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Part I - Improving performance of extended organizations with organizational capability approach:

Overview, challenges and proposition for a management framework

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Introduction – Strategy / performance considerations and organizational capability approach

Over the last years industrial groups adapted themselves to a very competitive and global environment. They aimed at optimizing their production system and their organizational structure. They used « Rightsizing », « Reengineering », and « Total Quality » to reduce costs, eliminate wastes, downsize risks and standardize practices (Amidon, 1997). However this industrial optimization, sometimes drastic (outsourcing, services centralisation, wage bill saving) triggered new stakes. Companies realized that they only resized the emerged part of their «value production system », sometimes to the detriment of the immersed part called "immaterial capital" (Edvinson, 1997). Indeed, individual and organizational knowledge management (Bernard and Tichkiewitch, 2008) and innovation have become the new sources of competitive advantages that must be created and protected.

Through their analysis of what performance is nowadays, (Kaplan and Norton, 2004) demonstrated that production and structural optimization must be reconciled with innovation and learning capabilities. In the Balanced Score Card depicted in Figure 1, the « instantaneous », « material » and « short-term » performance (financial efficiency, shareholders satisfaction) is only the top of a pyramid. It is supported by two operational performance levers, customer satisfaction (which enables to increase "volume growth") as well as internal processes improvement and product/service innovation (which reduces costs and raises benefits). Finally all these elements are backed by what these authors call "learning and growth", i.e. the capability of organization to innovate and to renew its functioning to insure a sustainable and "long-term" performance. This balanced view of performance resonates with the current crisis. Financial results and shareholders requirements currently seem to « pull » performance. To readjust that, performance system should be « pushed » by a sustainable learning system.

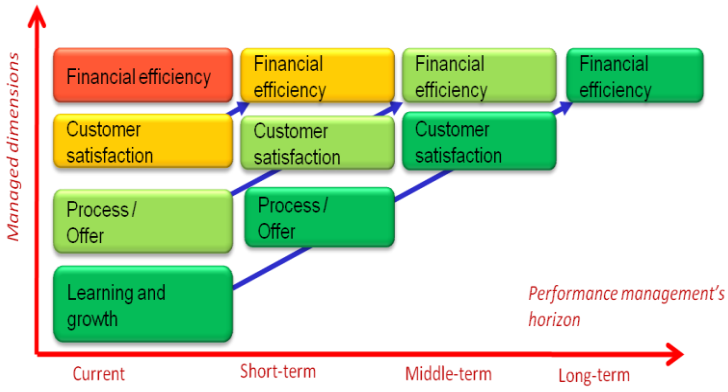


Figure 1: predictive horizons of the BSC

Harvard's SWOT model

To support this learning power, the organizational capability approach emerged in the beginning of 90's. Stemming from the Resource Based View theory and the Competitive Advantage approach (….), it looks for optimally exploiting the internal resources to create significant assets for the organization. In placing it on the SWOT model from (Learned et al., 1960), this approach can be therefore considered as a means to diagnose organizational strengths and weaknesses, to enhance the aptitudes of organizations more and more changing in a turbulent environment (Ansof, 1965), and to help decision-makers in their choice to launch such a new project or a reorganization (cf. Figure 2).

This paper aims at providing a global framework to support the organizational capability approach and to integrate it sustainably in the management system of extended organizations. These research efforts occur in the Pilot2.0 project, supported by French National Research Agency (ANR, 2007).

The first part deals with the concept of organizational capability in the context of extended organization and stresses theoretical principles to manage it. The second section presents methods and tools which can support the management of organizational capabilities and how they are structured to answer this challenge. Roadmapping, the specific method of Pilot2.0 project, is especially studied, and compared to the state of the art. Lacks and barriers limiting the existing methods are emphasized in the third part. Then a framework for managing organizational capabilities is proposed, verifying the principles and the structure exposed in parts I and II, and overcoming the barriers emphasized in part III. This framework is described trough two models: an UML class diagram for presenting the different systems and objects supporting the method, and an IDEF0 activity diagram for detailing the dynamics of the objects, defining and placing the actors involved in the approach. Finally propositions are discussed in last sections.

I. Related works – Context, concepts and principles for organizational learning management

I.1. *Needs for organizational capabilities management: the cases of Valeo and CG84*

The Pilot2.0 project's consortium gathers research partners and two different organizations which constitute an experimental field, summed up in Figure 3:

• Valeo is a huge automotive supplier group, which is composed of 134 plants geographically distributed in the world. In business, a group is most commonly a holding company consisting of a parent company and subsidiaries (Khanna and Yafeh, 2006). This is typically a cluster of legally distinct firms with financial relationship (takeovers, controlling stake), economical relationship (resources sharing), commercial relationship (concessions, purchasing and selling centralization), or managerial relationship (strategy, corporate managers choice). The relationship between the firms in a group may be formal or informal. Indeed a group is based on the centralization of the strategy and on a relative autonomy of the subsidiaries. This form of organization aims at insuring the efficiency and the agility of the management (Birkinshaw, 1999), but it can also cause heterogeneities in the practices used by plants and therefore in the products delivered to the customers.

• The General Council of Vaucluse (CG84) is an administrative organization focused on the delivery of social and infrastructural services (health, education, roads, and unemployment aid) for the French department of Vaucluse. The diversity of provided services and the willingness to locally serve citizens trigger off a scattering of agencies and employee on the territory, in terms of geography and missions. Moreover the management culture is not as rooted in the spirits as in corporate groups, making animation more complicated. This kind of context also results in issues to create synergies around global objectives and to homogenize the quality level of services.

VALEO			General Council of Vaucluse (CG84)		
Organization	**Environment**	**Mission**	**Organization**	**Environment**	**Mission**
Context			**Context**		
134 plants 12 product branches 15 functional networks	Global and competitive market (automotive sector)	Ensuring customer satisfaction by delivering same products with same quality level	Repartition of services on administrative territory 6 public service domains 26 functional divisions	Collaboration with other dministrative entities, with external suppliers and associations	Ensuring public services on the whole territory by federating the 6 domains (education, social action, civil engineering, health, public transportation, project investment)
Observations					
Difference of seniority and culture between plants matrix structure with operational and functional people	Plants acquisition and transfer, new partnerships	Ageing of methods Differences of maturity between plants Quality performance and audited progress	Different ways of working depending on functional culture A weak motivation system, without real animation and evaluation culture	Complex connections with different social and external actors	Difficult strategic alignment of the 6 service domains Problems for defining and animating objectives Information sharing issues between divisions and service domains
Issues					
heterogen used practices and processes					
difficult communication in managerial matrix structure			difficult communication between divisions and with external partners		
Heterogeneous plants			Heterogeneous service missions, and no coordination between them		
Missing standardization and continuous improvement of methods			a few standardized methods		

Figure 3: Valeo and CG84's contexts

These "variable-geometry" extended organizations, due to either an evolution of their borders or an evolution of the virtual perimeter adapted to the needs of each projects, is a place of experimentation and renewal. That enables organizations to progressively change and to maintain their growth on a long term. But the necessary management of this moving set is made very complex. This strong dynamism raises huge learning issues:

• How to integrate or deploy a new organizational entity and enable it to acquire organizational culture?

• How to manage and coordinate subsidiaries with heterogeneous structures and practices?

• How to detect and capitalize local good practices for the whole organization?

• How to transfer best practices to the operational ground, without "threatening" the "relative" autonomy of the subsidiaries and their capital of innovation?

• How to guarantee customers that a good or a service, wherever it is produced, will have the same performance and the same quality level?

These questions underline the needs for managing organizational capabilities, it is to say for guaranteeing a cohesive, continuous improvement of delocalized organizational entities, for sustaining organizational changes, and for having a robust image of what organization can do at all levels.

