Implementing a European KM Approach in a Brazilian Innovation Institute on a Remote Basis

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Abstract: This case study paper outlines the approach and experiences gained in a KM project conducted between two continents on a completely remote basis – due to the pandemic in 2021. The project scope comprises the systematic initiation, design and implementation of a comprehensive knowledge management system at an innovation institute in Rio de Janeiro, Brazil. The practical business process-oriented KM (BPO-KM) methodology of the Berlin-based Competence Center Knowledge Management at Fraunhofer IPK, was used to define KM goals, to analyze strengths and gaps in knowledge handling and to set up customized KM action programs. Starting with the examination of the institute's business strategy, the overall KM goals were derived together with the institute's top management and KM core team. According to the holistic KM approach on the levels "People, Organization, Technology", an online survey ("KM Fitness Check") was conducted with over 100 respondents. The survey results were discussed in an online kick-off workshop in order to prioritize the main strategic and operational KM challenges. In online breakout sessions with different working groups, using collaborative online tools, the knowledge flows inside the institute's value adding core processes were analyzed in depth ("KM Process Profiles"). In parallel, the KM core team was supported to develop a map of the institute's crucial knowledge to serve as a common taxonomy for the research groups and administrative functions involved in the KM project, such as HR, IT and project management office. After this initial analysis phase, suitable solutions for the main KM challenges were designed and transformed into three main action programs to start the actual implementation of the institute's KM system. In a preliminary evaluation, a systemic controlling logic was defined to keep track on results, benefits and impacts of the KM actions regarding the institute's business strategy. Major learnings, discussed in this paper, include the following findings: a) accompanying change management and communication from the beginning is key to keep motivation high, b) connecting KM to other organizational functions is crucial to anchor KM in the organization, c) remote and online project collaboration bears advantages and drawbacks.

Keywords: Business Process-Oriented KM, Brazil, KM Fitness Check, Business Strategy, Change Management

1. Introduction

Since 2012, Fraunhofer IPK has been assisting the Brazilian industry training service SENAI with establishing 25 innovation institutes based on Fraunhofer's applied research model. The establishment of this national network of innovation institutes was triggered by the Brazilian industry's demand to increase added value in the national economy and supply chains through technological development and applied research, generating direct benefit for Brazilian companies and enhancing their competitiveness on the global market (Kohl et al. 2020).

The SENAI Innovation Institute (ISI) for Biosynthetics and Fibres in Rio de Janeiro is one the most successful institutes inside this network. After a phase of rapid growth – up to 100 new researchers and employees in roughly five years of operation – the ISI for Biosynthetics began to face typical challenges of knowledge management (KM). In a nutshell, a more systematic way of handling the key resource of an applied research institute, knowledge, was needed. When starting a respective initiative internally, the ISI in Brazil asked Fraunhofer IPK's Competence Center Knowledge Management (CCKM) in Germany for methodological support.

In this paper, the used methodological approach from KM goals definition and analysis to solution, actions and KM controlling is described with a focus on the practical results of this case of international collaboration on a completely virtual basis between June and December 2021 due to the COVID-19 pandemic.

2. Methodology

The methodological core of this KM project at ISI Biosynthetics & Fibres in Rio de Janeiro is based on a Business Process-Oriented Knowledge Management approach. This approach includes a specific and systematic connection to the strategic level of KM in the initialization phase and in the evaluation/controlling phase as well as an additional focus on the accompanying aspect of change management and internal communication. This is especially relevant for the analysis and solution/implementation phase. In this regard, the KM project followed the logic of CCKM's holistic approach to KM in three main pillars (Mertins, Orth 2006):
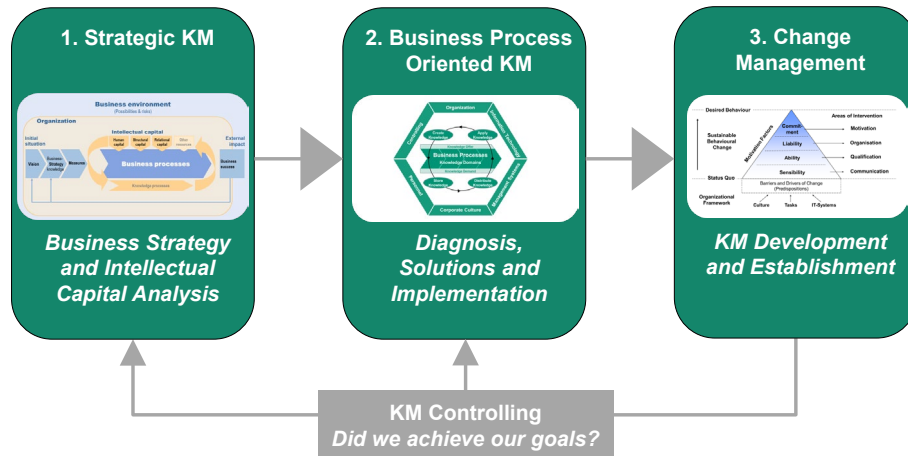

