A New Model for Identifying, Capturing and Transmitting Knowledge: A Proposal Based on Practical Experience

Luís Gomes
Department Economics, Management, Industrial Engineering and Tourism (DEGEIT)
University of Aveiro
3810-193, Aveiro, Portugal
luismgomes@ua.pt

Leonor Teixeira
Institute of Electronics and Informatics Engineering of Aveiro (IEETA), Department of Economics, Management, Industrial Engineering and Tourism (DEGEIT)
University of Aveiro
3810-193, Aveiro, Portugal
lteixeira@ua.pt

Abstract

Nowadays, markets are characterized by their complexity and unpredictability forcing organizations to adapt quickly to enhance their processes and achieve competitive advantage. To achieve these goals, the knowledge from each employee is fundamental because they know the process better than anyone. Thus, convert individual knowledge into collective knowledge is considered a key strategic resource for organizations to obtain long-term sustainable advantage, making evident the importance of investment in Knowledge Management (KM). Although companies are increasingly able to compete based on their ability to effectively manage knowledge, there are still several challenges in this area, particularly in the ability to capture the knowledge present in the employee's minds (tacit knowledge) incorporating it into an effective and efficient management system that enables the retention and transmission of core knowledge in a long-term period. This paper presents the results of a practical experience in a multinational company implementing a KM solution to identify, capture and transmit knowledge. Based on the best experience practices and on the SECI Model developed by Nonaka and Takeuchi, a new Model for Identifying, Capturing, and Transmitting Knowledge was developed and proposed. In general, the results indicate an improvement in the preparation of those responsible for conducting this type of work, an increase in the efficiency of knowledge capture and transmission, as well a positive involvement of employees in the organization's knowledge management culture. It is expected that these results can contribute as a tool to support other initiates in this area by organizations wishing to implement KM initiatives.

Keywords
Knowledge Management, Capture and Transmission of Knowledge, Tacit Knowledge, Explicit Knowledge, Methodology

1. Introduction
Nowadays, markets are characterized by their complexity and unpredictability forcing organizations to adapt quickly to enhance their processes and achieve competitive advantage (Jakelja & Brugger, 2019). Organization's ability to become and remain competitive is closely related to their internal capacity to optimize their processes and consequently reduce waste (Paschek et al., 2018; Singh et al., 2021). However, not all the wastes are easily quantifiable and tangible. Gay (2016) defines the eighth lean wastes as not specific to a production process and therefore, liable to be classified as intangible. This element of intangibility is known as employee talent and is considered a waste when organizations do not ensure its full usage to its benefit it. The employee's talent is often related to their ideas and agility to perform certain tasks, however it is the knowledge they possess that enables them of such characteristics and make them elements of extreme importance for organizations (Gay, 2016). This knowledge emerges from the daily acts that an individual performs, being, therefore, a core resource for organizations to optimize processes, reduce

waste, and, consequently, leverage their competitive advantage (Rožman et al., 2019) . The importance of investment in knowledge management (KM) by organizations becomes evident, enabling the construction of a deep and updated collective or organizational knowledge, based on the individual knowledge of their employees (Paschek et al., 2018). Although companies are increasingly able to compete based on their capacity to effectively manage knowledge, there are still several challenges in this area, particularly in the capability to capture the knowledge present in the employee's minds incorporating it into an effective and efficient management system (Massingham & Al Holaibi, 2017).

The work developed in this paper is part of a project carried out in a Knowledge Academy of a multinational wood-based panels organization, hereafter referred to as Company X. The organization was facing problems related mainly to the loss of organizational knowledge regarding a production process that could be critical for the company in the future. The main causes were related to the approaching retirement of a considerable number of experienced employees and the inexistence of a robust KM system that would allow the efficient capture, storage, and transmission of knowledge. Therefore, the objective of the practical project was to develop knowledge repositories about a certain production process in collaboration with employees from the different geographies where the company is present.

As a result of the practical experience, a new model to identify, capture, and transmit knowledge based on the Socialization, Externalization, Combination, and Internalization (SECI) approach developed by Nonaka and Takeuchi (2005) will be proposed. This document has the following structure: the section 2 presents a theoretical basis about knowledge, KM methodologies and techniques, as well as KM in organizations. Section 3 presents the methodological approach. Section 4 will be devoted to the presentation of the practical case. In section 5 a brief discussion will be presented, finally, in section 6 the main conclusion and future work.

