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# Combining Collaborative Networks and Knowledge Management: The SENAI Case

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**Abstract.** This work describes a practical case combining collaborative networks and knowledge management, at SENAI environment. SENAI was founded in 1942 to support the Brazilian industry through professional and technological education, and services. In 2011 SENAI started implementing a national program targeting the industrial competitiveness all over the country. Such an ambitious program relies upon several key elements and this work is focused on the most strategic one: culture. Logically such a challenge requires the combined effort of many actors and instruments as well. Those reported in this work are collaborative (technical) networks and knowledge management. On the one hand, the framework adopted to support the development of such networks is presented. On the other hand, knowledge management concepts and mechanisms were introduced in the scenario aiming at improving and catalyzing the results achieved by those networks.

**Keywords:** Collaborative networks; Knowledge Management; Cultural barriers.

## 1 Introduction

The global context of economic crisis brings opportunities and concerns for the Brazilian industry, sensitive to the business cycle and international competition. In order to stand out in this scenario of changes, the industry needs a more efficient and effective production, where technological innovation is a permanent asset required in all fronts.

One of the strategies that organizations are adopting to face these challenges is to change their relationship with customers, suppliers and even competitors, to work collaboratively on networks [1]. The survival of an organization has become a competition for participation in the emerging opportunities and not for market share [2]. One way to prepare a competitive organization is through the development of competences differentiated from others. In collaborative network, an organization must

have a differential that enables the complementation with other organizations in the work development.

The Brazilian National Service for Industrial Apprenticeship (SENAI) was created to serve the industry. In 2011, was developed the SENAI Support program for industrial competitiveness, to promote professional and technological education, innovation and technology transfer to make the Brazilian industries more competitive. SENAI has a physical structure in all Brazilian States, those structures were created over 70 years. In each state, SENAI has autonomy to meet the demands of local industry. The present work starts changing the culture of collaborative work, understanding that SENAI developed competences that can be leveraged working on technical networks. Therefore to enable the SENAI Support program for industrial competitiveness the new collaborative network culture becomes strategic.

For historical reasons, after 70 years essentially targeting “professional education” in an autonomous way (i.e., SENAI representations at each state work in an isolated way), a deeply rooted culture on this matter was built. Nowadays, Brazilian industry is also asking from SENAI the right support to jump into the innovation arena through a huge innovation program covering the whole country, involving more than a hundred of institutes providing innovation and technological services to the national industry. In this context, many challenges were naturally raised and this work points out some issues and possible solutions to overcome them. Two well-known institutions are SENAI partners in this quest: Fraunhofer (through the *Institut für Produktionsanlagen und Konstruktionstechnik* – IPK and other institutes) and Massachusetts Institute of Technology – MIT (through the Industrial Performance Center – IPC).

This paper describes the design and implementation of collaborative work in SENAI technical networks, introducing the framework developed and its deployment strategy, especially focusing on the cultural-related matters. Additionally, the work carried out in the innovation program, where Knowledge Management plays a role, is also discussed here, again focusing on cultural matters. Fraunhofer and IPC roles are also presented and future of the innovation program is shortly discussed.

## 2 About SENAI

By the end of 2012, Brazil was ranked as the sixth top world economy. In a country where 80% of the population lives in urban areas, the industry is absolutely the strategic vector of development. Brazilian industry answers for 27% of total salaries and employs one out of each four Brazilians registered in the employment booklet. It represents about 70% of the exports and 22% of the Gross Domestic Product.

Under that perspective, SENAI targets professional education for the industrial sector, also helping to reduce both economic and social differences. In an increasingly more competitive and demanding market, programs for management improvement, productivity increase and creation of social-environmental responsibility culture become essential to best qualify workers and companies.

SENAI is one of the five largest professional education organization in the world, the largest in Latin America. Since its foundation, in 1942, it has already graduated more than 52 million students. Last year, SENAI received nearly 2.7 million people.

All across the country, its courses train professionals required for the development of 28 areas of the Brazilian industry, including young apprentices, qualified technicians, technologists and specialized professionals.