Figure 1: Holistic KM Approach of Competence Center Knowledge Management at Fraunhofer IPK

The approach outlined above fulfils requirements for the operation of knowledge management in the sense of a management system according to current standards and specifications as recently published, e.g. ISO 30401, DIN SPEC 91443. These standards provide guidance on the planning, implementation, monitoring and continuous development of systematic knowledge management. In addition to the orientation towards the company's strategy and goals, the definition of priorities and areas of application for KM, the derivation of concrete and verifiable targets as well as the planning and implementation of KM measures are emphasised as relevant on the basis of a systematic process (PDCA cycle). Furthermore, it is addressed how enabling framework conditions, structures and incentives can be created so that employees build up, share and purposefully apply knowledge in their daily work (ISO 2021, DIN 2021).

According to this holistic approach to KM, the methods and procedures applied in this KM project are described for each of the three pillars in the following paragraphs.

3. Procedure and Instruments

In the following, the procedure and utilized instruments are described. Therefore, the different levels (strategic, operational, change management) are examined in detail.

3.1 Strategic Knowledge Management (Strategic Level)
The increasing importance of knowledge as a resource for maintaining the competitiveness of organizations is undisputed. Against this background, the interest in a targeted management of this valuable resource has come to the fore. Accordingly, the introduction of knowledge management is not an end in itself; rather, it serves to achieve higher-level organizational goals. Since knowledge is available in the sub-units of the organization, targeted strategies and measures are needed to utilize this knowledge in a way that creates value for the organization as a whole. The formulation of concrete knowledge goals is therefore often demanded as the central starting point of knowledge management, as these control all downstream activities.

The challenge for companies 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 this way the central questions of the introduction and control of knowledge management in the company can be clarified: Where is it most worthwhile to invest? What contribution does knowledge management make to the company's success? 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.

In the present case, the used approach to solve this challenge was to utilize the existing model for strategic management of applied research institutes, which is based on the German and European method for Intellectual Capital Statements (Alwert et al. 2008; European Commission 2008; Will 2015), and the Integrated Strategy Development (Will 2012; 2020; Will, Mertins 2013) which links the business strategy of an organization to the intangible resource base, i.e. the organization's intellectual capital as the strategic driver for business success. According to this methodology, the following strategic management model for applied research institutes was used as a framework to derive a first set of high-level KM goals by discussing the envisioned strategic contribution of KM to the ISI's business success with the directorate and KM core team of ISI Biosynthetics & Fibres:
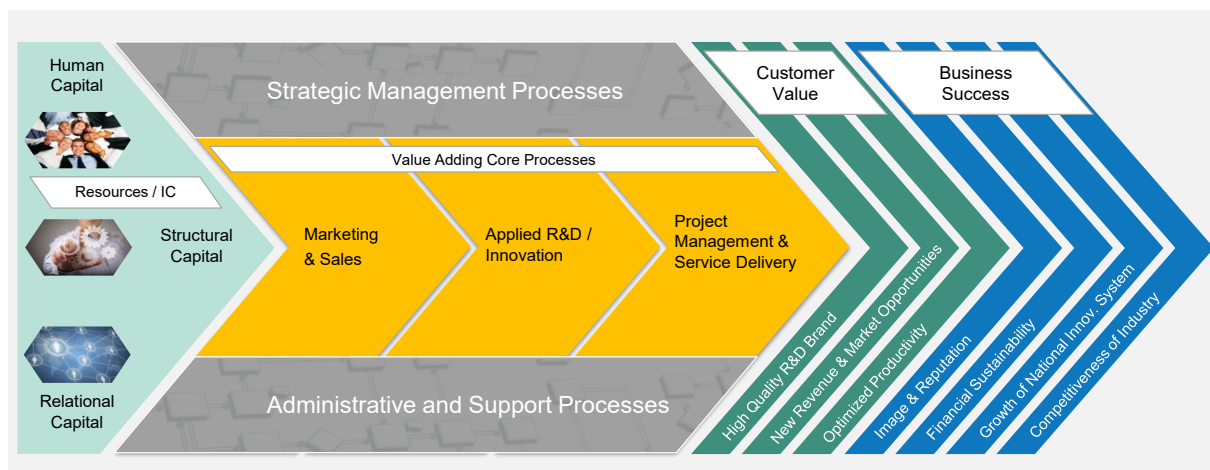

Figure 2: Strategic Management Model of Applied Research Institutes

Summarizing the main strategic objectives in a concise way, the layer of "Business Success" could be used as a starting point for the discussion to link the detected demand for KM to these high-level business objectives. The results of this discussion were consolidated into a first set of Strategic KM Goals which were not only used as a guiding frame for all subsequent steps at the operational KM level, but also form the basis for the KM controlling system. Thereby they to support a systematic and continuous evaluation of the progress and contribution of the actual KM actions and implemented solutions to the overall business objectives, e.g. desired financial results as well as the intended image on the market and retention of industrial clients.