I.2. *Definition and position: what is organizational capability and which novelty does it bring?*

According to (Ulrich and Dale, 1991), financial, strategic (building better products or services, pricing offer lower than competitors) and technological capabilities (introducing technological innovations in products or in manufacturing processes) must be supported by an "organizational capability". This one is defined as "the firm's ability to manage resource to gain competitive advantage". As emphasized by these authors, merely hiring the best people or buying the best machine do not guarantee organizational capability. It is necessary to develop people competencies through effective human resource practices. Quick fixes, simple programs or management speeches are not sufficient. That involves adopting principles and attitudes to create a real, collective synergy. In a more operational way (Saint-Amant and Renard, 2004) defines organizational capability as "a know how to act, a potential of action which results from the combination and the coordination of resources, knowledge and competencies of organization through the value flow, to fulfill strategic objectives". According to them, that results from the creation of a guide of practical knowledge which is then transmitted to the different organizational entities to ensure coordinated and collective progresses. This concept enables to join the organizational and the economical vision of the resource-based view theory (Fall, 2008). Indeed the value of organizational resources, knowledge and competencies does not depend only on Barney's criteria (Barney, 1991) about their rareness, value, inimitability, and non-substitution (like patterns, special machines, recipes). It can also be gained by the coordination of non strategic elements which bring together a real asset (for instance the preventive hand-washing is as valuable as the invention of a vaccine regarding the swine flu).

I.2.1. *Knowledge and Competencies Management considerations*

Organizational capability approach can be compared with other approaches inheriting from the resource-based view theory, like knowledge management and competencies management.

• A part of research works based on the resource-based view paradigm focused on the study of the « knowledge » object, resulting in the birth of the knowledge management approach. Supported by methodologies (MOKA, MKSM …), this approach is based on capitalization logic (Ermine, 199x). Knowledge is first captured and structured into a guide with the aid of explicit (documents, schemes …) and implicit sources (know-how, experience feedbacks, etc.), and this guide can then be put into a design- or a decision-support system. The final goal is here to save and distinguish the knowledge which has value to design and produce a new product/service, or to take a relevant decision (Xu, 2008).

• Another part of the academy focused on the HR dimension and on the « competency » object. There are thus many methods which look for managing resources allocation or individual plans around defined processes, based on the skills ment of each employee (Grabot, 200x, Harzallah, 200x). In mpetency" perspective another point of view can be also ıed, which aims at modeling pedagogic institutions as a of production of competencies, where the competency es the product to manage in the organization. zational capability approach enables therefore to the junction of knowledge management and tency management. The processes of knowledge ng and structuring are used to create a guide guiding ctive learning system. As figured by (Pelletier, 2003) jic of resources allocation and individual trainings is re changed into a collective organizational capability pment system.

Figure 4: From resources allocation and simple training planning to learning organizations

I.2.2. *Enterprise modeling considerations*

On another hand organizational capability approach causes changes in Enterprise Modeling principles. Indeed many methods are more focused on the definition and the description of processes (like CIMOSA, PERA, BPM …) than on the modeling of the synergy of organizational resources. In the same way, the change management proposed by the Business Process Reengineering is based on processes reconfiguration whereas organizational capability approach is more focused on the improvement of the resources interactions, coordination and collective learning. Thus resources are not any longer allocation variables that the modeler defines around processes to complete organization objectives. The modeling work can and must also be done on the coordination and the synchronization of resources around these objectives. Organizational capability approach is therefore a complementary resource-centered enterprise modeling, which can occur with or without the knowledge on processes, as proposed in the other process-centered approaches.

I.3. *Functioning principles: how to develop organizational capabilities?*

Organizational capability concepts are now defined and positioned relatively to other approaches from literature. But questions still remain. How is an organizational capability created? How is it modeled? How is it transferred to the whole organization? To answer these questions it is necessary to study the research works on organizational learning, on knowledge lifecycle and on good practices transfer.

I.3.1. *Organizational capability lifecycle*

Organizational learning is defined as a « collective endeavor which aims at increasing, in a continuous and active way, individual and organizational knowledge and skills » (Senge, 1990, Garvin, 2008). According to (Yeung, 1999), it can be considered as a capability which « enables to generate ideas (innovation), to detect and generalize them (conceptualization) then to transfer them through all the organizational layers (transfer), with the aid of initiatives and management practices». The first part of Yeung's definition focused on a "learning capacity" is similar to the analysis of (Diani, 2002), who writes about an ability to "create new knowledge and to transform this one into competencies for organization". This twofold challenge is depicted by the purple boxes in Figure 4. An important matter in organizational learning in extended organizations is the codification of local innovations, the transfer of this knowledge, called sometimes "good practices", and the use of these practices to increase the "organizational capabilities" of each entity. In this framework, (Szulanski, 1978) describes five processes. They explain the different transformation stages from a local innovation into a conceptualized organizational practice and then into a transferred organization capability (Figure 4, green boxes):

• *Acquisition:* an organizational need is identified and knowledge is found locally (by expert or operational workers) to solve this requirement.

• *Adaptation:* knowledge is modified and combined, to become an organizational knowledge and to be adapted to future learners.

• *Application:* This adapted knowledge is communicated and transferred to the learners.

• *Acceptation:* Animation around the applied knowledge must be done so that knowledge is effectively acquired by learners and becomes an organizational capability.

• *Appropriation:* Organization is mature on the transferred knowledge and skills, and entities are autonomous on them. They adapt them locally or propose modifications to group.

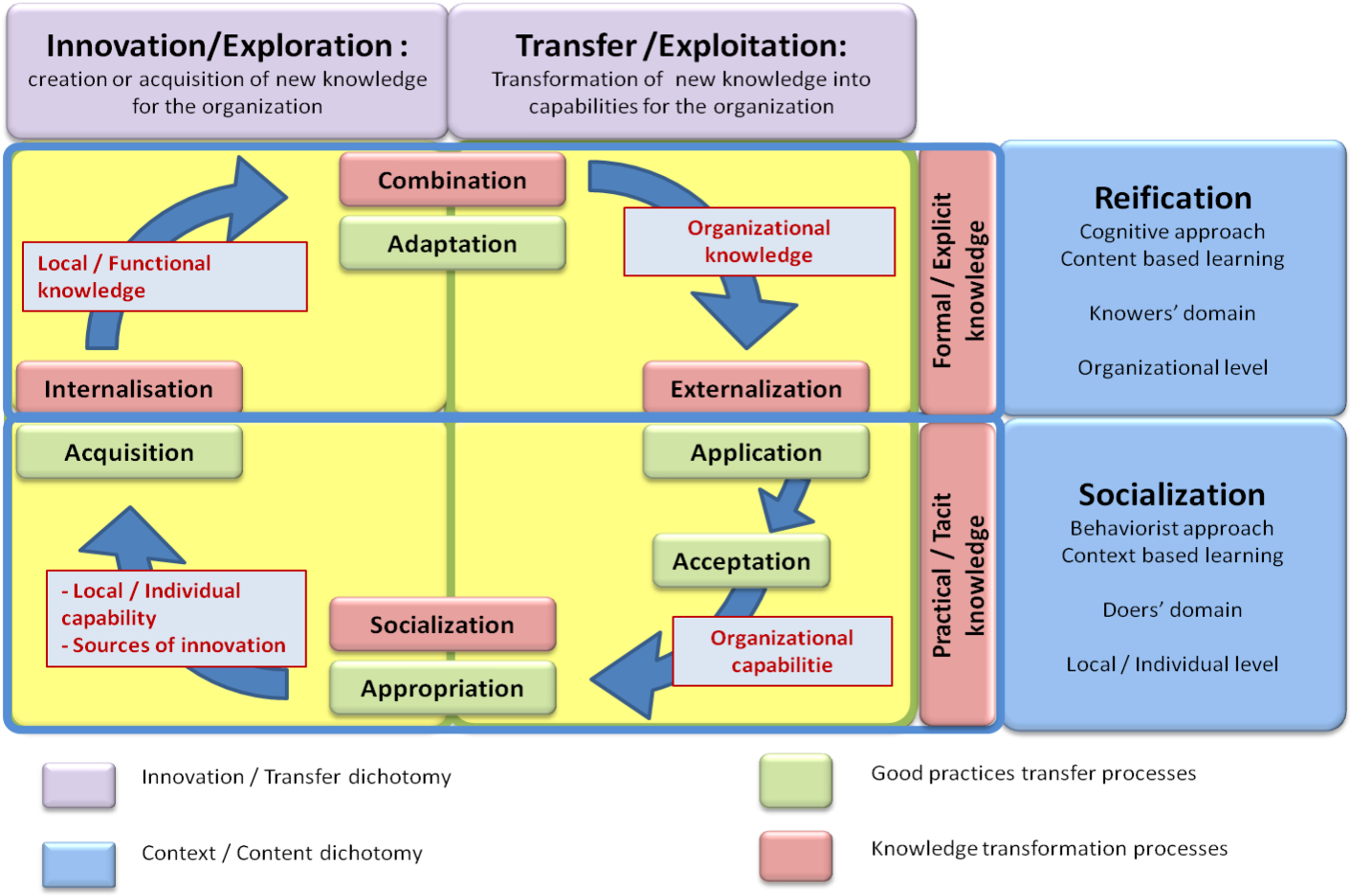


Figure 5: mechanisms for the development of organizational capabilities

These five processes are actually very similar to the SECI model (Nonaka, 1995), as emphasized by the green boxes in Figure 4. There is only a slight difference brought by the Szulanski processes. Indeed knowledge "externalization" is derived in two different processes, "application" and "acceptation", which play on the "individual/organization" duality. Thus an organization has to share the practices it wants to implement, but it has also to check if these practices are well understood and well used by operational subsidiaries. A second layer could be added to this analysis. As emphasized by (Leroy, 1998, Rauffet, 2008), learning processes can also be divided in two approaches, as shown below (Figure 4, red box):

• A cognitive approach, based on knowledge and capability codification, which is also called reification. It is the part dedicated to the "knowers", who model and make knowledge formal.

