

ACTIONAL INTELLIGENCE, A CRITICAL COMPETENCE FOR INNOVATION PERFORMANCE. A RESEARCH MULTICASE ANALYSIS.

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Actional Intelligence, a new suggested conceptual construct, is introduced to understand the application and actioning of knowledge. This paper aims at covering the gap in which most Knowledge Management approaches and studies fail to address. The Actional Intelligence concept introduced here is defined as the capacity of an organization, to identify useful knowledge, develop its activity to learn and apply it to perform the activity in an optimum way.

The relationship between knowledge management and Innovation has historically attract the interest of academic literature due to the fact that innovation, and not just organizational efficiency or quality management, is a primary source of competitive advantage. The paper introduces and develops a model, which links the process of actionable knowledge with the firm innovation performance. This research is based in a multicase analysis where seventeen firms have been surveyed analyzing their knowledge management processes and their innovation performance. The results show a clear and direct relationship between both.

1. Introduction

Actional Intelligence, a new suggested conceptual construct, is introduced as a contribution that builds on previously-existing ideas of actionable knowledge developed among others by: Dewey (1949), Argyris (1978, 1995, 1996) and Carlile (2002), the core capabilities model of Leonard Barton (1995); the concept of knowledge worker of Drucker (1999); the knowledge generation paradigm of Nonaka and Takeuchi (1995); as well as the learning organization and learning networks schools (Senge, 1994; Brown and Duguid, 2001; Davenport, Jarvenpaa and Beers,

1996). This new concept is introduced to analyse the process of understanding and application/ actioning of knowledge. It is defined here as: *Capacities of an individual and, by extension, of an organization, to identify useful and necessary knowledge for an activity, learn and apply it in order to optimize the activity performance.*

This paradigm addresses a relevant concern of the knowledge management community. Actionable Knowledge has been covered superficially by most approaches though it is a key step in the knowledge management process. However, it is the only connection between the intangible and the world of business (Argyris, 1990, 1995, 1996).

This article has two main objectives. The first is to identify the real sense of Actional Intelligence and validate this new construct. The second is to analyse how companies can improve their innovation performance by improving their knowledge management process (mainly the actioning/measuring step).

The paper has been organized as follows. The first section presents a short overview of previous literature concerning the foundations of Actional Intelligence. Additionally the relationships between Knowledge Management and Innovation have been reviewed. The second section presents the research hypothesis while the next section describes the research methodology. Finally, we present the main findings concerning the Actional Intelligence construct and its relationship with firm's Innovation Performance. Conclusions and future research issues constitute the final section of the article.

2. Actional Intelligence: theoretical foundations

Actional or actionable intelligence is a term that has been basically applied by military intelligence and corporate intelligence literature (Ganesh al, 2003).

Main topics related to knowledge management based on the ideas reviewed by Ponzi (2003), Davenport and Prusak (1998), Leonard Barton (1995) and (Nonaka, 1995) and other authors about learning, competences - attitudes, knowledge and abilities and performance (Kirkman and Shapiro, 2001; Covey, 1989; Posner, 1985) are reviewed. Clarifying the difference between knowing and knowing how (Brusoni, 2001) are the basis of this work.

The introduced construct builds on specifically five basic concepts about learning, knowledge management and performance (shown in Figure 1). They all are positively related in different groups.