Therefore, the following framework for the strategic KM controlling was established to ensure a consistent analysis of the actual status of the handling of knowledge as well as a derivation of suitable solutions, KM instruments and actions aligned with the overall business and KM strategy from the beginning:
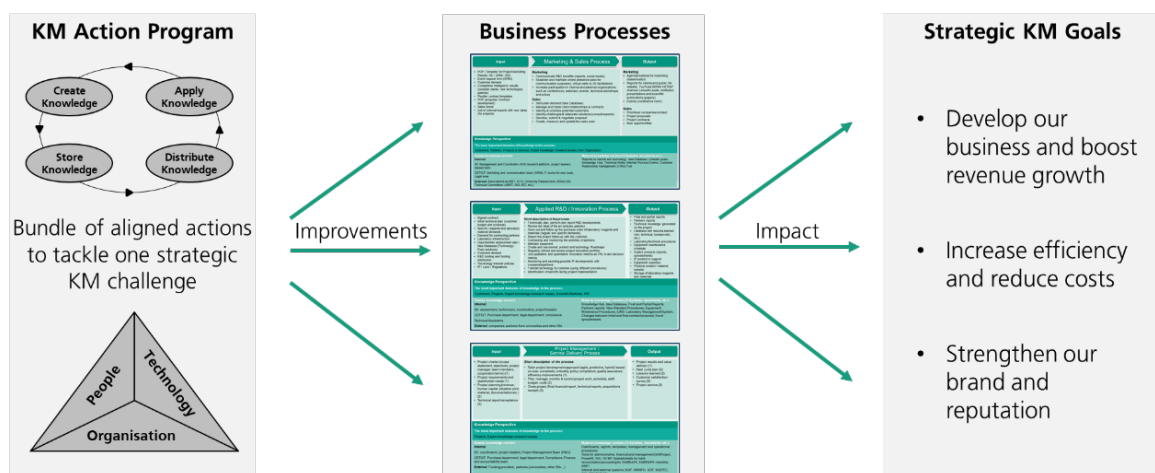

Figure 3: Strategic KM Controlling and Evaluation Framework

As shown in Figure 3, the concrete actions – bundled into meaningful action programs – have to be aligned and geared towards operational improvements at 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. Having this strategic frame at the methodological and content level set up, the following steps of the operational and process-oriented KM can be aligned with the overall business strategy.

3.2 Business Process-Oriented Knowledge Management – BPO-KM (Operational Level)

The BPO-KM Methodology is based on the "POT" (People-Organization-Technology) model and the basic assumption that knowledge is utilized in business processes to produce certain results of value for the customer and for the own organization (Figure 4). The three dimensions of the POT model and their relevance to knowledge management can be summarized as follows (Mertins et al. 2016):

People: As carriers of knowledge, experience and competences, the employees of an organization represent a central success factor of knowledge management. In the field of human resources, the aim is, therefore, to examine key qualifications for knowledge management and to identify development needs.

Organization: The term organization encompasses both the organizational structure and the process organization. The level of knowledge management penetration in the organization depends largely on the extent to which the existing structures and processes enable the smooth execution of the KM core activities (see below).