• A behaviorist approach, based on the learning and the work context, which is more focused on the Nonaka's process of socialization. It is the part dedicated to the "doers", who use knowledge as capabilities to do their tasks.

These two last points of view are essential for organizational learning in extended organizational. The formal work of knowledge modeling is the fundamental support for communicating on and managing the organizational capabilities development. This is a way to clarify the message that organization want to transmit to its entities, and to mobilize these entities around key objectives. On another hand the informal knowledge sharing is vital for adapting corporate practices to the local and operational context. It is also an enabler for creating an innovation dynamics, where the "doers" have the possibility to improve the guide by giving to organization a part of their experience. The following section deals particularly with these adaptative and transformative mechanisms.

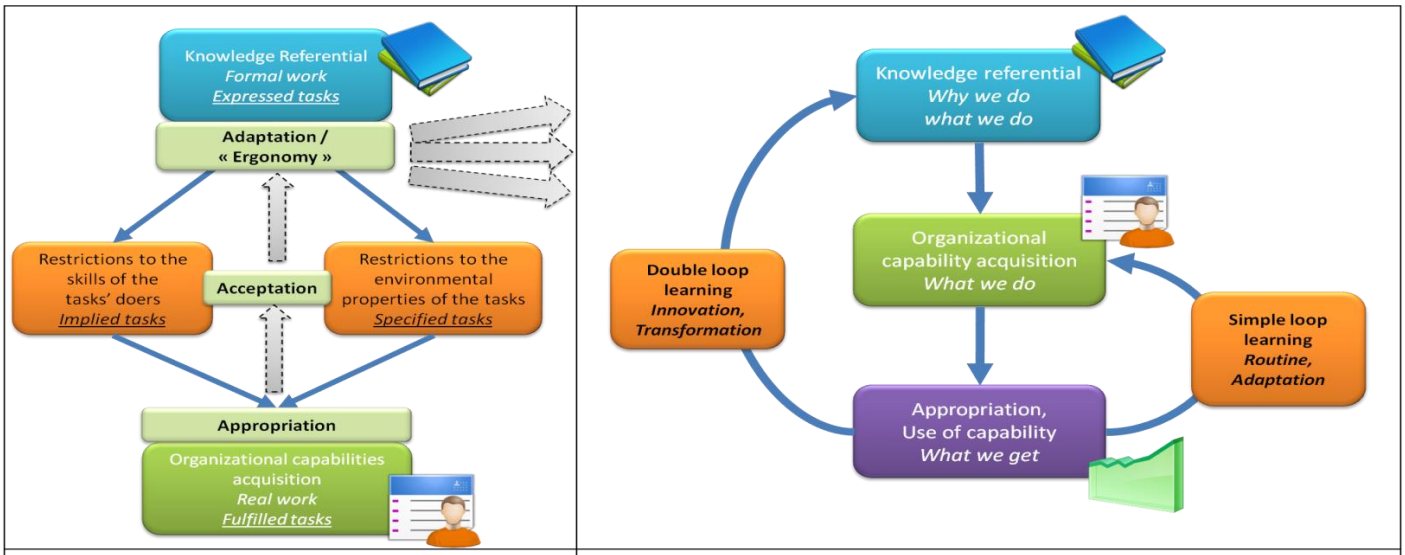
I.3.2. *Organizational capability renewal mechanisms: how to make it dynamic and sustainable?*

In extended organizations it is necessary to detect local good practices, to generalize them and to transfer them on the whole organization. Indeed it is impossible to manage such complex structures and to deliver quality products or services if each organizational entity uses its own guide, its own methods. However, this kind of learning can fast become static, without change and improvement of the organization standards. It is why feedbacks from the entities are important to boost, to loop the transfer processes, and avoid them to become too normative. To guarantee practices appropriation by the « doers », acceptation mechanisms must be understood. As explained by (Guillevic, …), this acceptation process depends on two factors (cf. left side of Figure 6):

• The intrinsic attributes of the learners, which reduces what "organization wants" into what "learners is capable to do"

• The characteristics of the learning's environment, which reduces what "organization wants" into what "learners is allowed to do"

To limit the restriction effects generated by these factors, it is necessary to adapt or to transform the guide content or the application context. In this framework, (Argyris and Schoen…) introduced the "double-loop learning" principle (cf. right side of Figure 6). That enables to support the sustainability of the organizational learning system, by leaving the "doers" propose innovation and call imposed practices into question. As underlined by the "performance's causal model" from (Burke and Litwin, 19xx), the "doers" are not only in a "transactional" logic, where they look for adapting their behavior to match the allocated objective. They are also able to have a "transformational" impact on what they are asked to do.



Gap between formal knowledge and acquired capabilities	Learning loops for content / context adaptation or transformation

Figure 6: Adaptive and transformative mechanisms

II. State of the art - Organizational capability management methods and tools

There are many "organizational learning" approaches which aims at supporting the previous presented mechanisms, especially the codification and the transfer of good practices. After giving an overview of these methods, the roadmapping used in the Pilot2.0 project is presented. Then a summary table is drawn.

II.1. *Literature overview: review and trends*

Over the five last decades many methods and tools emerged to manage organizational capabilities and their learning in organizations. Industrial groups constituted different good practices libraries to make their entities progress on particular concerns (production, information system, purchasing…). Indeed it is necessary to clarify and transmit the knowledge pillars through their extended structures, where communication can be complex due to the numerous interactions and the distance between interlocutors (at geographical, semantic or cognitive levels). Same efforts are also found in national institutions (like the Canadian electronic administration) or in organizations for the development of emerging countries ().

Among a plethora of methods and tools there are general trends:

• *Toward a holistic management and a complete support for organizational learning:* the approaches found in the literature review aimed at covering over the years the whole organizational capabilities development lifecycle (cf. part I.3.1). They have integrated successively the different systems of processes of organizational capability management that could be organized according to the AFNOR's typology (AFNOR, 2000):

- **Primary processes - Design and transfer:** Deming's PDCA and 5S methods first aimed at communicating on and imposing new work cultures through rallying leitmotivs, as simple as consigns given by national institutions to help new parents through child safety guides and journals of child health care.

- **Support processes - Assessment and enhancement:**

  - These "primitive" good practices libraries were replaced by very detailed libraries to support their complete and controlled implementation within the whole organization. Progress becomes measurable, because of the need for assessing and sometimes certifying the organizational capabilities acquisition on a particular criterion (ISO9000 for quality, OHSAS for security, and ISO14000 for environment) or on a specific department (CMMI for IT, Purchasing…). This control is done with the aid of metrics included in the structure (e.g. CMMI defines a scale for measuring the capability), or by means external to the methodology (like audits for ISO norms).

  - Moreover the design of practices libraries becomes bottom-up through the use of feedback tools to adapt or transform the top-down recommendations (QRQC, REX).

- **Management processes - Coordination and alignment:** Nowadays the goal is to coordinate these functional learnings and to align them according to the corporate strategy, by proposing integrated governance frameworks (SMI, EFQM, COBIT…).