SENAI has over 800 education centers throughout Brazil, including vocational education centers, training centers, technology centers and mobile training units. Along its over 70 years of history, SENAI has provided attendance to thousands of Brazilian enterprises.

The SENAI Support program for industrial competitiveness was conceived based on two main pillars, namely education and support in technical and technological areas. Whilst the former aims to surpass four million enrollments in 2014, the latter aims to create 25 SENAI Institutes of Innovation and 62 SENAI Institutes of Technology. However, in order to meet those challenging goals is mandatory to develop a new culture of collaborative work among the whole SENAI universe.

### 3 Framework Supporting Instantiation of SENAI Technical Networks

In order to start leveraging a culture of collaborative work SENAI developed a framework based on the AmbientCE model proposed by Vallejos et al. [3, 4]. This framework is based on three steps (Figure 1), namely:

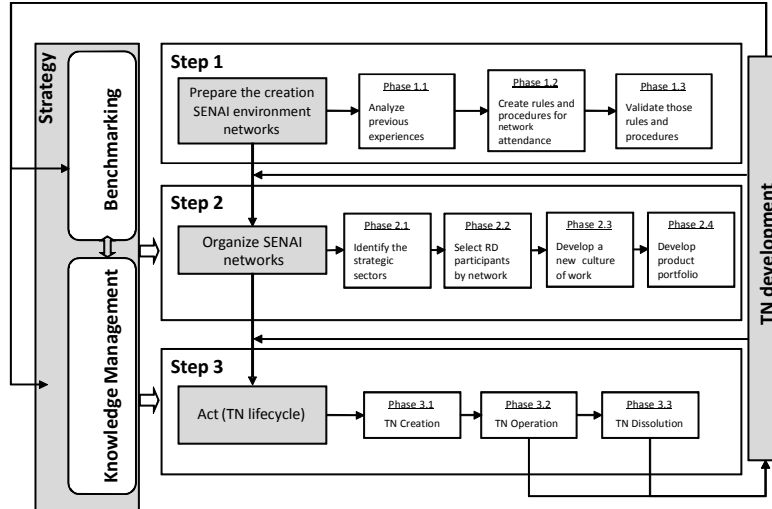


Fig. 1. Framework for the SENAI Networking

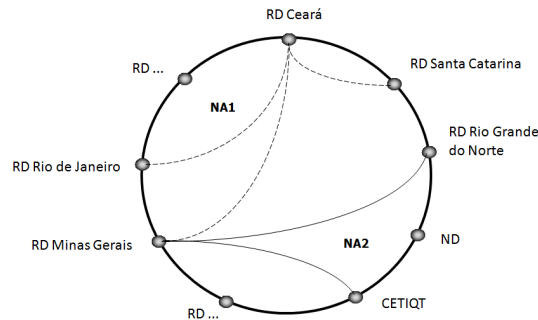
- *Step 1*: Prepare the creation of SENAI environment networks. This step is divided in three following phases: analysis of previous experiences on

successful networking, creation of rules and procedures for network attendance, and validation those rules and procedures.

- *Step 2: Organize SENAI networks.* Covers: the identification of the strategic sectors to form SENAI networks, selection of Regional Departments (Brazilian States) that will take part of each network, development of the roots to promote the collaborative work culture, and development of portfolio of products for each network considering its competences.
- *Step 3: Act (technical network lifecycle).* Organized into four phases [5, 6], namely: technical network (TN) creation, TN operation, TN development, and TN dissolution.

A strategy to deploy this framework in SENAI networks will use Knowledge Management supported by a system of benchmarking, developed by Vallejos et al. [4].

Figure 2 presents a scheme where the SENAI units interact to attend a business opportunity through technical networks. The figure represents a network attendance 1 (NA1) being coordinated by the Ceará Regional Department (Ceará RD) and having as collaborators RDs of other states such as Rio de Janeiro, Santa Catarina, and Minas Gerais. At the same time a network attendance 2 (NA2) is settled being coordinated by Minas Gerais RD with the collaboration of other RDs.