Technology: In the field of information technology, numerous solutions can be found that support effective knowledge management, e.g. to facilitate communication, cooperation and access to information and knowledge resources. In this respect, the choice of adequate instruments from ICT area is decisive for the success of knowledge management.
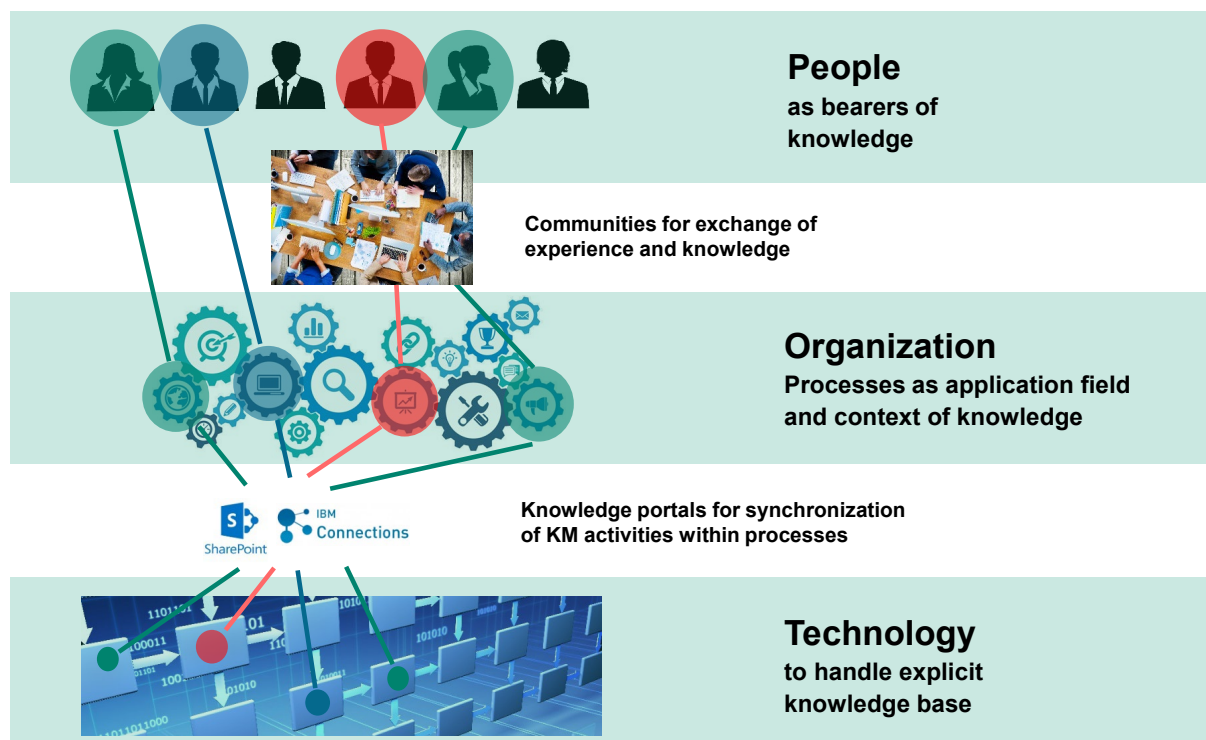

People
as bearers of knowledge

Communities for exchange of experience and knowledge

Organization
Processes as application field and context of knowledge

Knowledge portals for synchronization of KM activities within processes

Technology
to handle explicit knowledge base

Figure 4: "POT" Model links three operational levels of KM: People, Organization and Technology

To operationalize this general model for the actual KM analysis and solution phase, the core logic of the BPO-KM methodology was applied, aiming at closing the loop of four KM core activities as an integral part of the ongoing value creation of an organization: creating, applying, distributing and storing relevant knowledge for the success of the organization's business processes (see Figure 5).

In the following paragraphs, the main methods and procedural steps of the analysis and solution phase on the operational KM level are summarized:

Knowledge domains and knowledge map

Knowledge is always knowledge about something, i.e. knowledge refers to specific areas, e.g. as knowledge about the customer, knowledge about one's own product or knowledge about methods and procedures. Therefore, when implementing knowledge management, it is of central importance to describe and concretize the knowledge of the respective organization. The description of a knowledge domain, i.e. a concrete knowledge area, makes it possible to develop and establish a precisely definition of knowledge for the respective company in practice. For the visualization of the knowledge domains, instruments such as a mind map are suitable.

Knowledge-oriented analysis and design of business processes

The basis of the knowledge-oriented analysis and design of business processes is the method of business process-oriented knowledge management (BPO-KM) developed at Fraunhofer IPK (Heisig 2005; Orth, Mertins 2016). Against this background, the analysis and design method focus on the value-adding processes of the company, since this is where the daily handling of knowledge takes place. The integration of the WM core activities into the business processes ensures the link between knowledge management and the tasks of day-to-day business.
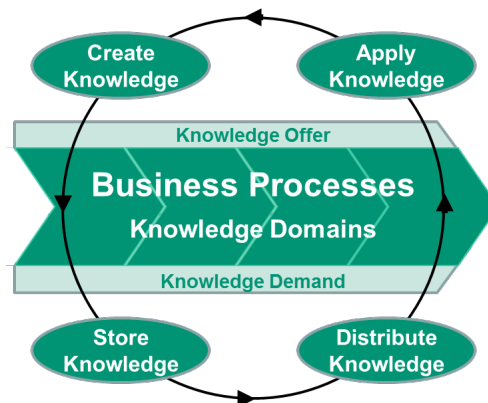

Figure 5: Core logic of Business Process-Oriented Knowledge Management: Closing the loop of four KM core activities inside the value-adding business processes

The BPO-KM method is divided into three consecutive steps:

- Selection and description of processes
- Analysis of strengths and weaknesses in the handling of knowledge
- Selection of KM solutions and introduction of them in a process-oriented manner

Step 1: Selection and description of processes

Aligning KM activities with concrete business processes ensures that the operational processes of the organization are considered, thus ensuring the integration of knowledge management into the day-to-day work of the organization. Thus, at the beginning of the project, it is important to select suitable business processes that are to be improved in the future with knowledge management instruments and solutions.

