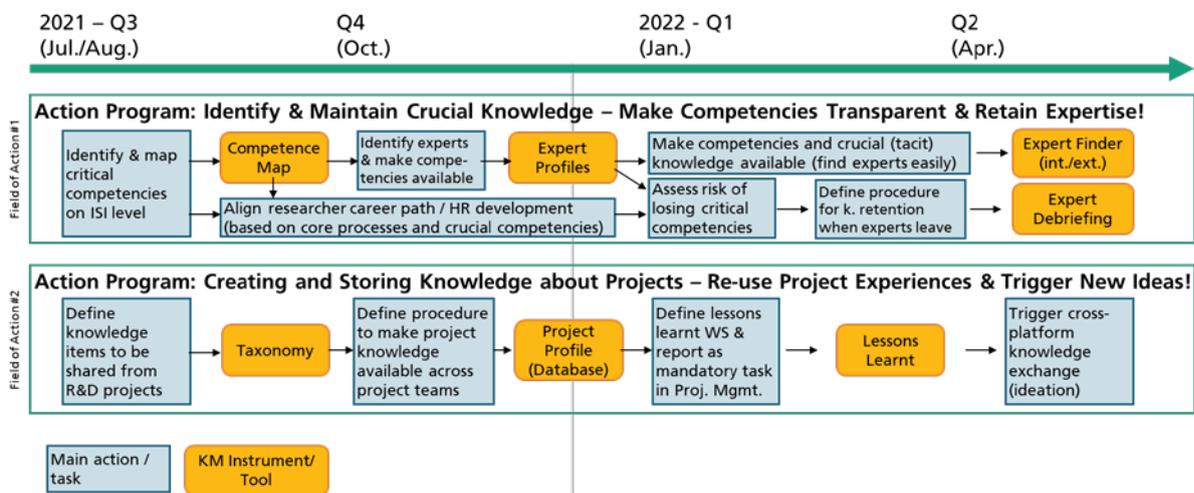

Source: own illustration (2022)

4.2 KM SOLUTIONS (IMPLEMENTATION)

4.1.1 Action Roadmap

Using the combined results of the strategic goal definition, the knowledge map, the business processes described and the strengths and potential for improvement identified through the online survey, a roadmap with the selected KM solutions was developed

The horizontal action programs comprise the essential measures to be taken to achieve the specific goals. The upper action program aims to identify and maintain success-critical knowledge in the organization. This program bundles various measures to build a competence map, from expert profiles to an expert finder over the course of a year. The second action program refers to the identified potential for improvement in generating and storing knowledge about projects and provides for the establishment of a corresponding taxonomy, database-supported project profiles and a systematic procedure for extracting and documenting lessons learned from ISI's R&D projects (figure 7).

Figure 7 – Action Roadmap ISI Biosynthetics and Fibres

Source: own illustration (2022)

Against this background, the following sections present results, procedures and experiences from the planning and implementation of selected KM solutions at ISI BF.

4.1.2 Competence Map

The Competence Map seeks to develop expert profiles that are available to all researchers and that can be used to support the analysis of the current and future status of the institute's technical competencies.

The process begins with the researchers filling out a questionnaire, where they will inform about their level of knowledge on each technical competence. Good adherence (close to 60%) was noted in completing the questionnaire, making it possible to identify a good number of specialists. Then the results are analyzed, mainly considering mapping the specialists and also what we called "competences on alert", that refer to competencies that have zero or one expert in the institution. For the competencies considered to be on alert, an action plan is developed for the short, medium and long term, considering also the priority level.

Some insights from this solution are that the action plan based on the evaluation needs to be carried out as soon as possible due to the high turnover and that an approach more focused on infrastructure skills should be tested.

4.1.3 Knowledge Hub 2.0

The Knowledge Hub is an internal platform developed seeking to establish an internal corporate portal that makes available the tacit knowledge produced and also provides tools for a better distribution of this knowledge among researchers. Its structure was built based on a preliminary taxonomy created together with some researchers from different technical areas, in order to be able to map the different types of existing knowledge that can be stored in it.

With the advancement of the development of the portal, several issues were raised, regarding data security and even about the use of data generated by the institute, which must respect the guidelines of the Brazilian law on the subject (Lei Nº 13.709 - General Law of Protection of Personal Data). These questions need to be turned into internal policies before making the information available to all researchers.