2.   Theorical Background
2.1. About Knowledge and Related Concepts

Nowadays, knowledge is a crucial factor for any organization (Rožman et al., 2019). This fact leads us to question what knowledge is and what is the real impact on an organization's life, whether in their processes, employees, or strategies to acquire competitive advantage. Thus, it is important to understand that the knowledge concept results from the evolution of the data and information (Frost, 2018). According to Zins (2007), data is the basic element of information obtained by observation, but without any context (example: numbers and signs), while information, on the other hand, is obtained by analyzing and interpreting the collected data organizing it coherently. Finally, knowledge results from the human interpretation of available information to solve problems and understand a given context. For Massingham & Al Holaibi (2017), knowledge emerges from the execution of an act, because it is during its comprehension that human beings become aware of the data, information, and skills they need to complete it effectively. The opinion of authors such as Nonaka (1994) e Linderman et al. (2010) corroborate this idea by further stating that the creation of individual and organizational knowledge comes from the thought and experience of human beings based on data and information (inputs) to perform their tasks and solve problems (output).

Human knowledge can be categorized into two dimensions: explicit and tacit. On the one hand, explicit knowledge refers to knowledge that is easily transcribed into words or numbers, such as properties of materials and equipment, and transmissible in tangible formats such as paper or digital platforms. On the other hand, tacit knowledge refers to knowledge that resides in the routine and mind of an individual, possessing a personal and unique component that makes it difficult to articulate and transcribe in words (Nonaka, 1994; Paschek et al., 2018). Several researchers consider that tacit knowledge could be a technical or cognitive process that results from routine acts, which has a high value for organizations. For example, if an industry's processes have a variable variation an employee who has more experience in the process or working with particular equipment will have different behavior when compared to his younger colleagues. This is because over the years he has acquired the knowledge that allows him to be more familiar with all the surrounding variables being able to make a better decision to correct the variation (Massingham & Al Holaibi, 2017).

2.2. Knowledge Management Methodologies and Techniques

As already mentioned, knowledge can be divided into two distinct categories: tacit and explicit. However, according to Nonaka & Takeuchi (1995) knowledge creation in an organization results from the continuous conversion of tacit knowledge into explicit and vice-versa and they even propose a model for this (SECI Model). This model consists of an interactive and spiral process of new knowledge creation in four phases: *Socialization* (sharing of experiences between people); *Externalization* (transcription in words of tacit knowledge capture into explicit knowledge);

Combination (organization of explicit knowledge in a coherent and transmissible form); and *Internalization* (transmission of explicit knowledge within the organization enhancing the creation of new knowledge and problem-solving by employees). Given the difficulty in capturing the knowledge intrinsic to people and codifying it in a universal language, the authors argue that the model should be applied in a *Ba*. *Ba* is a Japanese word that means physical or virtual context/environment that facilitates the activities and involvement of participants in the creation and transfer of organizational knowledge. In Figure 1 the spiral model for knowledge creation described above is schematized.
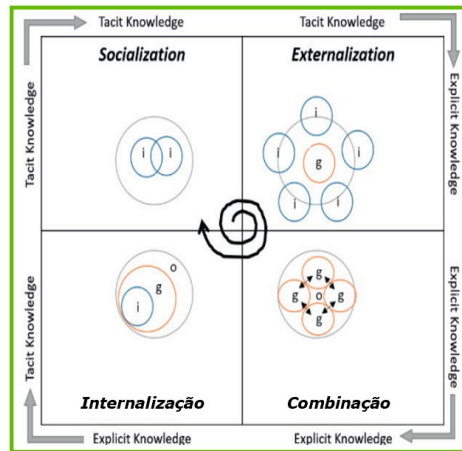

Figure 1 Framework: SECI Model (Adapted from (Paschek et al., 2018))

Despite the success and relevance of the SECI model within KM, according to Bratianu (2010), some limitations should be considered when using it. One of the main limitations and challenges enumerated by the author concerns the indiscriminate use of methodology designed and applied for a unique cultural and industrial context, the Japanese culture.