Within the framework of the project, the essential parameters were compiled into a process profile. When filling out the process profile, the most important tasks, the people involved, as well as the input variables and results of the process are defined. It also specifies which knowledge is relevant for the process and which instruments and tools are currently used.

Step 2: Analysis of strengths and weaknesses in dealing with knowledge

After identifying the processes to be analysed, this step takes a closer look at the handling of knowledge as well as central knowledge domains and framework conditions. The aim is to identify strengths and potential for improvement in the handling of knowledge and to derive fields of action for improvement measures.

At the ISI, the KM Fitness Check was used to identify and evaluate strengths and weaknesses in the handling of knowledge. This is a continuously developed questionnaire that can be adapted to the specific needs of the

organization. In its basic features, the catalogue does justice to the holistic understanding of knowledge management. The KM Fitness Check is based on the principle of the Fraunhofer KM Reference Model (Mertins et al. 2016) and is thus composed of questions on the four core activities (generating, storing, distributing and applying knowledge) as well as on the three design fields (personnel, organization, technology). These question areas are supplemented by the assessment of the knowledge domains. This creates an overall picture of how knowledge is handled in the company.

The KM Fitness Check is an analysis method that provides an excellent introduction to the topic of knowledge management. The survey of all employees is an important instrument for participation and sensitization in the context of the introduction of knowledge management. On one hand, employees are given the opportunity to help shape the process through their assessments of the issues, and on the other hand, by dealing with the questions, they are invited to reflect the handling of knowledge in their daily work (Kohl 2016).

The results of the survey provide an overview of the status quo in dealing with knowledge with regard to concrete activities such as creating, storing, distributing and applying knowledge, as well as with regard to the framework conditions in the company. Important knowledge domains are identified and their availability is assessed. This results in an overall assessment of how knowledge is handled in the company, which is based on the assessment of the employees.

Step 3: Select KM solutions and introduce them in a process-oriented manner (KM Roadmap)
The previously identified potential for improvement can be developed through suitable knowledge management methods and instruments. The scope for design in the selection and development of solutions is large. The Fraunhofer KM solution collection provides a comprehensive repertoire with design recommendations for this phase of knowledge management implementation (Voigt 2016).

Once suitable WM instruments have been selected, they must be adapted to the organization-specific conditions and integrated into the company processes during their implementation. To support the sustainable anchoring of knowledge management in the company, it is advisable to clearly name the solution modules in the company-specific process model and to clearly define the corresponding tasks.

The subsequent implementation process itself should also be planned systematically. The creation of a solution roadmap has proven to be a useful tool here. The roadmap makes it possible to specify the desired target state, to define important milestones on the way to achieving the goal and to concretize the time planning of the introduction process.

3.3   Level „Change Management"
As many KM initiatives have shown, it is of utmost importance for a successful implementation of a KM system and the respective KM instruments and actions to integrate the actual (future) users of the KM system into the project from the beginning. Key questions to be answered throughout the whole KM project and the different phases are:
- How does knowledge management have to be introduced into a company in order to ensure its success in daily routine?
- How can the best possible acceptance and motivation on part of the employees be achieved?

The intervention model for pro-active change management (Finke, Will 2003; 2005) as part of CCKM's holistic KM approach assumes that the employees have a certain pre-disposition that needs to be taken into account when analyzing the four factors of motivation and deriving the respective accompanying actions in the four fields of intervention, as shown in Figure 6 below:
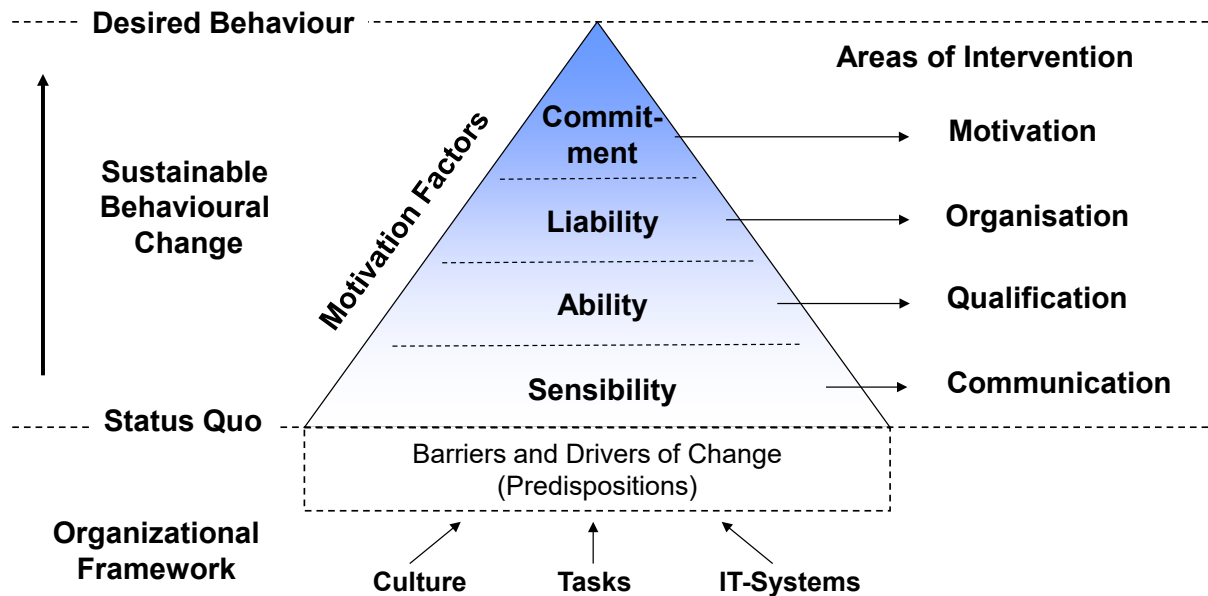
Figure 6: Intervention Model for Pro-active Change Management