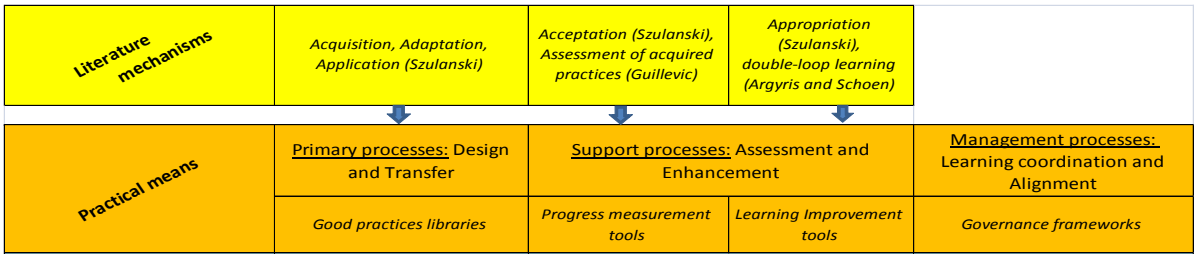


Figure 7: Progressive integration of organizational capability development processes, built from (AFNOR, 2000) typology

• *Toward "customized" good practices:* Unlike the previous evolution tending to a global framework for managing organizational learning, practices are more and more customized to match the context where they are used.

- **Generic:** Initially 5S "common sense" principles could be applied in production or in office;
- **Functional:** Then hundreds of pages of ITIL or CMMI methods were only dedicated to the particular domain of IT, whereas ISO proposed transversal norms to manage a particular criterion, like quality or security.
- **Specific:** Nowadays normalization work is still more adapted to specific contexts (pharmaceutical, nuclear, oil industries …). In parallel of this international normalization, organizations have their own practices libraries based on their corporate culture and want to capitalize it into the learning management system.

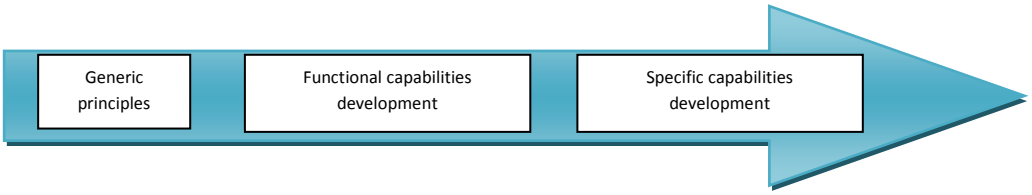


Figure 8: Progressive customization of the practices to specific contexts

There is therefore a granularization of organizational capability modeling through the definition of more and more contextualized good practices. That makes organizational learning more concrete and assessable. On another hand integrated management frameworks are important for transferring and piloting these learning guides into the whole organizations to serve fully the strategy of extended organizations. These two analysis axes are used to build the table on Fig.12 and compare the different methods of the state of the art.

The following part studies in detail the case of the method developed by Pilot2.0 project's team, to observe the used elements for structuring, implementing and governing organizational capabilities.

II.2. *Case study: analysis of Pilot2.0 project roadmapping*

The roadmapping of management (Blanc and Monomakhoff, 2008) is supported by a formalism, the roadmap, and a software tool. It is used for transferring good practices, integrating new entities, and assessing locally and globally organizational capabilities.

II.2.1. *Roadmap learning architecture and assessment*

To capture good practices and structure them for building organizational capabilities, the method proposes a pattern called roadmap. An instance is illustrated in Figure 6, used for developing the capability of managing Information Systems in each organizational entity. This pattern has a 2-dimensions matrix architecture, composed by:

- "actions levers" in the rows, it is to say all the resources required by the organizational learning at the entity levels.

- Five "knowledge maturity levels" in the columns, similar to CMMI, which enable to draw a progressive learning path.

- The roadmap content is based on the capture of local good practices and innovations. These one are organized in two levels of granularity: (1) the requirements express the general objectives for each "action lever" at each maturity level. For instance, "a manager is appointed" is a requirement. (2) The deliverables are a list of actions which brings details on how the above requirement could be fulfilled. For instance, "a selection committee is created" and "A list of the applicants for the position exists" are two deliverables of the previous requirement.

Maturity levels/ Action levers	1	2	3	4	5
Manager	A manager is appointed	Resources and structure are ready to go	Management by objectives is used	IS objectives are aligned with the other functions' objectives	IS department becomes the group training center
Applications and data	Applications comply with local laws	A fulfilled applications mapping is made	IS is involved in all the stage of applications lifecycle	A Data Quality approach is implemented	Data formats are updated to comply with last standards
Suppliers	IS purchasing processes exist	The IS purchasing processes are standard	Contracts are organised based on deliverables	The audit of suppliers provides new performance indicators	Suppliers are involved in the continuous improvement process

Figure 9: Roadmap architecture and assessment

The roadmaps are used to model and transfer the good practices through a web platform. This one enables also to assess if organizational capabilities are well acquired by entities. Thus all the local managers who use a roadmap have to report the progress they achieve at least once a month. That enables a delocalized measurement of the organizational learning. The grades follow basic rules:

- If all the deliverables are achieved, then the requirement is considered as fulfilled (the roadmap's cases turn in green).

- To reach a knowledge maturity level, all the requirements on this level and on the previous one must be done.

- The final grade is composed by the maturity level grade and an extra grade representing the completion of the first unfulfilled maturity level.

Corporate Activities	1	2	3	4	5
Purchasing			10%	30%	10%
Production				10%	
Sales					10%
HR		90%	40%	10%	

Figure 10: Roadmap consolidation

In Figure 6, the maturity level is 2 and the final grade is 2.33 (33% of the third level is completed). All these grades are consolidated at different group levels, to give an overview of thee maturity levels reached by a business unit, a functional network, or the whole group (Figure 7). These two assessment levels provide thus indicators on the acquisition of organizational capabilities.

II.2.2. *Roadmapping lifecycle*

The use of the roadmaps and their assessment could be summed up in the lifecycle presented in Figure 8.

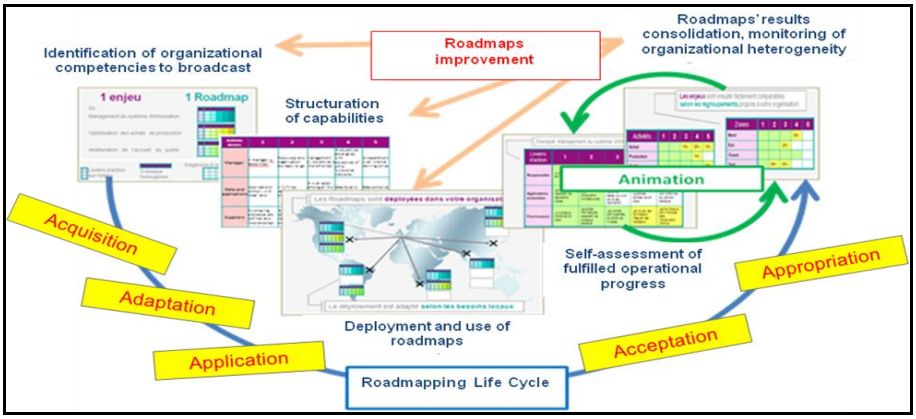


Figure 11: Roadmapping lifecycle

As depicted as above the roadmapping processes follow very finely the Szulanski's proposition:

• The roadmaps' subjects are generated by strategic managers, and necessary knowledge is identified by functional experts.

• Roadmaps are written, to adapt and combine all the good practices in the roadmap's learning architecture.

• The roadmaps are firstly transmitted to middle and operational managers, who discuss objectives, in terms of level to reach and delay to respect for level achievement. Then the roadmaps are deployed in all the concerned entities.

• The roadmap are used and self-assessed by local managers. Their grades express the acceptation degree of the learning patterns. The notes are consolidated to provide indicators on how organization acquires capabilities and to help managers for orienting the development of the resources and adapting the strategy of the organization.

• In a process of continuous improvement, feedbacks are collected about the content and the deployment of roadmaps. New versions of roadmaps can be proposed, and learning objectives can be modified.

Roadmapping is from now an approach which enables to develop specific and contextualized organizational capabilities. It is being tested on the internal libraries from Valeo Group and General Council of Vaucluse, as well as on the REACH norm.

Its strong points are the architecture and the deliverables' concreteness (which allow structuring libraries and making them operational), the mechanisms of assessment and consolidation (which provide relevant indicators for governing resources development) and feedback tools (which enables an evolution of the organizational capabilities management system).