In addition to the SECI model, there are other models and techniques for the identification, capture, and transmission of knowledge in organizations. The technique most referred in the literature and widely used is the triangulation of methods (participant observation, workshops, and interviews) (Carter et al., 2014). Another useful technique for the capture process is the 5 *Why's* because it is a simple and flexible tool for constant questioning until all the information or knowledge needed to take a given situation is obtained (Mindtools, 2016). The BPM - *Business Process Management* life cycle and the BPMN - *Business Process Model and Notation* language can also be considered techniques that contribute to the identification, capture, and maintenance knowledge (Salvadorinho & Teixeira, 2021; Onofre & Teixeira, 2021). The BPM because it consists in a sequence of logical steps for the detailed discovery of processes from macro processes to their micro-processes and the BPMN because it consists of a universal, simple, and visual language for mapping and recording organizational processes without, however, neglecting its formality (Dumas et al., 2018).

In the literature, greater relevance is given to the capture and transmission of tacit knowledge, compared to explicit knowledge, because the challenges for its identification, capture, and documentation are higher, as already mentioned (Chedid, et al., 2020a; Chedid, et. al., 2020b; Chedid et.al. 2020c). One of the examples of models that aim to contribute to clarifying this situation is the one suggested by Chergui et al., (2018). The authors propose the identification and capture of tacit knowledge in organizations according to the response to three dimensions: *Know-that*: identify the actions and activities performed in micro-processes; *Know-how*: understand how the identified action and activity is executed; *Situation*: understand the context surrounding the actions and activities of micro-processes, framing them in the macro process.

Documentation, either in physical or digital format, is also a technique for transmitting knowledge. However, if employees are not encouraged to consult it, the probability of knowledge transmission and learning is reduced. In the study by Caporarello et al (2020), learning is mentioned as a topic of interest to most employees but they

simultaneously consider that most of the organizational sharing and learning moments/activities remain exclusively paper-based and without a plan suited to their needs. To improve this scenario, moments that promote dynamic learning and closer proximity with the knowledge owners should be privileged to encourage the open discussion of ideas and doubts, moments such as group dynamics, training activities, and workshops provide this type of interaction (Sousa & Dinis-Carvalho, 2020). Another tool that can be useful in this type of initiative is the digital teaching platforms that, in a didactic, autonomous, and interactive way, allow individuals to test their knowledge and learn through error (e.g., didactic games, quizzes, or e-learning). Finally, the adoption of hybrid education (face-to-face and distance learning) has proven to be a modality capable of meeting the training needs regardless of political, economic, epidemiological, or social barriers (Pontes, 2018).

2.3. About Knowledge Management in Organizations

According to Mahmood (2020), at the strategic level knowledge can be considered an essential tool for decision making and for the development of unique and robust strategies that guide organizations to create and sustain their competitive advantage in the long term. Thus, the relevance of KM is increasingly allowing to learn from past mistakes and successes, avoid the loss of knowledge and skills by the departure of employees or reimplement the acquired knowledge in other company areas/departments (Hajric, 2018). Despite the evident KM benefits, there are still some failures in this area. According to Dawson (2009), the main causes for failure are misalignment with organizational objectives, the idea that large investments are needed, inadequate planning, and lack of support from management. According to Sanchis et al. (2020), the barriers to KM implementation can be categorized into five areas: human, organizational, technological, contextual, and informational. Some common practical examples are lack of time to share knowledge among employees, mainly due to the heavy daily workload; lack of motivation to share knowledge among employees; an individualistic culture that inhibits the sharing and reuse of knowledge as an organizational resource; lack of specialized KM people/departments and technological or technical support within the organization; and resistance to change.

3. Methodology Approach

In this research, a case study was conducted where the authors were assigned to the organization's Knowledge Academy team to conduct an initiative to capture and transmit knowledge about the organization's core production process across multiple geographies. According to Rashid et al. (2019) a case study is a good strategy when the research focus is embedded in a real practical context, enabling a detailed analysis of the context and processes based on the empirical material collected.

As responsible for the development of a manufacturing process manual and pilot training for employees the researchers were able to interact directly over several months with different employees and factories of Company X. In addition to the review of KM methodologies and techniques for organizations present in the literature, the methodology used for the practical research includes participant observation, workshops, and interviews, following a method triangulation approach. According to Creswell (2014), this technique when aligned with the case study objectives will allow capturing the desired data, information, and knowledge (tacit or explicit), as long as researchers adopt a critical stance. Triangulation can also be seen as a strategy to test the veracity of the tacit knowledge gathered by converging different sources (Carter et al., 2014). As participant observers of the environment under study, the authors took notes throughout their experience in order to develop knowledge repositories, training actions, and a methodological proposal that meet the specific needs of the employees and the organization at present and in the near future.