According to this intervention model, the four factors of motivation can be summarized as follows:

- **Sensibility.** The concerned employees have to be thoroughly informed about the objectives and methods of knowledge management, about change measures and decisions, and the implications for their individual performance and working situation.
- **Ability.** The concerned employees must be competent enough to cope with the demands of change and fit the requirements of new KM activities.
- **Liability.** The executive personnel must initiate corresponding measures of steering and control, and they should take over the function of a change agent.
- **Commitment.** The concerned staff has to be involved in the change process with regard to the given conditions.

The challenge in the practical context is to understand the needs and the current status of the employees' motivation regarding the adoption of new behaviors, i.e. new or different tasks or a change in the way things should be done. In order to create the desired sustainable change of behavior, suitable approaches have to be included into the KM actions and/or accompanying actions regarding communication or qualification as well as organizational measures and involvement of the employees have to be planned and executed in parallel to the actual KM project work, i.e. the employees' requirements regarding the four factors of motivation have to be considered and met in each project phase in order to guarantee a successful implementation of KM in the organization.

4. Results

In this chapter the main practical results of the KM project at ISI Biosynthetics & Fibres are summarized. The results description will follow the structure of section 3.2.

4.1 Strategic KM Goals

Following the methodological approach proposed in section 3, the existing strategic management model of applied research institutes was used to derive a first set of high-level KM goals. The guiding question to these strategic KM goals was how KM shall contribute to the overall strategic objectives and business success of the ISI. The derived strategic KM goals are as follows:

4.1.1 Develop our business and boost revenue growth by…
- **combining knowledge** and fostering **synergies** between our technological platforms and research groups (technology convergence);
- creating **new application ideas** to trigger demand ("tech. push projects");

- leveraging our potential to produce **breakthrough innovations** with higher added value for our customers.

4.1.2 Increase efficiency and reduce costs by…
- using existing knowledge systematically to **avoid double work** (inventing the wheel a second time);
- **re-using newly created knowledge** and transferring competencies from one project to the next application context;
- **retaining crucial knowledge** when key people leave;
- increasing speed in administrative processes, harmonize procedures.

4.1.3 Strengthen our brand and reputation by…
- building up new knowledge and **showcasing pre-work** to reduce R&D risks for our clients;
- showing "hidden" competencies to **build confidence** and to communicate the "unknown";
- **institutionalizing reputation** through professional handling of knowledge (structural capital).

4.2 Knowledge Map and Knowledge Domains
In a next step the ISI developed a knowledge map. The relevant knowledge domains for the ISI are: Organization, Partners, Customers, Markets & Competitors, Products & Services, Scientific Methods, Expert Knowledge in the research areas, Projects and IPR. All knowledge domains were further detailed into smaller sub-domains. The knowledge domain of Partners as an example is one of the branches of the developed mind map. Knowledge about partners was then split up into knowledge about partners from the industry, research and development, associations as well as suppliers.

4.3 Selected Process Profiles
After exploring the different knowledge domains, the perspective was focused on the business processes (see section 3.2, step 1). At the ISI, three processes were selected and examined in more detail: *Marketing and Sales, Applied R&D / Innovation as well as Project Management / Service Delivery.* The profiles provide a comprehensive overview template including a short process description, information about input and output as well as a knowledge perspective regarding most important knowledge domains, human and material knowledge carriers.

4.4 ISI's Strengths and Weaknesses in Dealing with Knowledge
The analysis of the strengths and weaknesses in dealing with knowledge at the ISI was conducted via an online survey based on the "KM Fitness Check" (see section 3.2, step 2). The aim of the employee survey was to achieve awareness regarding KM and work time allocation in general and specifically to get insights for the ISI on their processes and status quo in knowledge management in detail. The survey was, aligned with the KM approach, structured into three parts: Knowledge Domains (Part I), Knowledge Handling (Part II), Knowledge Framework Condition (Part III). Core results of the survey will be summarized in the following.