II.3. *Synthesis and comparison: How organizational capability management is supported and what is missing?*

The previous methods and their attributes are summarized in the following table, following the two axes defined in part II.1. "Check" sign means that the process is completely covered by the studied method; "Slash" sign means that the method brings solutions supporting partially the processes.

Practical means	Primary processes: Design and Transfer	Support processes: Assessment and Enhancement		Management processes: Learning coordination and Alignment
	Good practices libraries	*Progress measurement tools*	*Learning Improvement tools*	*Governance frameworks*
State of the art				
Generic Principles				
Toyota's 5S, Child safety guides, Journals of Child Health Care	**V** (very simplistic leitmotivs, easy to communicate as an organizational culture)			
Functional capabilities development				
Security, Quality, Environment				
Transversal norms (ISO 9001/ ISO 14001 / OHSAS 18001)	**V**	**/** (Compliance Audit)		
Integrated Management System, EFQM Model	**/** (ISO 9001/ ISO 14001 / OHSAS)	**/** (Compliance Audit)		**V**
Information Technologies				
ITiL / ISO 27000 /ISO 20000	**V**	**/** (Compliance Audit)		
CMMI	**V**	**V** (Maturity level notes)		
COBiT	**V** (can also integrate ITIL / ISO 27000 library)	**V** (Maturity level notes)		**/** (only for IT)
Project Management				
Project Management Maturity Model, SMEP, Mariska, OP3M	**V** (PMBoK)	**V** (Maturity level notes)		**/** (only for PM)
Specific capabilities development				
sectorial norms: adaptation of generic norms for particular domains like oil (ISO 29001), automotive (ISO 16949), chemical or food industries (REACH)…	**V**	**/** (Compliance Audit)		
Internal libraries: Valeo's V5000, Toyota's TMMT…	**V**	**/** (Compliance Audit)	**/** (linked with QRQC's feedbacks…)	
Studied method				
Pilot2.0's Roadmapping method	**/** (Can integrate Valeo's V5000, CG84 Quality Policy, REACH)	**V** (Maturity level notes)	**V** (user's feedbacks systems)	**/** (Ascending control but not descending deployment: creation of multilevel and multi- functional indicators, but no coordination tool for all the roadmap)

Figure 12 : Summary table of the state of the art

This summary table enables to emphasize different points:

• *On primary processes:* all methods start from the constitution of good practices libraries. Nevertheless two categories can be distinguished: the ones whose library formalization is the core activity (ISO, ITIL, CMMI), and the ones which reuse existing libraries as data sources and structure them according their own architecture (Integrated Management Systems, COBIT, Roadmapping) to enrich them with a learning path or assessment tools.

• *On support processes:* more and more methods propose to add maturity levels into their structure (CMMI, COBIT, Project Management methods), to clarify the acquisition path and provide metrics for having a better understanding and a better monitoring of organizational capabilities development. They aim thus at being different from recommendation methods (ISO norms), which only provide a guide to improve organizational capabilities and audit processes to check punctually their conformity to the recommendations, without giving a daily view of achieved progress. Moreover all libraries proposed by the methods are globally set (due to a normalization approach) and do not propose tools enabling the “learners” to modify the practices given by the “teachers” (it is to say the functional experts) or the way to teach the practices.

• *On management processes:* only a few methods provide a global management logic and a framework for integrating the different organizational capabilities development, but the trend exist (EFQM, COBIT…). This part is essential to prevent a « silo effect » in the management system. Organizational capabilities management is a global multi-criteria resource optimization problem. However many methods are still focused on finding a local optimum on each criteria. It is therefore necessary to consider the dependency relation between the different organizational capabilities for managing and even sometimes modeling them.

Furthermore many methods do not offer a complete support for managing organizational capabilities. The lacks in enhancement tools (for improving primary processes) and in governance frameworks (for managing and optimizing globally organizational capabilities), as illustrated in Fig.12. The specific case of Pilot2.0 project’s roadmapping is indeed the only method covering *in extenso* the three processes systems necessary to sustain the organizational capability lifecycle. Nevertheless even this method has weaknesses, especially in

the governance part, where measurement can be used for providing consolidated, multi-criteria and multi-levels view, but where there is no tool for planning and coordinating the combined development of different organizational capabilities.

As emphasized in next section, if methods from this state of art bring keys to support all or a part of organizational capabilities development, proposed solutions do not always work efficiently and there are still barriers which can avoid a sustainable integration of a management system based on organizational capability approach in extended organizations.

III. Challenges: Barriers and limits for a sustainable organizational capabilities management

In addition to the lacks observed in the state of the art (cf. Fig.12), the literature points out obstacles which can interfere with the good functioning of organizational capabilities development. Moreover, by using Pilot2.0 project's method as a case study, other barriers were found on operational field which can limit the application of practical solutions proposed by the methods of the state of the art. These theoretical and practical hindrances, presented as below, are aimed at being overcome in the proposition part of this paper.

III.1. *Barriers identified in literature*

Literature points out what can put a brake on each of the three systems for a good management of organizational capabilities.

- **Design and transfer**

  - Some authors consider as crucial the choice of good practices occurring in the organizational capability design phase. This is indeed a key point to guarantee a good understanding from the « learners » and a successful transfer, but this is a tough task for many reasons:

    - Reification of good practices is not always easy to do. A pregnant example of this situation is the case of the home breadmaker from Matsuhita, a Japanese company. Its engineers did not succeed in imitating the move what bakers do to knead dough. They finally followed a training course with the best Japan's baker so as they realize that bakers do not only knead dough, but they also twist it in a particular way to make it more flexible. It is only with the aid of this socialization process, based on observation and imitation, that they captured what bakers did not explain, and succeeded in integrated this double move in their machine (Perrin, 2006).

    - Transferred practices are sometimes not enough adapted to the perimeter of use. They are either not generic enough (too few entities can use them) or specific (the definition of practices is too broad to be useful). It is therefore very important to find a "happy medium" when libraries are defined; it is to say the accurate granularity level (Fall, 2008) between the genericity of normalization approaches and the contextualization of specific approaches (cf. II.1).

    - Good practices are sometimes over-diversified for dealing with a same concern, experts spend sometimes much time to reinvent wheel. It is due to the weak reuse of what already exists and works (Laroche, 2007). It is then necessary to arbitrate between several potential good practices, to optimize the structure of organizational capability (Deguil, 2008).

  All these observations can be summarized in a problem of knowledge management: good practices must be capitalized, homogenized and reused when organizational capabilities are modeled, to avoid confused and useless good practices libraries creation.

  - The definition of the application perimeter (it is to say where an organizational capability is transferred) is also crucial : if the main goal is to increase globally the capabilities of the organization, all entities do not face the same challenges, do not have the same context or the same "weapons" to answer to a given challenge. Thus a too uniform application of an organizational capability (with the same objectives and the same transfer scheme for everyone) could be dangerous, because it risks becoming perceived as shackles by operational workers. The story of Lafarge, a company specialized in plasterboard production, illustrates this danger (Perrin, 2006):

    "To prevent lump from appearing during the mixing process, the plant of Ausneuil invented in 1998 a tool, called lump breaker. This information was communicated through the technical newsletter of the company, and the plant of Wilmington, US adopted successfully the tool. Observing this success, the corporate experts decided to transfer this technique to all entities, but without any effort for explaining or documenting the invention. The first experience of entities where the tool was transferred was a failure, because of this lack of communication. Moreover, the plants tried to hide their failure without giving feedback on their problem in creating a new tool more adapted to their local specificities. Finally, this bad

first experience, due to a bad communication, resulted in creating some doubts and some resistance to adopt the tool in the other plants, and only a few of them succeeded in using the lump breaker."

Management must be therefore flexible, to avoid resistance to change, prevent cultural barriers, and overcome the external and internal constraints defined by Guillevic (cf. I.3.2).

- **Assessment and Enhancement**

o The methods of the state of the art propose verification and measurement tools to assess the acquisition status of organizational capabilities by the entities. However this notion of measurable progress, based on the measure of knowledge acquisition, even if they are practical, has limits. Stata (1989) raises obviously the problem: does an organization learn really if it is not possible to observe an improvement in its performance and a satisfaction of its customers? Ineffective organizational capabilities can come from the two primary processes:

▪ Transfer of new methods and tools can cause disorder in operational field and result in a decrease of efficiency (Weick, 1990) even if the proposed practices are good

▪ According to (Beguin and Cerf, 2004), good practices libraries are only a body of assumptions from organizational capabilities designers, which will be validated, refuted or more often improved by the experience of the learners. How to trust the assessment of capabilities, which is sometimes done on unvalid models, that is the question!