**Fig. 2.** SENAI technical networks attendance schema

The technical network has to be very dynamic and flexible, based on two “ifs”: if responsibilities of all members are clearly defined, and if rules and procedures are established with the agreement of all participants. This necessarily involves the narrowing of the relationship and the development of trust among the members of the network. Developing trust is necessary to recognize and develop the competences of those involved in the network. Soon, it may be stated that in order to form a network it is necessary to change the culture of labor relations referring to the notions of competences, trust, and collaboration.

The change of basic concepts like culture, competences, trust and collaboration, also represents an opportunity for the institution to reorganize a powerful set of procedures and indicators, in order to encourage networking work, thus enabling a more agile performance.

## 4 Creating, Deploying, and Operating SENAI Technical Networks

The creation and deployment of SENAI technical networks is based on the following phases:

- **Creating a network.** In order to create a technical network, SENAI ND considers: a) the demand of an industrial sector; b) establishment through National strategic planning; c) RDs proposition; and d) National Network Market proposition. Any technical network must involve six to nine RDs, promoting the new culture of collaborative work and conducting pilot projects (business focused).
- **Organize a network:** once the network starts producing good results, it can be extended to include six to nine DRs who already have maturity in the technical area. This is the consolidation phase of the network and its development should bring the guarantee that there is a new job culture in the whole system SENAI being put in place.
- **Expansion of a network:** the initiative to participate in the expansion of the network will be up to DRs who show interest, following the requirements and skills necessary for election. It is desirable to open it to all DRs in the latter stage, because we firmly believe that there is a potential market in attendance through network all over the country.

Once a technical network was created and organized it is necessary to internalize the operational procedures. The success of a technical network is based on the ability to create and establish temporary cooperation among RDs to answer business opportunities.

Technical networks target the search for supplement of internal competences offered by SENAI in education, technology, and innovation, in order to answer to industries needs in effective form. The technical network attendance life cycle covers the following:

- **Creation:** is the phase in which the technical network attendance is configured to better attend that industry necessity. In this phase the business opportunity is detected and the interlocutors are responsible for defining which RD will be Technical Coordinator and which RD or RDs will be Operators.
- **Operation and Evolution:** phase in which the technical network is performed based on the work plan agreed between the stakeholders, with systematic monitoring, ownership of results and records of occurrences, based on the rules and practices of project management. When problems occur during the operation phase and it is necessary to restructure the team or process planned, the Evolution phase is executed. In the Evolution phase it is possible to incorporate other RD or stakeholder during the Operation phase.
- **Dissolution:** phase in which, after product delivery and acceptance by the customer, gains and losses generated by the technical network are distributed. The gains may be tangible (e.g. financial, equipment, laboratories) or intangible (e.g. information, knowledge, patents, methods).

## 5 Validation of Framework for SENAI Technical Networks

In order to validate the framework, governance, policies and procedures of SENAI technical networks, the strategy was to create a new technical network: the textiles network. This sector is priority because is suffering a fierce competition and is one of the main financial contributors to SENAI. Six RDs were selected considering: expertise and experience in work development within local companies in the textile area, and the local market in that RD.

Each RD pointed a technical interlocutor and a market relationship person. After that, meetings and activities to develop the new culture of work were performed, considering: the culture of competence (all RDs recognized the competences of each RD involved), the culture of trust (better knowing and understanding each representative/RD involved) and the culture of collaboration were set (developing network attendances NAs). These meetings and activities were held in different RDs.

Together with this group, rules and procedures for technical networks were developed. These rules and procedures were evaluated in some pilots by the textiles network.

These rules and procedures were assessed by the following people before they were accepted for the whole SENAI system: a) SENAI ND networks coordinators; b) regional directors from 6 RDs involved in textiles network; and c) regional directors of all the whole SENAI system.