The ISI shows strengths in willingness to share knowledge, applying (existing) knowledge as well as a strong people-based KM approach. KM challenges were identified on strategic as well as operational level. Strategic challenges are found regarding creating and storing knowledge about projects, knowledge about customers (plus market & competitors), storing explicit knowledge (finding data and making data available), as well as synergies between research groups (exchanging experiences across departments). Operational challenges are mostly present in framework conditions in form of IT systems.

The results of the survey were validated and prioritized to identify possible fields of actions. These action fields were further operationalized in the next section.

4.5 Knowledge Management Action Roadmap
With help of the combined results of the strategic goal definition, knowledge map, process profiles as well as KM strengths and improvement potentials found through the online survey a KM Roadmap was developed as a result of step 3 of section 3.2, see Figure 7. The KM Roadmap includes selected KM solutions and introduces them in a process-oriented manner.
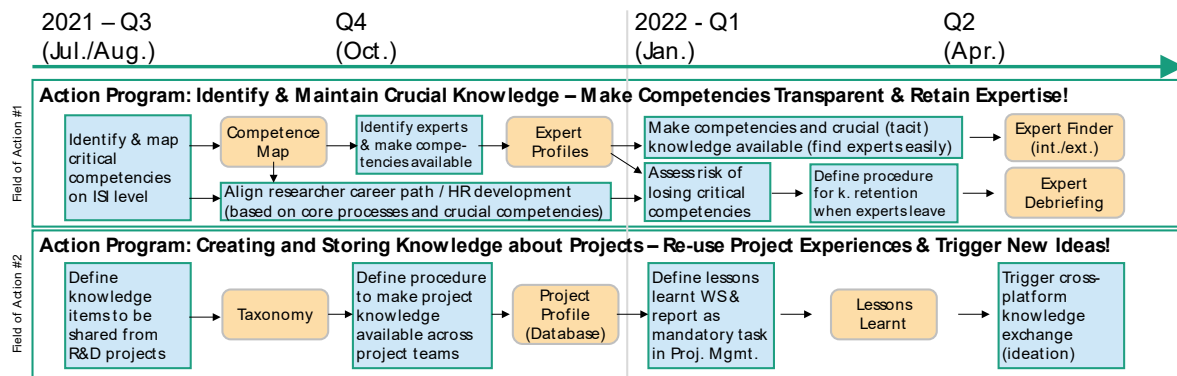
Figure 7: Action roadmap including two operationalized action programs

The horizontal action programs include all actions to be taken to reach the specific goals. The upper action program has the aim to identify and maintain crucial knowledge in the organization. The action program foresees different actions to build up a competence map, expert profiles up until to an expert finder over the course of one year.

The last step was to link the actions between the business processes and the strategic KM Goals. This happened via an impact diagram shown in Figure 8.
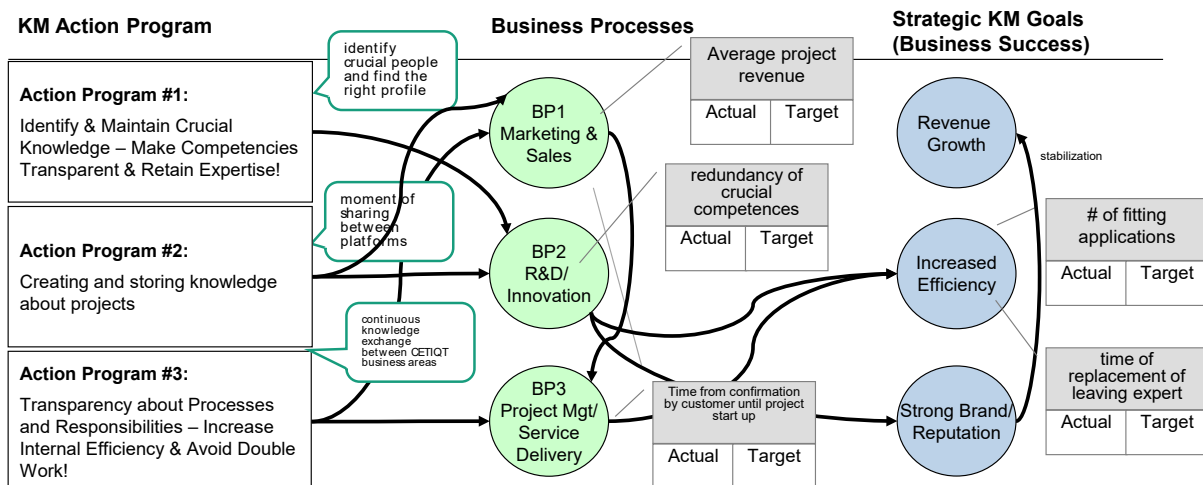