It is therefore important to verify and validate the effectiveness of the primary processes of organizational capabilities development by comparing capability progresses and performance results (Rauffet, 2008) to ensure that proposed capabilities models and transfer choices work.

o To make learning dynamic and correct the dysfunction of learning primary processes it is necessary to work on appropriation and innovative participation from learners (Nhim, 2008), in thinking about how to guarantee the double loop learning of Argyris and Schoen (cf. I.2.3) in the framework of extended organizations.

▪ Motivating people to improve what or how they are asked is very complex: people are often very busy by their weekly action plans and they have no time to do what they consider the job of functional experts.

▪ The acceptation of the medium (a "bible" of good practices, an information system) used to transfer organizational capabilities is also a considerable factor which explains the degree of involvement of the learners (Tran, 2008).

▪ The extended characteristics of organizations play also a huge role in how people participate in the improvement of organizational capabilities primary processes. Management networks are indeed more and more complex and diversified, and interlocutors can be multiple (functional expert, plant manager, project manager…). It is therefore difficult for people to know to whom they have to report their issues, or though their questions or their recommendations will be feedback to the good person. Responsible

There are thus many challenges raised for providing a sustainable enhancement system: making aware middle management of its responsibilities, defining clearly the management networks, finding incentives and new participative systems, or creating indirect systems based on progress and results indicators comparison for identifying risking zones where enhancement and innovation are crucial for the good health of organizational capabilities (Rauffet, 2009).

- **Governance**

As emphasized in part I organizational capability approach gives a strategic dimension to the resources development and management. It is therefore necessary to support the link between strategy and progress plans (Kaplan & Norton, 2008) and to avoid "silo effects" (Cap Gemini, 2007). Indeed strategy is decomposed into objectives (means or result oriented), and these objectives are then managed, often independently, in forgetting sometimes their relations to the upper goal, and the links existing between them (for instance, each functional network tends to manage its own organizational capabilities development, sometimes without having a transversal view and preferring its own priorities rather than the organizational priorities).

III.2. *Experience feedback: Barriers identified in a field study*

As member of Pilot2.0 project and contributing to the development of the roadmapping method aiming at fully supporting organizational capabilities management, the authors were able to observe its first implementation on Valeo Group. A body of interviews was made in 2008 to study the first Valeo's users' feedbacks about the proposed roadmapping system. The sample is composed of 27 people, coming from different industrial

branches: 12 are operational engineers (at the plant level), 15 belong to the middle management, i.e. they have responsibilities at the branch or division levels. Each interview was individual, and divided in two parts: a "questionnaire" part, which allows measuring the impacts of roadmapping on the way managers work, and a free conversation part, enabling to gather the met issues and recommendations to improve the method. This field experience underlines that practical solutions from the state of art can face pitfalls:

- **Design and transfer**

According to 83% of operational engineers and 73% of middle managers, roadmaps can be a source of misunderstanding. The free conversations explain that this can be due to a not enough explicit modeling, to a not accurate granularity level of chosen deliverable, or even sometimes to a language problems (in this first implementation, roadmaps are written in "academic" English). There is therefore a gap between what top management and functional experts prescribe, and how middle and operational management understand (cf. Guillevic in I.3.2). As (Fall, 2008) suggests, a solution could be a "crossed learning", where both "teachers" and "learners" design collaboratively to build adapted roadmaps, taking account both organizational objectives and operational realities.

- **Assessment and enhancement**

If middle managers use roadmapping as a management tool, 66% of operational engineers consider it only as a reporting tool (operational managers are people who self assess their progress in the system).

  - All these people regret that there is no easy means to compare their performance and their organizational capabilities, to verify if their commitment and their resources development have an impact on their operational results.

  - On another hand the interviews reveal issues for communicating around roadmaps and enhancing them. Almost all interviewed people confessed they do not use the feedback tools included in the roadmapping system, and some people were not aware of their existence. Moreover they claim they have not enough time or motivation to improve roadmaps, because they are already very busy with other stuff (objectives of results…). This problem of motivation and participation from operational managers could come from an insufficient communication from the middle management. Moreover the incentive system of Valeo rewards only the acquisition of organizational capabilities, but not the participative innovation for improving modeling or implementation processes. Formal and practical works are therefore partitioned: the second one only aims at satisfy the first one, without following the double loop learning principles (cf. I.3.2).

- **Governance**

middle managers involved in different functional networks expressed the need for a coordination tool, which could help them to manage transversally and coordinate their progress. This silo effect comes from the dominance of functional networks in the structure and the management of roadmaps, and prevents also from having a strategic view of organizational capabilities development (for instance the system cannot easily generate a scorecard, if you want to monitor together one or two roadmaps in each functional networks involved in the achievement of a particular transversal objective).

III.3. *Synthesis*

The barriers identified in the literature and in the field study are summarized as below:

Systems	Literature barriers	Field study barriers
Design and transfer	- Reification, Granularity level, Homogeneity - Flexibility and dialog for defining perimeter and objectives	- Collaborative design needs
Assessment and enhancement	- Validity of organizational capability design, Verification of effectivity in transfer processes - Participative innovation	- No comparison between capabilities progress and performance results - Motivation and participation weaknesses
Governance	- Silo effect - Linking strategy to operations	- No coordination tool for managing transversally different functional organizational capabilities - Dominance of functional networks in the management of organizational capabilities

Figure 13 : Summary table of the barriers

These barriers match each other: the work on the field enables to confirm and enrich what literature emphasizes. Whatever the chosen method, it is therefore necessary to check if the practical solutions it proposes do not trigger these identified barriers. The following section proposes to structure a framework for managing organizational capabilities development, that reuses the essence of the state of art's methods, and which attempts to avoid these eventual barriers.

IV. Propositions – Designing a management framework for sustainably integrating organizational capabilities approach in extended organizations

Part I emphasizes the strategic importance to manage organizational capabilities and the way to develop them. Then part II gives an overview of practical solutions supporting this approach, identifies three systems to structure it, and points out the lacks of the state of the art on the covering of organizational capabilities development. Finally part III provides in detail the barriers that the implementation of organizational capability approach faces with.

From this point a management framework can be built, in taking account of the theoretical principles of Part I, decomposed according to the three systems identified in part II, and which attempts to fill the lacks of the state of the art and to overcome the barriers of part III. To structure all the elements necessary to define the framework, two models are proposed: an UML class diagram, detailing the three systems and the key objects, and an IDEF0 diagram on which processes and actors are placed, to show the dynamics of objects and the involvement of actors in these processes.

IV.1. *System and object modeling*

The monitoring of the organizational status serves to define strengths and weaknesses of organization. Fundamental (what results does organization have to reach?) and means (what means does organization have to acquire?) objectives can be therefore deduced (Keeney, 1992). Means objectives could be then reached by the acquisition of a key resource (as defined by Barney, cf.I.1) or by the coordinated development of an organizational capability. To manage organizational capabilities in taking into account of the conclusion of parts II and III, the core objects of the proposed framework are defined as following, summarized in Fig. 14 and modeled in Fig.15:

- **Design and transfer**

  - *A collaborative organizational capability model:* The design of this model must be oriented by functional experts, who hold formal knowledge about means objectives about his domain. Nevertheless, so as to avoid the gap between the "knowers" (functional experts) and the "doers" (operational staff), design must also take into account of operational experience, in a collaborative way. Starting from the capitalization of practical and formal knowledge, the model has to synthesize and structure the good practices necessary and sufficient to the coordinated development of organizational resources, following a determined learning structure. It must be generic enough, to be understandable wherever it is implemented, and contextualized enough, to be useful for organization.

  - *A flexible transfer guide:* This guide enables to discuss flexibly objectives and context (delay, level, application perimeter) between operational staff and middle management for the acquisition of a key resource or an organizational capability. It generally inherits from the organizational capability model: for instance, ISO9001 norm is an organizational capability model, which helps people to build a transfer guide implemented in a specific area to reach quality standards. In the same way, a roadmap is a knowledge pattern where good practices are structured by functional expert, then it is used as a transfer guide where middle management and operational staff add the learning objectives and adapt the model to their context (for instance by claiming a good practice as "not applicable").