## 6 Knowledge Management Facilitators & Policies into the SENAI System

In parallel to the work conducted over the technical networks, SENAI has launched a huge initiative in order to build (in all senses of the word) a network of innovation institutes across the country (25 of them have been planned so far, including embedded systems, mineral technology, electrochemistry, etc.) knowing in advance that SENAI institutes must be free to collaborate among themselves according to the business opportunities. As part of this work and in perfect harmony with the technical networks (now these networks involve not only RDs but also innovation institutes), an ongoing work focused on the use of Knowledge Management (KM) concepts and practices was started, in order to help creating a KM-oriented culture, a KM way of working, a KM environment. It is worth noticing that such a work was not targeting the development of “yet another KM tool”; rather, the idea was to put technology as the last bit of the work and to consider it only (and if only) deemed really necessary.



**Fig. 3.** KM facilitators at SENAI system

KM group, responsible for the KM angle in the SENAI system, is working supported in two major vectors: facilitators and policies. Facilitators (figure 3) represent the elements that play a relevant role as part of the creation and dissemination of a KM-oriented culture.

Therefore, figure 3 must be read bottom-up, as follows:

- Organization is the basic foundation supporting the whole work. In this case, organization represents the SENAI high administration level, which in this case, is firmly committed to the whole project.
- Culture represents the required change towards a KM culture. Actors involved in all SENAI networks must be *educated* to work collaboratively in an environment where knowledge exchange is vital. This means they must get the appropriate help to: give value to the knowledge created, provide a permanent knowledge memory, share, transfer, and reuse knowledge.
- Rules & Guidelines can be defined by the organization in order to help creating and promoting the KM environment. Few examples of rules & guidelines are the following: promoting collaborative work, pushing the creation and transfer of knowledge, providing access to the knowledge sources spread across the country.
- Operation represents the modus operandi of every single member of SENAI networks. Here is the stage where knowledge really takes form and action, during the activities performed by all members of SENAI system. How knowledge is created, stored, shared, and reused is effectively considered as part of the operational sphere of SENAI networks.
- Technology, as previously stated, may play a role but never the central one. KM platforms, if required, are tools intended to facilitate the technical procedures guiding the daily work of SENAI members, targeting the creation and dissemination of a KM environment. KM tools may help acquiring, storing, sharing, and reusing of knowledge as part of the collaborative work conducted by SENAI technical networks. It is important to say that technology is 100% dependent of the other levels and not the contrary.

Regarding KM policies, they are needed to guide the following subjects: a) knowledge sharing among SENAI institutes (what are the knowledge sources to be shared, how they are shared,); b) incentives to collaboration (why institutes must collaborate, from all perspectives); c) management of knowledge sources (responsibilities about the knowledge sources, their availability, quality, etc.); and d) interoperation among institutes at a national level, knowing that for the first time in SENAI history one entity from a given RD will be able to conduct business with clients from other RDs. These 4 subjects were chosen due to their strong influence on knowledge management practices. The competences (from institutions and people) are the target in collaborative projects. The exchange of knowledge relies on collaboration channels, which by SENAI very nature, must be strongly promoted. Knowledge sources are the currency supporting successful collaborative (and sometimes innovative) processes. Finally, historical paradigms of SENAI behavior must be broken in order to give rise to a new culture of work, which must be collaborative and based on knowledge exchange, essentially. The success of SENAI networks will strongly rely on them.



## 7 Conclusions

The global stage competitive imposes organizations to change the way of work with their customers, suppliers, and even competitors. One strategy that is being implemented by these organizations is to work collaboratively or in networks. SENAI was created to attend Brazilian industry and in this context developed, in 2011, the SENAI Support program for industrial competitiveness. In this program there are challenges for the vocational and technological education areas as in the innovation and transfer technology to make industries more competitive. One strategy to achieve this program is to develop a new collaborative work culture in the SENAI system, leveraging the competences that exist in the 27 different RDs.

At the same time, launching the national network of innovation institutes set the challenge to a more complex level. Collaboration is a must to provide the power to SENAI networks to effectively attend industry demands, on one hand and, on the other hand, knowledge-based culture must be put in place in order to create the assets to fully provide an innovation-oriented environment for the Brazilian industry. After all, industry required a very clear help: a network of innovation institutes capable to push our potential forward and really gives birth to a new (and innovative) industry. We believe that this work is one of the most important for the maintenance of the SENAI system providing effectively and efficiently the Brazilian industry.

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