Figure 8: Impact diagram to link actions with business processes and strategic KM goals

5. Discussion, Limitations and Outlook

The results of this KM project, as summarized in the previous chapter, were assessed as highly beneficial for the systematic set-up of the KM pilot initiative at ISI Biosynthetics & Fibres by the responsible KM core team and the ISI's directorate. Of course, these first steps of analysis and implementation of concrete KM actions are only the beginning of a longer journey towards a full-fletched KM system. But it was seen as crucial to choose the right and systematic approach to initialize this endeavor based on the proven methodologies presented in this paper. This is especially important with regard to the mentioned aspect of change management and involvement of the employees as the "KM users" in order to ensure a successful implementation and operation of KM in the later stages which is only possible if the future users understand the background from the beginning, i.e. the specific demand and challenges, the envisioned benefits for the organization, as well as for their daily work.

In order to keep motivation high from the beginning, transparency and a structured, but easy-to-understand, approach is essential. Therefore, the KM core team at the ISI Biosynthetics, supported by the methodological experts of CCKM at Fraunhofer IPK, took care of informing and integrating the ISI's staff in different formats:

- The overall KM initiative and the underlying demand was presented by the ISI directorate and the KM core team during a general assembly of all employees to ensure a first sensitization even before concrete operational steps were initiated.

- After the definition of the overall methodological approach by the experts, all employees were invited to take part in the survey "KM Fitness Check" which was introduced at another general meeting, and which was designed to give further input about KM while triggering the reflection of one's own handling of knowledge in the context of the daily business.
- The results of the survey were presented at an official KM Kick-off meeting with all ISI employees, and the key findings were discussed, clustered and prioritized into the main KM challenges which formed the basis for the definition of the first fields of action and the respective operational KM objectives to tackle these concrete challenges. In this way, each employee had the opportunity to not only be part of the analysis of strengths and weaknesses regarding the handling of knowledge inside the ISI, but were also involved in the definition of the concrete action programs, resulting from this first phase of analysis.
- In parallel, an extended core team of key staff (senior researchers and group leaders) was involved in the description and knowledge-oriented analysis of the main business processes. In virtual breakout sessions, using MS Teams breakout rooms and conceptboards, each of the three value-adding core processes was analyzed by one "process team" consisting of key staff from different functions and hierarchical levels, gathering the process knowledge from the internal experts in a systematic way, moderated by the methodological experts of CCKM.
- In later steps, e.g. the detailing of the initial knowledge map and drafting the first layers of the taxonomy, as part of action program no. 2, key staff was also involved in order to develop the taxonomy based on the existing mental structures and vocabulary in use at the ISI. Here, it was noted that the involved colleagues from the research groups were motivated at the beginning of the task, but as the work load grew, they were asking themselves the "why" question and had doubts about the results and benefits of this task. When discussing this challenge between the KM core team and the methodological experts of CCKM, it became apparent that the "bigger picture" had got lost on the way when diving deep into the operational and technical task of defining the taxonomy. As a consequence, the framework for strategic evaluation was used to show the impact of the task on the higher level, and the roadmap of the action program to show the connections to the envisioned final results and the respective benefits for the daily work. The illustrative nature of the roadmap allowed the KM core team to easily and actively follow the KM project objectives and helped to compare the current implementation status with the planned timeline. Respective communication efforts were, again, needed and crucial to ensure the commitment of the involved staff. Informal stories about smaller benefits that were generated as "side effects" during the KM actions completed the strategy of pro-active change management as the key success factor for the effective implementation of KM in the organization.

Further lessons learnt and study limitations in this KM project included the finding that it is also important to integrate other administrative units such as HR, project management office or the IT department, which belong to the surrounding organization of SENAI's national department in the case of the ISI Biosynthetics & Fibres. Depending on the actual topics to be worked on in the different action programs, the respective administrative units should also be integrated in early stages, e.g. the HR department regarding the definition of competence profiles, or the IT department regarding the definition of the taxonomy and structures for better data retrieval. That is why the ISI directorate had decided to have these units already participating in the analysis phase inviting them to take part in the survey "KM Fitness Check" to use the opportunity to sensitize them for the specific challenges of the value-adding core unit ISI when defining the necessary adaptations and actions within their support processes. A possible language barrier should also be accounted for in integrating the administrative units as fluent English skills are not as present as in the technical-scientific staff.

Further research opportunities open up regarding the roll-out of the used KM approach and methods to the whole ISI network. The ISI Biosynthetics & Fibres is one of 26 institutes in the SENAI network. The goal for the future is to enable the ISIs to learn from each other and to foster transfer of best practices in the ISI network. This would allow the transfer from organizational to inter-organizational knowledge management. The ISI headquarter could take on the role of the facilitator to channel the KM effort in the network.

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 learnt, 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.

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