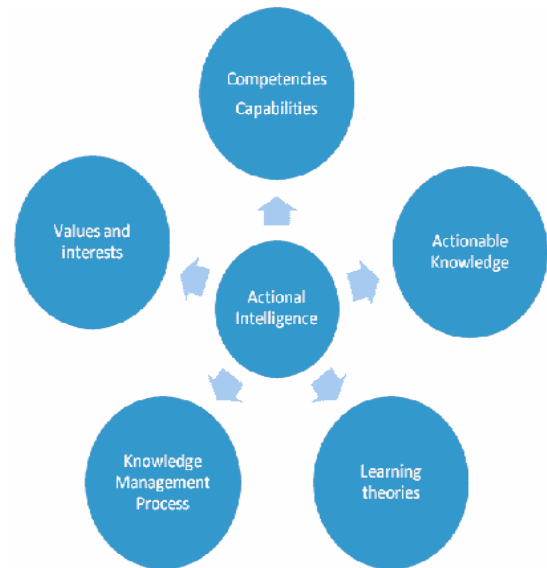


Figure 1. Actional Intelligence sources

Competencies, capabilities. Beginning with the idea of competencies, Rychen and Slaganik (2001) and OECD (2003) defined it through three perspectives of knowledge: conceptual (to know/ understand), procedural (to know how) and attitudinal (to know to be). The concept of competencies is supported and further developed from this point to educational purposes out of the aim of this work by other authors (Hager, 1996). Leonard Barton (1995) goes further on those competencies that form specific capabilities to differentiate significantly one organization from another. She points out a relevant importance of some intangible assets as knowledge and work practices. A vision complemented by Teece et al (1997) on dynamic capabilities that determine the different ability to detect and take advantage through a redefinition and adaptation of organizations, from opportunities in a changing environment.

Actionable knowledge. Other pillar is built on the seminal ideas of actionable knowledge proposed by Argyris (1996), Polanyi (1967) and other academic authors. Argyris points out that: “Actionable knowledge is the knowledge that is most likely to be of help to human beings because it prescribes how they should act. The basis for the sense of competence, self-esteem, and self- efficiency is effective action. Action is therefore at the heart of what it means to be human” (Argyris, 1996).

It should be differentiated from the ideas under the concept of knowledge management practices defined as “routines within the firm” (Hull et al, 2000). He and other authors focus their research in analysing ‘practices’ within a number of disciplines: social practices within the firm (Tsoukas, 1996; Turner, 1994; Pickering, 1995; Wenger et al, 2002). Argyris continues defending that “Knowledge actioning will be always linked ultimately to the individual and to his ability to internalize new learning. And thus it influences the way he acts and performs his function in the organization. Assimilation of all this will have an effect on practices, processes, relationships... In the

end, it will provide measurable results”.

Learning theories. An effective organizational learning depends, ultimately, on the individual attitude towards learning (Novak, 1998; Gagne, 1970). This doesn't imply that encouraging, enabling and motivating environments to promote learning aren't needed at an organizational level. A solid and rich cognitive structure in the organization leads to a sustainable learning when it's significant. It means that new concepts are linked to existing knowledge in the corporate culture (Ausubel, 1978). Learning organizations, as defined by Senge (1994) or Garvin (1998), automate the way they learn and this constitutes a core competency (Leonard Barton, 1995).

Knowledge management process. Another relevant idea supporting this rationale is the knowledge management process. It is closely related to one of the prior concepts - actionable knowledge. An exhaustive literature review shows us that knowledge management has evolved through several stages. Finally, a fad positioned the discipline as a technological issue. Thus, words, information, knowledge and data were exchangeable without losing sense. Recently, the concept of knowledge management has returned to its origin and its analysis and understanding has improved. Special attention has been paid to the way it can be automated and several interesting proposals have been introduced. Some relevant models are the ones presented by: APQC (American Productivity and Quality Center), Watson (2001), Alavi & Leidner (2001), or by the project Know Net (Mentzas, 2000). The latter has nine steps in the process cycle.

Ramos (2009) introduces a Knowledge Management Maturity model synthesized from all of them. It considers the main relevant ideas of all and it has 6 steps (see figure 2).



Figure 2. Knowledge Management Processes

The steps of this process are the following:

Absorb, create. New ideas are created (to innovate), new knowledge from the environment is absorbed.

Validate. This step assumes it is known what knowledge is relevant for the organization in general, and for the individual activity. And it can drive two options: On the individual perspective, at an implicit level, an assessment of its usefulness is made. And it

can address to an application phase. On the organizational dimension, once the new concept is understood to be useful for the organization it is documented and archived.