4. Practical Case: Development of Knowledge Repositories

4.1. Problem Contextualization

The case study was conducted within a multinational wood-based panel organization, referred here as Company X. Currently Company X has 24 industrial and commercial units in 9 locations spread over 2 continents and around 3000 employees, where more than 1600 workers in operational areas. The organization was facing some challenges regarding the loss of organizational core knowledge due to workforce retirement that could be critical for the company's future since knowledge was mostly resident in this people's minds and spread along the organization without a proper mechanism that helps capture, record and transfer core knowledge between employees, helping them to achieve a better performance one the day job.

For the reasons above, Company X invested in the development of Knowledge Academy focused on identifying, collecting, and levelling the company's core knowledge, ensuring that it is leveraged internally and that contributed to the sustained growth of the company by increasing the performance of its employees. This case study was focused on capture and transfer knowledge regarding a specific and complex product production process by developing a technical manual and training programs, and to design a more effective methodology for this type of work in the future.

4.2. Development of Knowledge Repositories

The development of knowledge repositories in the organization resulted in a methodological approach based on the SECI model, developed by Nonaka and Hirotaka Takeuchi for the conversion of tacit into explicit knowledge, and is therefore equally divided into four major phases (socialization, externalization, combination, and internalization). For each phase, the best practices and guidelines identified for the identification, capture, and transmission of knowledge will be described.

Socialization: Data, Information, and Knowledge Capture

The first task to be performed for the development of knowledge repositories should be divided into two major steps: (i) identification of the knowledge area to intervene and; (ii) collection of data, information, and knowledge. The first stage essentially corresponds to the identification of the need to proceed a KM initiative within an organization and the preparation, if necessary, of the person responsible for the task in two dimensions: a theoretical-practical (study of the practical environment where the work will be carried out) and a theoretical (study of the present methodology for the capture and transmission of knowledge).

The second step is the collection of data, information, and knowledge which should be defined with local knowledge owners (employees or managers) to outline the collection plan (scheduling meetings, workshops, and interviews), objectives, and request existing documentation of interest. The most advisable method for collection is a local visit, particularly when it comes to undocumented operational knowledge, however, for topics with a higher theoretical and technical content, such as safety or environment, for which some documentation already exists, the option of requesting data and information is also valid, as they allow focusing attention on capturing tacit knowledge. During this moment it is common that the amount of data, information, and tacit knowledge collected is extremely high and difficult. Thus, to mitigate these challenges the following mechanisms were developed:

- Field capture sheet: with identification of the knowledge owners involved, date, location, topics covered, recording methods used (photos, audios, etc.);
- Five-step Method for collecting data, information, and knowledge from the macro-processes to the micro-processes of the practical environment under study (Table 1).

Table 1 Five-step Model for data, information and knowledge gathering

Step	Description
1	Collect data and information on the macro-processes of the environment under study, then systematize the information collected in flowcharts (mapping - BPMN) by identifying the best-qualified knowledge owners for each macro-process identified. In parallel, consult other existing sources of information of interest (e.g. manuals, existing flowcharts, etc.) and validate the mapping with the knowledge owners.
2	Define the main micro processes of each macro process, based on the information gathered in the previous step.
3	Collect data, information, and detailed knowledge of each micro process through observation, workshops, interviews, meetings, informal conversations. To ensure a comprehensive and detailed capture, it is suggested to use techniques such as 5 Why's, "Know-that; Know-how; Situation" - (identity the actions and activities performed, understand how they are performed, understand the surrounding context of the selected actions and activities), as well as complement the collection with photographs, audios, videos and other sources of information linked to the process (e.g. work instructions).
4	Verify the information and knowledge during the collection process, using the *"What, How and Why"* technique (to ensure a better understanding of the tacit knowledge transmitted).

5	Validate the information and knowledge with other knowledge owners of the defined macro-process (ensure that the information and knowledge recorded have been properly understood and that there are no inconsistencies in it).