Systems	Literature barriers	Field study barriers	Key Objects
Design and transfer	- Reification, Granularity level, Homogeneity - Flexibility and dialog for defining perimeter and objectives	- Collaborative design needs	→ **Collaborative organizational capability model** → **Flexible transfer guide**
Assessment and enhancement	- Validity of organizational capability design, Verification of effectivity in transfer processes - Participative innovation	- No comparison between capabilities progress and performance results - Motivation and participation weaknesses	→ **Multi-dimensional and Crossed scorecards** → **Passive and active feedbacks**
Governance	- Silo effect - Linking strategy to operations	- No coordination tool for managing transversally different functional organizational capabilities - Dominance of functional networks in the management of organizational capabilities	→ **Management Portfolio**

Figure 14 : Summary table of the key objects of the proposed management framework

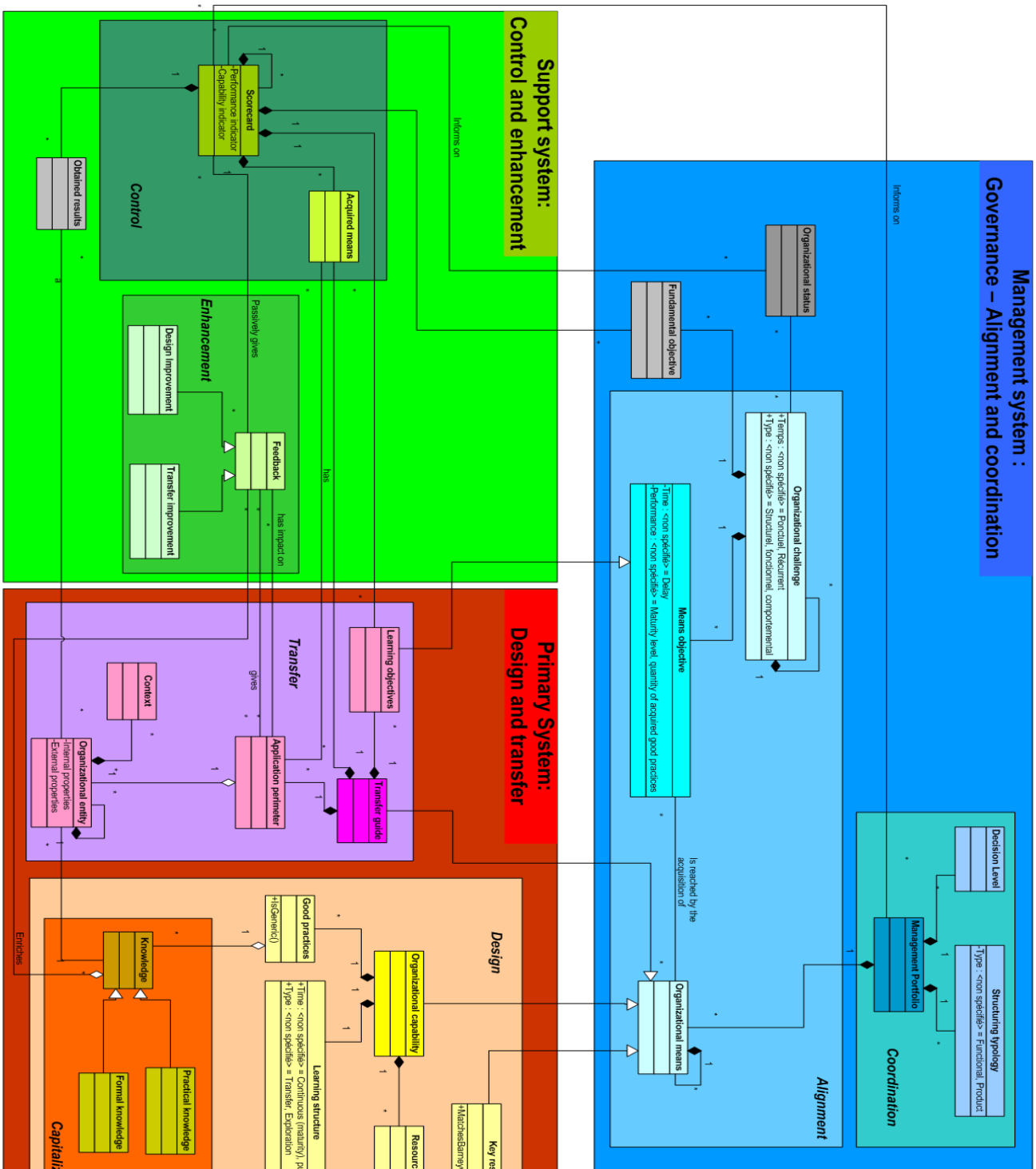
- **Assessment and Enhancement**

  - *multidimensional and crossed scorecards:* scorecards must be dynamically built to assess the means acquisition and consolidate these measurements. Moreover, these progress indicators must be crossed with activities results indicators, to verify if organizational capabilities and key resources are real inductor of performance. These scorecards could be helpful at all levels, to realize the work done and the efforts to do (operational staff), to focus on particular concerns (middle management), to observe the alignment between objectives and means and to orient organizational strategy (decision-makers).

  - *passive and active feedbacks:* Feedbacks are necessary to support the double loop described by Argyris and Schoen (cf. I.3.2), and to make organizational capability management sustainable. They can be active, it is to say that users can share their experience for improving design and transfer processes by feeding for example wiki or issues form. Nevertheless, because participative innovation is sometimes tough to manage, especially in extended organizations, « passive » feedbacks could be also proposed. These one can use the comparison between activities results indicators and organizational capabilities indicators, to identify entities which have a singular behavior and launch targeted actions on these perimeter to gather the causes of the outperformances.

- **Governance**

  - *A management portfolio:* This portfolio should ensure the cohesion of the different organizational capabilities development and avoid a silo effect, by listing and linking the organizational capability models and key resources around the organizational objectives. That would enable to conserve the alignment between objectives and means, and to coordinate the different functional networks.



IV.1.2. *Processes and actors modeling*

Fig. 17 shows the dynamic behavior of the objects previously described.

- **A1. Design and transfer:** This group of processes aims at creating and transferring the « corporate » good practices library. After a bottom-up phase (where knowledge is gathered and good practices are identified by functional experts, and then design with operational staff into an organizational capability model), there is a top-down phase (where the model is deployed through a flexible transfer a guide onto chosen organizational entities with specific learning objectives discussed between the middle management and operational staff).
- **A2. Assessment and enhancement:** The goal of these processes is on one hand to gather the experience feedback of organizational entities on their transfer guides, and on another hand to measure the organizational capabilities acquisition by these entities. These two kinds of processes enrich each other: the feedback could explain particular results, whereas the consolidated scorecards can provide passive feedbacks. The impact of organizational learning can therefore be verified, and these complementary processes enable to create a double loop system, where the design and the application of the model are continuously improved.
- **A3. Governance:** These processes are used for determining the organizational stakes and refining them into needs for organizational means, by studying and analyzing the organizational status. A FBS reading grid can be used for that (according to the performance behavior of the organization, or the changes in its structure or its function). Moreover they contribute to create the management portfolio management, where the identified organizational means are structured and coordinated around means objectives, in avoiding the silo effects between the different functional networks, the different product branches, and in aligning the efforts at the different decision levels.

The actors involved in each process are represented below each box, according the following legend:

Letter meaning
d: decision-maker f: functional expert m: middle manager o: operational staff
Case meaning
D: process owner d: process contributor

Figure 16: IDEF0's legend

- Decision-makers are leader on the choice and the structure of organizational means to implement (processes A3.1, A3.2, A3.3), and have the responsibility to control how they evolve (A2.3) to orient organizational strategy.
- Functional experts guarantee that decision-makers' choices can be documented and structured (A3.2, A3.3). They are leaders on the knowledge gathering, they have to build organizational capability models (A1.1, A1.2, A1.3), and must analyze the feedback of organizational entities (A2.5) to improve their models.
- Middle managers have a coaching role in the system. They control the discussion with operational staff about learning objectives and application perimeter (A1.4, A1.5, A1.6), to define the transfer guides. They are also the main users of the consolidated scorecards (A2.3) to follow the progress of organizational entities and to distinguish the entities which must be helped. Finally they must analyze the feedback of operational staff to adapt and optimize the application to transfer guides (A2.5).
- Operational staffs have to acquire the organizational means decision-makers choose, by following what functional experts' model with their contribution (A1.3) and according to the objectives they discussed with middle managers (A1.5). They have the responsibility to report their activities results (A3.1), to assess the acquisition of the organizational means (A3.2), and to give their experience feedbacks (A3.4) to provide information on the system and create a control loop. They use the scorecards to follow the progress on their roadmaps (A2.3), as well as the feedbacks from the other entities to overcome eventual hindrance (A2.5).