4.1.4   Lessons Learned

The lessons learned process was designed to monitor the developments generated during the projects, seeking not only to assess risks and challenges, but also opportunities perceived during the project. For this, a face-to-face meeting is held with the presence of a neutral moderator who addresses different points about financial management, relations with partner companies, relations with other partners (universities, other ISIs and ICTs), team relations, technical review and risk management. This meeting generates a report that is stored in the Knowledge Hub.

Some interesting results could be observed, such as the good reception to the practice (therapy moment feeling), the exchange of best practices between the different technical sectors involved in the project, in addition to the exchange between more experienced and less experienced researchers. This last observation generated the demand to hold the meeting necessarily with the presence of newly admitted or less experienced researchers.
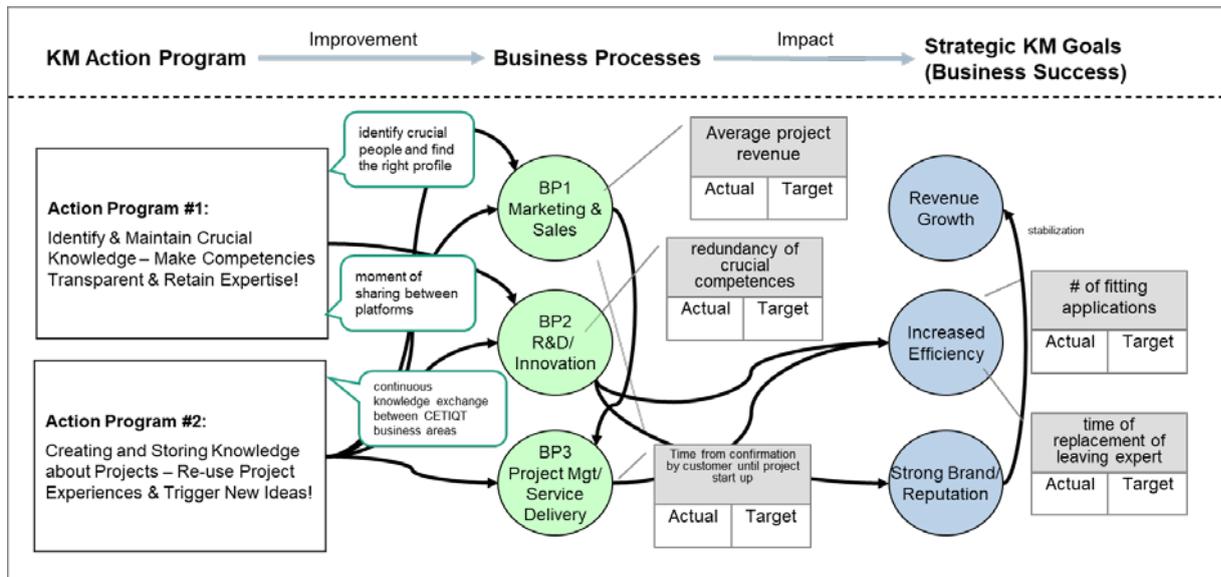
The next step towards this solution will be to transform the collected observations into a strategic plan to solve challenges and propose new opportunities.

5   CONNECTING THE STRATEGIC AND OPERATIONAL KM PERSPECTIVE

In order to make the connections between the strategic and operative KM perspective more visible, impact maps were used. For this purpose, the elements of the ISI Management Model (figure 2) are linked to selected measures of the KM action program.

As shown in figure 8 the concrete actions – bundled into meaningful action programs – have to be aligned and geared towards operational improvements on the level of the value-adding business processes of the organization, which shall directly help to achieve the strategic KM goals, which, in return, would generate a positive impact on the aspired business objectives. In addition, it is possible to use selected indicators to map the objectives and the status quo in the impact maps.

Figure 8 – Impact diagram to link actions with business processes and strategic KM goals

Source: own illustration (2022)

6 DISCUSSION AND REFLECTION

In this article, a systematic approach to planning and implementing KM was described and illustrated with a case study of a Brazilian research institute. The approach outlined combines a strategic and operational, business process-oriented perspective of knowledge management. All phases of the approach were characterized by the involvement of the institute's employees in the analysis, design and implementation of the KM initiative. After the beginning of the project, different people from different sectors of the institute had contact with the concept of knowledge management and it has been seen that it is reinforced in several speeches during strategic meetings in order to better use resources in the institution and generate greater value and revenue. This made it clear to all involved that KM is not an end in itself, but must contribute to achieving the overall goals of the organization.