An inadequate approach can jeopardize the success of the following steps. Thus, it is essential to be judicious in selecting the knowledge owners to accompany the capture stage being the experience, technical knowledge, and ability to expose ideas the selection factors to consider. Finally, establishing empathetic relationships with people should also be made to gain their trust enhancing the collection and generation of honest debates that contributed to the sharing and creation of knowledge.

Externalization: Knowledge Documentation

This phase aims to systematize and organize the data, information, and knowledge collected in the previous step into repositories or manuals. The main challenge at this point is to ensure that the person responsible for documentation takes ownership of it, having the ability to convert tacit knowledge into explicit knowledge and to update it whenever there are changes that justify it. In figure 2, is described the sequence to be followed:

Figure 2 Externalization: Knowledge Documentation

Finally, it is important to clarify that the creation of documents on each of the macro processes identified will originate the final chapters of the manual/ repository, allowing the researcher focus of to be centralized in the writing of a certain knowledge area and speeding up the validation processes given the possibility that simultaneously a document could be validated by knowledge owners while another one is being developed.

Combination: Knowledge Aggregation in a Single Repository

The third phase of the methodology is characterized by being a process of organization and storage of all the valuable knowledge codified in the externalization step articulating it with other information and knowledge from existing repositories in other topics of interest, departments, or organization geographies. This stage aims to increase the veracity, transversality, and robustness of the final manual/repository. The final manual should be easy to consult and so it is suggested the following structured: (i) introduction; (ii) document overview; (ii) sequence of macro-processes/topics (documents drafted and validated in the externalization phase); and (iv) other subtopics considered relevant for the document by the researcher, Knowledge Academy team or knowledge owners.

This phase also includes the final manual validation by the Knowledge Academy team and the subsequent availability of the document on physical or digital platforms of free access to the entire organization. If the document content is

considered specific to a particular function or activity, different degrees of access may be created to avoid the transmission of noise or access to confidential information. Managers should encourage employees to use the document/s as a resource for the execution of their daily tasks. Finally, if the organization is present in several countries, it may be necessary to translate the document into the local language to make it more convenient for employees to consult it.

Internalization: Training Materials Development

The last phase of the model has as the main objective to develop a set of training. The first phase is to define the training requirements and structure its pedagogical model, which includes: target audience, objectives, sequence, and training modules complexity. The target audience and training objectives will allow the development of training modules with different degrees of complexity (detail) according to the level of usefulness of the knowledge for the functions. Thus, the training modules should be divided into two major levels:

- Basic: level of training with less detail, using only general and short descriptions. Level indicated for the target audience whose functions are not directly related to the knowledge to be transmitted;

- Advanced: level of training with greater detail and technical references addressed to the target audience whose functions have a direct and symbiotic relationship with the knowledge to be transmitted.

Another important factor to consider is the support of structured and robust learning. Therefore, learning should be gradual, i.e., training modules should be taught in an increasing sequence of complexity (basic to advanced). For example, a participant who will perform functions in macro-process_A should go through a basic training process where he/she will learn the general concepts of all the areas related to macro-process_A. Then move on to a more advanced level aiming at a deeper technical knowledge and specialization in macro-process_A. For participants with experience in the organization, the sequence to be followed should be evaluated on a unit basis, but the history of the function and feedback from leaders and employees themselves may act as a selective tool.

Based on the above-mentioned considerations, the planning of each training starts with the definition of its contents, pedagogical methods and materials, logistical needs (trainers, computers, etc.), and methods for measuring the impact of the training modules on learning. However, before starting the pedagogical methods and materials development, it is crucial to validate all this planning with the knowledge owners and/or other specialists (e.g., human resources department). After the planning has been validated, the pedagogical methods and materials can start to be developed and several methods can be applied (Table 2).

Table 2 Suggested pedagogical methods for the training modules

Method	Description
E-learnings	Objective, practical, and interactive learning format, outside the traditional classroom context. Possible to use videos, images, texts, and exercises to complement and make the training more interactive. A good method for transmitting theoretical knowledge (basic or advanced) to a large number of employees given the ease of development and access.
Workshops	Training method based on discussion and brainstorming, promoting the involvement of the participants. A good method for training a small number of employees on recent themes.
Group Dynamics	Learning modality concerning one or more topics through role simulation by participants and group discussion to solve a real problem question or case study. A good training method for a small number of employees on specific knowledge topics (advanced level).
Hybrid Learning	Face-to-face and distance learning modality that allows the use of more interactive technological teaching platforms that complement traditional learning. A good method for when you want to transmit basic or advanced theoretical knowledge at a distance and encourage subsequent rational discussion in a traditional classroom environment.
One-the-job learning	Learning through on-the-job experience generally consists of five stages: specific training (learning the theory); observation (watching others act); reflection (analyzing the observation); assisted execution (carrying out the tasks monitored by a mentor); and autonomous execution (trying out what you have