Storage. Knowledge is saved in all kinds of physical and electronic storage media. Normally it is only explicit knowledge.

Share, collaborate. The knowledge bases are accessible to everyone in the organization to allow a collective enrichment of the learning and ideas stored. Interactions happen here at both levels: implicit and explicit.

Review, improve. As results of the interactions, use and experiences, existing knowledge is enhanced, distilled to better match with organizational interests.

Actioning and measure. This step includes the application of the knowledge. Actioning, means that individuals take on board a new learning and it implies a modification on the way he or she acts. Actioning leads to an improvement in the functions of people in the organization, and in aggregation, it leverages the organizational performance. To be managed it has to be measured through key performance indicators.

A variety of authors have analyzed the performance of Open Source communities and pointed out that some individuals perform very well for the community in contrast with their productivity at their regular jobs and this could be explained by individual values and interests (Kaplan and Norton, 2004; Getha-Taylor, 2008; Kirkman and Shapiro, 2001; Sveiby, 1997; Farrington and Nelson, 1997; Gordon and Di Tomasso, 1992). In this direction, Communities of Practice (CoPs) have been defined as “persons with complementary knowledge who form a group” (Albors and Ramos, 2008; Davenport and Prusak, 1998). On the other hand, CoPs are usually founded spontaneously, due to their members shared values or private interests. Wenger et al (2002) defines them in a similar way as, “...a group of people that share a concern or passion or something they do, and they learn to do it better through regular interaction.” Gordon and Di Tomasso (1992) made some interesting contributions complementing and reinforcing the findings of Denison (1996). Both authors point out that CoPs performance is associated with a strong culture and clear and auspicious values.

3.- Knowledge management and Innovation performance

Various authors have studied relationship between knowledge management and innovation. Some identify knowledge management as an antecedent of innovation (Darroch and McNaughton, 2002). Others have linked firm routines on knowledge stabilisation with path dependency as well as knowledge as a production factor (Coombs and Hull, 1998). The models and modes of innovation have been also related with the process of knowledge creation (Popadiuk and Wei Choo, 2006; Jensen et al, 2007). The increasing

importance of knowledge as an economic driver has major implications for innovation management, which is, in turn, a key determinant of national and regional competitiveness in the global, knowledge-driven economy. The contribution of knowledge to innovation is achieved in part by reducing transaction costs between firms and other actors, most notably in the areas of research and information, buying and decision-making, policy and enforcement (Maskell, 1999).

Other authors have integrated knowledge management and innovation as a value providing process in the market success: "The introduction of new products or methods. Involves the integration, combination or synthesis of knowledge into new products, processes or services in an original, relevant way and providing value" (Luecke and Katz, 2003).

The systemic approach to innovation recognizes that innovation and knowledge generation take place as a result of a variety of activities, many of them outside the formal research process (Liyana and Poon, 2003). Knowledge is thus generated not just in universities and research centers, but also in a very wide variety of locations within the economy, and notably as a product (learning-by-doing) or of consumption (learning-by-using). In the current economic context, growth must mainly originate from increasing the productivity of knowledge work, and the most important contribution management can make is increasing this productivity. The most valuable assets of a 21st century firm are its knowledge workers and their productivity. Knowledge-intensive organizations, ranging from knowledge-intensive service-providers to high-tech manufacturers, need to manage innovation processes so as to increase knowledge productivity (Drucker, 1999).

Knowledge management has also been contemplated as a coordinating mechanism. Empirical evidence supports the view that a firm with a knowledge management capability will use resources more efficiently and so will be more innovative and perform better (Darroch, 2005). Human resource practices when combined with IT based Knowledge management tools have a relevant impact on innovation performance "soft HRM practices" and "hard IT practices" are implemented (Gloet and Terziowski, 2004¹).