In the overall, the application of the proven KM methods from the European side at the ISI for Biosynthetics & Fibres in Brazil can be assessed as a successful and systematic initiation of the KM initiative which is ongoing and will produce further results and learnings in the future. The extracted lessons learned, once more, showed that a well-structured methodological KM approach is good and important, but not enough: it should be seen as a basis to constantly adapt and translate the single steps and KM actions into internal communication and involvement, always making sure that the connection to the overall strategic objectives is assured and visible for all levels of staff and the different roles in the organization.

REFERENCES

DIN ISO (2021). Knowledge Management Systems – Requirements (DIN ISO 30401:2021-02). Retrieved from https://www.beuth.de/de/norm/din-iso-30401/331113422

Finke, I., & Will, M. (2005). Mitarbeiterorientierte Einführung von Wissensmanagement. In: Barske, Heiko/Gerybadze, Alexander/Hünninghausen, Lars/Sommerlatte, Tom (Eds.): *Das innovative Unternehmen – Produkte, Prozesse, Dienstleistungen (Digitale Fachbibliothek)*, Düsseldorf, Nr. 2012.01.01, S. 1-58.

Kohl, I. (2016). Den Status quo im Umgang mit Wissen erkennen. In: Kohl, H., Mertins, K. und Seidel, H. (Eds.): *Wissensmanagement im Mittelstand. Grundlagen - Lösungen - Praxisbeispiele.* 2. vollständig überarbeitete und ergänzte Auflage. Heidelberg: Springer Gabler, pp. 53–61.

Kohl, H., Will, M., Prim, M. F., & Pavim, A. X. (2020). Building up a national network of applied R&D institutes in an emerging innovation system. *Production*, 30, e20190151. DOI: http://dx.doi.org/10.1590/0103-6513.20190151

Mertins, K., Kohl, I., & Orth, R. (2016). Ein Referenzmodell für Wissensmanagement. In: Kohl, H., Mertins, K. und Seidel, H. (Eds.): *Wissensmanagement im Mittelstand. Grundlagen - Lösungen - Praxisbeispiele*. 2. vollständig überarbeitete und ergänzte Auflage. Heidelberg: Springer Gabler, pp. 31–40.

Mertins K., & Orth, R. (2006). Strategisches und operatives Wissensmanagement – Ein ganzheitlicher Ansatz. VDI-Berichte 1964:3–24.

Orth, R., & Mertins, K. (2016). Wissensorientierte Analyse und Gestaltung von Geschäftsprozessen. In: Kohl, H., Mertins, K. und Seidel, H. (Eds.): *Wissensmanagement im Mittelstand. Grundlagen - Lösungen - Praxisbeispiele*. 2. vollständig überarbeitete und ergänzte Auflage. Heidelberg: Springer Gabler, pp. 63–71.

Voigt, S. (2016). Wissensmanagement-Lösungen auswählen. In: Kohl, H., Mertins, K. und Seidel, H. (Eds.): *Wissensmanagement im Mittelstand. Grundlagen - Lösungen - Praxisbeispiele*. 2. vollständig überarbeitete und ergänzte Auflage. Heidelberg: Springer Gabler, pp. 107–113.

Will, M. (2020). Integrated Strategy Development Based on Intangibles. In: P. Ordónez de Pablos & L. Edvinsson (Eds.): *Intellectual Capital in the Digital Economy*. New York: Routledge, pp.74-94.

Will, M. (2015). Intellectual Capital Statement as a Strategic Management Tool – The European Approach. In: Ordoñez de Pablos, P.; Edvinsson, L. (Eds.): *Intellectual Capital in Organizations. Non-Financial Reports and Accounts*. New York: Routledge Chapman & Hall, pp. 93-108.

Will, M., Orth, R., & Budde, F. (2023). Wieviel Essentials stecken in den neuen Wissensmanagement-Standards? Ein Erfahrungsbericht. In: Gesellschaft für Wissensmanagement e.V. (Eds.): *Knowledge Management Essentials*. Das Kuratierte Dossier, Band 5, März 2023. ISSN Online 2940-1380.

Will, M., Orth, R., Budde, F., Neumann, F., & Santos, V. (2022). Implementing a European KM Approach in a Brazilian Innovation Institute on a Remote Basis. Proceedings of the *23rd European Conference on Knowledge Management*, Vol. 23 No. 2 (2022), S. 1230-1240. DOI: https://doi.org/10.34190/eckm.23.2.623