	learned). A good method for practical training of a small number of newly recruited people for a specific area of knowledge.
Face-to-face learning	Learning and knowledge consolidation modality with the guidance of a trainer, usually a specialist in the area, who dynamizes the exposure of knowledge and moderate's discussions. A good option for theoretical training of a small number of employees, whether in a face-to-face or digital format.

As previously mentioned, the implementation of these methods will always depend on the training objectives and knowledge to be transmitted, as well as on logistical needs and associated costs. However, the investment in the didactic component of the training modules is also important for the success and quality of knowledge transmission. Thus, Table 3 describes some suggestions of dynamics for training whose investment was considered affordable for the organization.

Table 3 Suggestions of dynamics to be used in the training modules

Dynamics	Description
Audiovisual materials	of real or personified videos with narration to present the topics and images or schemes illustrating the knowledge.
Knowledge Check	Including verification moments of the knowledge acquired during the training, either individually or in groups, is a good mechanism to boost the commitment of the participant in the session
Gamification	Dynamics created through the inclusion of characters, achievements and scores during formative moments. This dynamic contributes to the addition of interactive and challenging moments for participants.
Local Visit	Live observation is an excellent mechanism for contemplation and consolidation of learning in relation to the subject matter, be it products, equipment or materials.

Finally, the internalization stage must have a set of periodic methods to monitor the impact of the current training in the organization (example: KPI's), aiming at the suitability of the training process to the functions, continuous improvement (new techniques or transmission methods) and knowledge management in the organization based on the feedback from participants/collaborators and supervisors/knowledge owners.

At the end of the fourth stage, it is expected that the knowledge will be incorporated into the people's minds who will use it to perform their functions, improving them and generating opportunities for the creation of new knowledge to start a new cycle of conversions and transmission of knowledge. From this experience emerged a methodology that will be presented in the next section of results and discussion.

5. Results and Discussion

The practical work at Company X resulted in the development and validation of two production processes manuals with 168 pages of tacit and explicit knowledge from three different geographies. Additionally, four different training modules were developed (group dynamics, e-learning, one the job learning and knowledge checks) to train the younger generations and empower the older ones with new tools and knowledge, and two questionnaires to evaluate the impact of the training modules in the organization and to identify opportunities for improvement. With the practical implementation of KM in the organization, it was possible to understand the possibility of performing similar work in a more efficient way through more detailed tools and methods. The methodological proposal presented in this work and portrayed in Figure 3, allowed the mitigation of some of the main challenges present in the Academy – (i) KM Responsible Preparation; (ii) Gathering and Analyzing the Collected Material; (iii) Documentation Structuring and Validation; (iv) Documented Knowledge Articulation; and (v) Alignment of Training Modules to Employee's Needs – as detailed in the following.

Challenge 1: KM Responsible Preparation

In the role of researcher, the main difficulty experienced was the lack of detailed preparation for the execution of the work at a theoretical and practical level. The guidelines provide in the socialization first task allowed us to mitigate the initial difficulties experienced, having even reduced by two days the gathering plan initially defined.

Challenge 2: Gathering and Analyzing the Collected Material

Tacit knowledge is difficult to count and transcribe into words since each person has his or her way of defining and explaining events. Since this knowledge results from daily activities usually is captures large amounts of this type of knowledge from different sources (Nonaka, 1994; Paschek et al., 2018). To mitigate this challenge, the systematization of data, information, and knowledge in record sheets with identification of sources, contents, and dates, as well as the 5-step method contributed to a better understanding of the processes and variables and to eliminate the "noise" between the data, information, and knowledge captured.