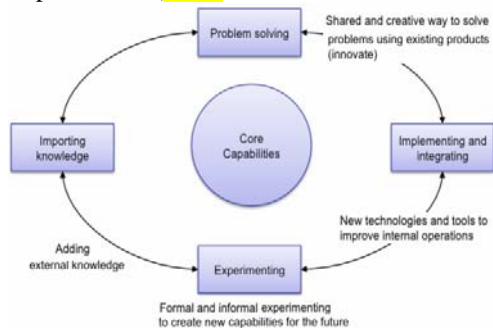


Figure 3. Activities for new knowledge creation

There are several research contributions which analyze the relevance of KM, as a means to leverage

innovation and, therefore, as an essential mechanism for competitiveness (Furman, Porter & Stern, 2002). Barton (Leonard Barton, 1995) provides a useful model relating knowledge management practices with innovation. Its main contribution involves the "Core Competences" concept which has also been utilized by Prahalad (1990) and which is defined as "... knowledge set that differentiates and provides a competitive advantage to an organization". These core capabilities provide a vast diversity of specialized knowledge and skills to develop processes and products (Leonard Barton, 1995; Eisenhart and Martín, 2000). Finally, it has also been pointed out recently that knowledge management has a direct contribution to innovation performance (i.e.: Lundval and Nielsen, 2007).

4. Research hypothesis and proposed model.

The main objective of this research is developing a model useful to understand the knowledge management process in the firm from a dynamic perspective (Actional Knowledge/ Actional Intelligence) and linking it with the firm dynamic evolution in the direction of learning and performing in the case of innovation.

The figure 4 below shows the model of development of Actionable Intelligence in the firm as described in section 2. It follows the paradigms mentioned above and it is also inspired, as well by King et al (2008). This model has modified the last quadrant related to the tacit domain of Nonaka and Takeuchi (1995) by adding the applied adjective, since it is essential for knowledge actioning. Thus the further an organization completes the loop of this knowledge management process the higher its level of maturity in actional intelligence.

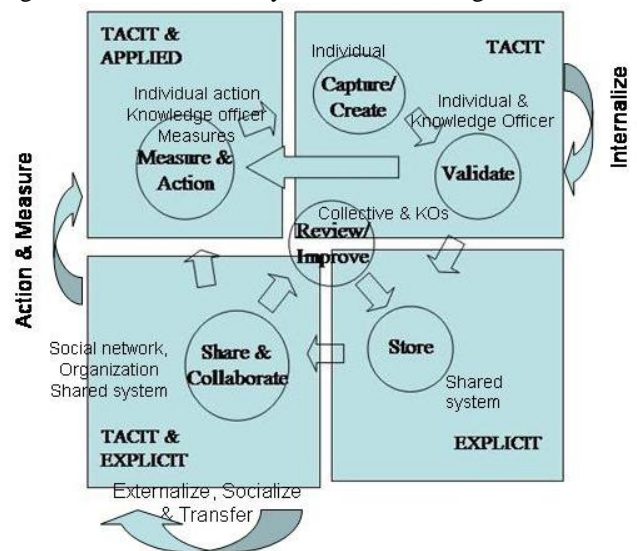


Figure 4. The evolution of actioning knowledge.

The research hypothesis could be proposed as follows:

H: Actionable knowledge level (based on mature knowledge management practices) has a positive influence on innovation performance.

Recalling the Knowledge Maturity Model proposed in section 2, we identify six steps, already described there: (a) Absorb and create, (b) Validate, (c) Store, (d) Share and collaborate, (e) Review and Improve and, finally, (f) Measure and Action. According to these steps we have defined six group of variables which will measure the knowledge management maturity level of the organization and its actional intelligence level.

Based on the 6 step process shown in figure 3, the variables measured (King et al, 2008; Mentzas, 2004; Kirton, 1984) are those detailed in Table 1.

Table 1. Knowledge actioning variables.