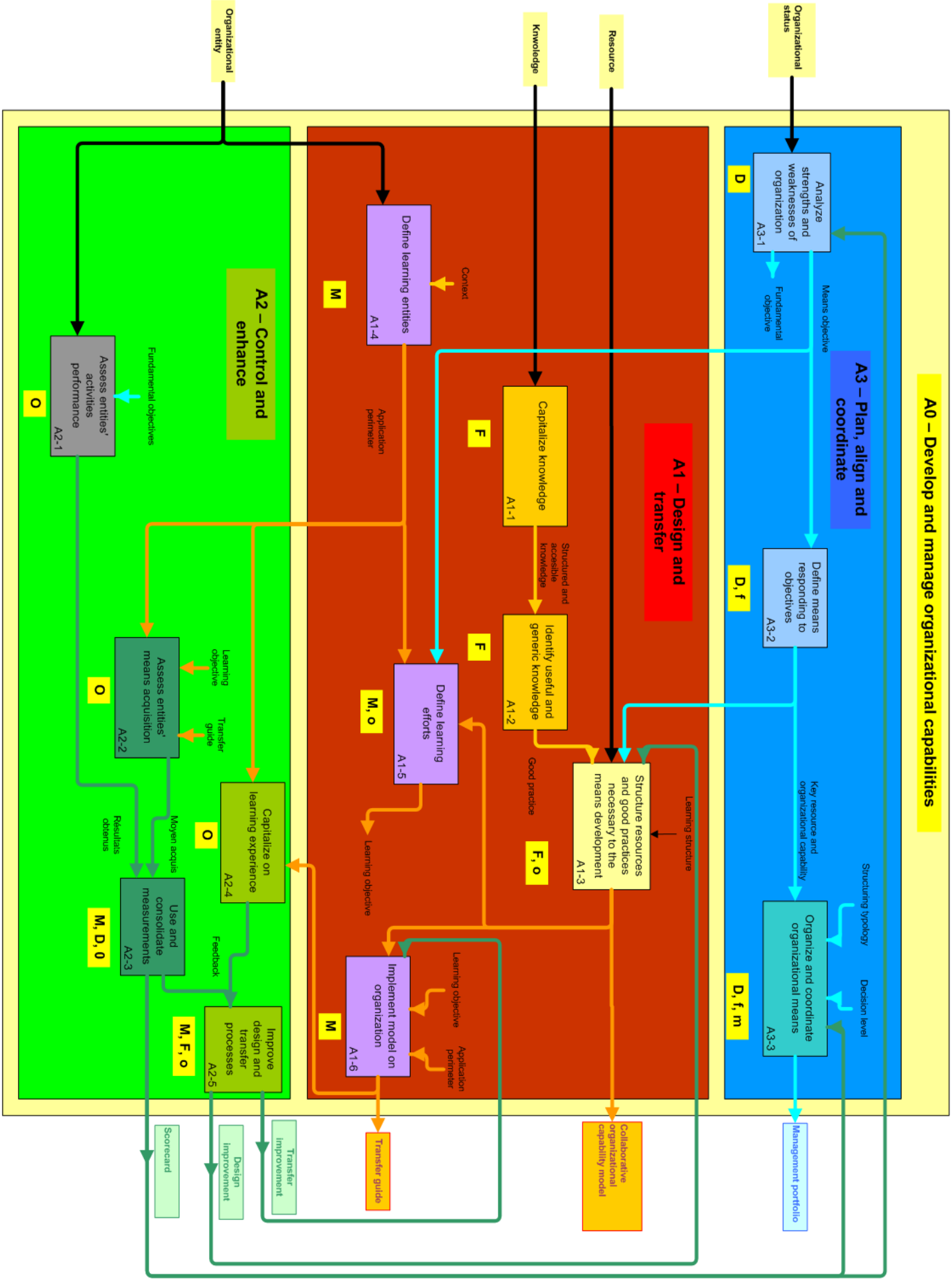


Figure 17: Processes and Actors modeling of the management framework

V. Discussion

V.1. *Illustration: Organizational capability management in Valeo Group*

Valeo uses roadmapping for managing the development of organizational capabilities on its whole structure (about 50 modeled roadmaps deployed on 200 organizational entities, in 6 different functional networks and 9 product branches). This system helps them to integrate faster newcomers, to measure the organizational strengths and the weaknesses at all levels, or to decide the launch of a new product, a new transversal project, a new merge, etc Since the first implementation and the field study led in 2008, the method has known enhancements, following the management framework described in previous section:

- **Design and transfer:** Valeo's functional experts use Quick Response Quality Control method, audit reports, and the V5000 quality guide to structure organizational capability models according a maturity path. To guarantee a global coherence as well as a better genericity of roadmaps, and to avoid a silo effects between functional networks, crossed meeting were organized between different functional experts, and operational staff from different product branches. This participative and collaborative design enables for instance to reduce the number of roadmaps in production systems from 21 to 8.

- **Assessment and enhancement:** Support and feedback tools have been enhanced. A service was created in India to support users in their understanding of the roadmaps' content and in their use of the information tool. Furthermore, collaboration tools were added to the platforms (forums, chat, mailing lists) to share and solve a common problem. On another hand a double check system was implemented, to verify the good health of organizational capability development. About 10 auditors control once a year each entities on their roadmaps (these models are becoming the transparent audit guides for the whole organization), to validate the self-assessment, whereas the use of Business Intelligence tools enables to compare organizational capabilities acquisition indicators with activities results indicators, to validate the effectiveness of the roadmaps on the organizational performance).

- **Governance:** tools are tested, for coordinating the development of organizational capabilities from different functional networks. For instance a middle manager in UK division created a tool based on VBA to plan the joint objectives and monitor the progress of her organizational capabilities in the domains of Production Systems and People Involvement.

V.2. *Position of the paper and perspectives*

This paper crossed the field study, provided by the Pilot2.0 project, its roadmapping method and the two organizational partners (Valeo Group and CG84), with the literature principles and the state of art, to propose a robust management framework for the development of organizational capabilities in extended organization. These research works are therefore at the border between organization sciences (especially concerning organizational learning), and the engineering sciences (with enterprise modeling and KM approaches). It proposes to think about the sustainable integration of the organizational capabilities approach in organizations, whatever the methods are used (CMMI, ISO, Roadmapping…). Indeed, even if methods differ, the principles of transfer and learning, as well as the barriers observed in the state of the art, remain the sames. The paper attempts thus to answer to these generic questions by:

- Claiming that organizational capabilities approach, based on resources evolution rather than processes definition and reengineering, become strategic for organization

- Proposing and modeling a management framework to support sustainably this approach, to make it more practical and further implementable, and to complete the existing methods of the state of the art (and more especially the Pilot2.0's roadmapping)

These research works are now focusing on detailing a toolbox for supporting this approach and to fill the lacks let by the methods of the state of the art. They aim especially at explaining how the key objects defined in section IV could be structured or even automated, and at testing on real cases (Valeo, CG84) the approach and its toolbox.

VI. Conclusion

This paper focuses on the organizational capability based approach, which allows a global and coordinated management of resources, by facilitating future synergies. It gives an overview on the theoretical principles supporting this approach and on the practical solutions. Then it points out the lacks and the barriers limiting or avoiding its sustainable functioning. Finally it proposes the modeling of a management framework, following the theoretical principles and overcoming the identified barriers.

This modeling work must be soon completed by a toolbox, so to make this methodological support more practical. The set of these propositions is the bases of Pilot2.0 project, which are implemented in organizational cases, Valeo Group and CG84.

VII. Acknowledgement

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VIII. References