Challenge 3 - Documentation Structuring and Validation

The main complaints about the Academy's existing production processes manuals were the complex structure and long validation periods. To simplify the manual structure each chapter was divided into just two sections: process description and critical points (previously there were four). To reduce the time for validation instead of one knowledge owner per macro process were selected two or more being possible to continue the validation process even if someone is unavailable and reduce a potentially negative impact in their daily tasks (validation time was reduced by 1.5 weeks compared to previous models). In a survey conducted to the 11 people involved in this work to assess the advantages and impact of the new document format and validation: 63.6% considered the new structure clearer, more concise, and adequate to the organization's needs, while 72.8% answered that the new validation model had low or no impact on their daily tasks and 72.7% considered this model more effective than the previous one. Finally, this work contributes to the KM culture dissemination throughout the organization and mitigates some of the barriers identified by Sanchis et al. (2020), such as the lack of motivation or time for knowledge sharing due to the daily workload.

Challenge 4: Documented Knowledge Articulation

Company X has factories in different geographies which consequently leads to diversified sources of information and knowledge that must be analyzed. Thus, the proposed framework focuses first on gathering, documenting, and validating as much knowledge about a specific topic as possible in a single unit/plant. This first phase enables researchers to gradually familiarize themselves with the environment and topic under study (socialization and externalization) that will culminate in a greater knowledge domain and transcription skills. This is followed by capturing complementary knowledge in other units/manufacturing plants (if needed) and building the final manual/repository (combination stage) that allows ensuring the document's transversality, robustness, and validity to the entire organization as advocated by, Harihayati & Widianti, (2019). Two other relevant factors to mention are the capture and documentation celerity and lower cost due to reduced travel time to foreign facilities, compared to a process that involves a complete capture in different locations on a common topic.

Challenge 5: Alignment of Training Modules to Employee's Needs

The training process of employee's is considered a key factor for the success and progression of their careers. However, in the study conducted by, Caporarello et al (2020), a significant portion of the training activities did not match the specific learning needs of each employee and did not enhance the participants critical thinking. Based on this finding, the internalization phase proposes a training process for each employee regarding their area or macro process of work where periodically employees and managers could give their feedback to fit the training to their needs. Several pedagogical methods and dynamics were also considered to provide diversified learning and discussion moments to replace routine learning in a traditional classroom. In addition, the structured proposal of "hybrid teaching" could be a solution to suppress training needs in complex social and epidemiological contexts, such as the current COVID-19 pandemic.
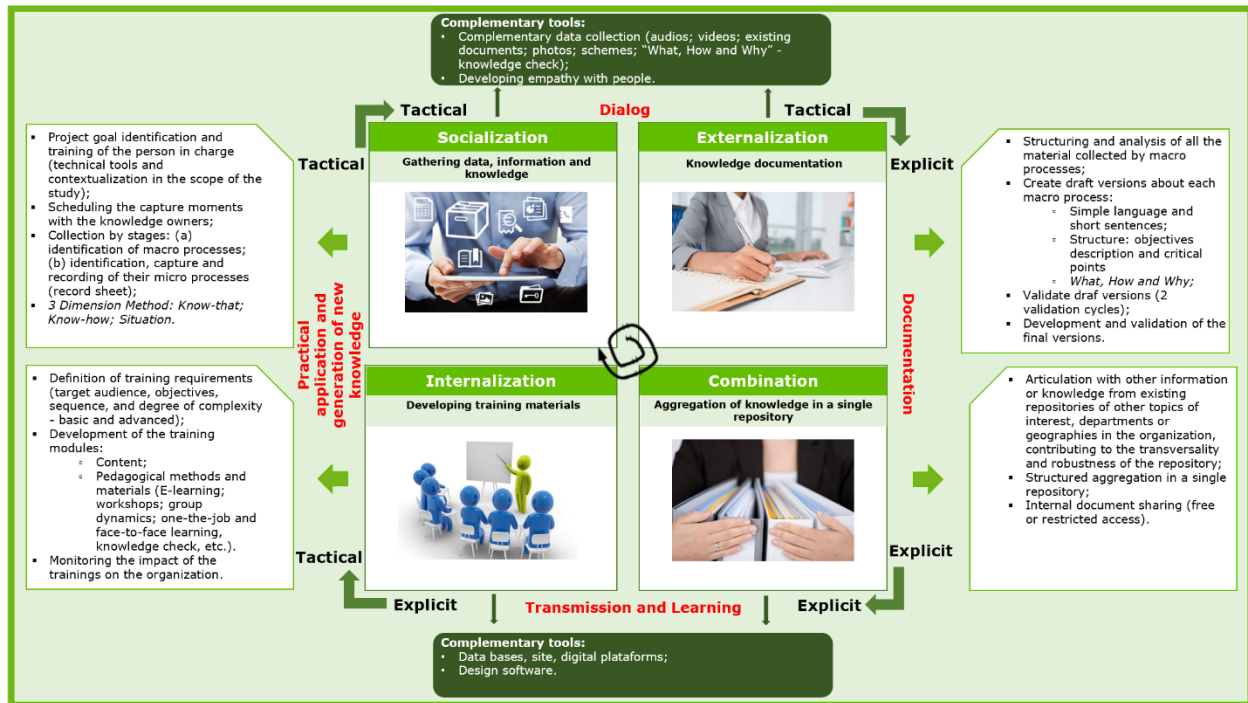
Figure 3 Framework: Model for identifying, capturing, and transmitting knowledge – SECI Model Adaptation

6. Conclusion and Future Work

The success of KM in organizations involves sustaining initiatives and methodologies aligned with their objectives, being flexible to current and future needs, as well as subject periodic evaluations of the results obtained (Mohanjan, 2019). This paper suggests a new agile methodology for identifying, capturing, and transmitting knowledge that could be adapted to organization's objectives through detailed methods and tools. From the methods proposed, we highlight the initial steps in the preparation of those responsible for this type of initiative, which are sometimes undervalued factors for the efficiency and quality of the final work. It should be noted that this preparation allowed to finish the capture phase 2 days before the initial plan. Furthermore, the identification and capture of knowledge based on 5 steps allow researchers to understand the big picture (macro processes) and, subsequently, to intensify efforts at the individual level (micro-processes) increasing the ability to identify and capture relevant knowledge.

The conversion of tacit knowledge into knowledge that is easily understood by the target audience in words is one of the main challenges for any researcher in this type of KM initiative, given the complexity, individuality, and sometimes interculturality associated with this type of knowledge. With this study, it was concluded that the documentation by macro processes of the data, information, and knowledge captured with a simplified structure based on processes descriptions, objectives, and critical points optimize and speed up the task because the researcher focus centers on the most important: *"What is the Process?, What is it used for?; How it works? and What are the variables that influence its performance?".* Furthermore, the simplification of language and the use of short sentences and illustrative images/schemas are guidelines that contribute to the clarity desired in knowledge manuals/repositories. The model presented also contributes to mitigating some of KM barriers indicated in the literature, particularly with the possibility of encouraging the dissemination of KM culture as a "no extra load" for employees through diversified capture and validation plans, the possibility of reducing costs with travels to increase documents veracity and robustness, and the development of dynamic and interactive training based on the employee's real needs.

Finally, this paper highlights the possibility of adapting the SECI Model as a model for the creation and conversion of tacit and explicit knowledge in an industrial context different from the Japanese. However, to address some limitations to leverage future work it is relevant to mention that the model was implemented in an industrial context of an organization where the KM culture is present. So, in the future, it would be interesting to measure its impact in

another context and organization without this culture, as well as the improvement in the researcher preparation (socialization phase) and the full practical implementation and validation of the training modules proposed in the model.

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Biographies

Luís Gomes is a master student of Industrial Engineering and Management in University of Aveiro, Portugal. His research interests are in knowledge management and continuous improvement. He has been involved with these issues through her working experience within Sonae Arauco firm.

Leonor Teixeira graduated in Industrial Engineering and Management, received a MSc. degree in Information Management, and a PhD in Industrial Management (Information Systems area), in 2008, from the University of Aveiro, Portugal. She is currently an Associate Professor of the Department of Economics, Management, Industrial Engineering and Tourism (DEGEIT) at the University of Aveiro. She is also a researcher (Integrated Member) at the Institute of Electronics and Informatics Engineering of Aveiro (IEETA) and collaborator at Research Unit on Governance, Competitiveness and Public Policies (GOVCOPP) of University of Aveiro. Her current research interests include Industrial Management in general, and in Information Systems applied to Industry in particular. She has over 200 publications in peer-reviewed journals, book chapters and proceedings, and has several communications at international scientific conferences, some of which as invited speaker. She serves as a member of Program Board and Organizing Committees for several Scientific Committees of International Conferences and has collaborated as reviewer with several journals. She is associated with IIIS, IEEE Society and APSI/PTAIS.