Variable	Indicator	Id	Range
Absorb and create	There are systems and tools for capturing knowledge (After Action Reviews, brainstorming repositories...)	KinCapt	0, 1
	There are collaborative policies, External collaboration is also promoted: 1. Education 2. Consulting 3. Competitors monitoring	KinAbs	1, 2, 3
Validation: identifying relevant issues	Business key knowledge areas are identified	Valid	0, 1
Store: expliciting & codifying in repositories	Repositories are organized using a taxonomy. There are also procedures to explicit knowledge: 0. No 1. Basic 2. Advanced	StorExplic	0, 1, 2
	The role of Knowledge Officer has been recognized	KO	0, 1
Share: broadcast & collaborate	Needed knowledge (intern and extern) for workers activity is accessible and easy to use	KAccess	0, 1
	There are competences to promote open communication, collaboration and knowledge sharing in the HR development systems	HRColComp	0, 1
	There are Communities of Practice, Purpose, internal and mixed (with external members) Social Networks	CoPSNA	0, 1
Actioning: applying, using & measuring impact	Useful knowledge is applied to produce and perform. The 6 step KM process is adopted in the organization in a more or less formal way	KAct	0, 1
	There are specific Key Performance Indicators for KM	KPI	0, 1
	When recruiting and in HR development policies the corporative values are matched with the individual is assessed. An open attitude towards long life learning is requested	HRActVal	0, 1

Maintain: review, improve & evolving	Continuous maintenance, improvement and review of KM system: 0. No 1. Basic 2. It allows suggestions and improvements made by users	KMImp	0, 1, 2
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Based on these variables and following various authors (Kirton, 1984; Abecker et al, 1999) we could classify the maturity level of an organization in relation to their knowledge management in four levels. The formula these authors propose for establishing these levels is as follows:

$$\text{KM Maturity level} = 3 * \text{Absorb \& create} + 2 * \text{Validate} + 2 * \text{Store} + 3 * \text{Share \& collaborate} + 4 * \text{Review \& Improve} + 2 * \text{Measure \& Action}.$$

Consequently these levels are the following.

Accidental: Those organizations are not sensible at all to knowledge management. However there could be some accidental KM as users who could share knowledge or natural actioning of knowledge.

Passive: Organizations which are not familiar with KM, but do not reject it either. KM occurs spontaneously. There is certain KM capture from the environment by external training of their employees (KIAb=1) or by the fact that communities of practice could arise naturally (CopsNA=1).

Active: In these organizations there is a sensitivity about KM and there are ongoing efforts to incorporate it adequately (KinCAP=1; kINaBS=1). There are repositories for shared information (StorEpic=1 or 2; KAccess=1) and formal responsible officers for them (CKO=1). There are communities of practice and social networks supported by the organization (copSNA=1) There are at least qualitative indicators for KM (KPI=1) Processes and systems related with KM are maintained in a proactive way (KMImp=1).

Leader: This is the most advanced group and complies with the characteristics of previous group with the addition of having utilised KM consultancy services (KINAbs= 1). Knowledge storage comprehends specific processes with its own taxonomies (StorExpli=2) and in the identified areas of knowledge (Valid=1). The sharing of knowledge is particularly supported by supporting personal competences in this sense (HRCol=1). Actioning of knowledge and its practical application is common (KAct=1) and the results are measured (KPI=1). Additionally continuous learning is promoted (HRActVal=1). Finally, KM maintenance is carried out in a continuous basis (KMImp=1).

In relation to the innovation performance we have followed the classification developed by Arundel and Hollanders (2008). This classification is based on two main criteria: the level of novelty of the firm's innovations, and the creative effort that the firm expends on in-house innovative activities. Based on this criteria four innovation modes are proposed.

Strategic innovators. For these firms, innovation is a core component of their competitive strategy. They perform R&D on a continuous basis to develop novel product or process innovations. They are the main source of innovations that diffuse to other firms.

Intermittent innovators. These firms perform R&D and develop innovations in-house when necessary or favourable, but innovation is not a core strategic activity. For some, their R&D efforts focus on adapting new technology developed by other firms to their own needs.

Technology modifiers. These firms modify their existing products or processes through non-R&D based activities. Many firms in this group are essentially process innovators that innovate through production engineering.

Finally, **Technology adopters** are firms that primarily innovate by adopting innovations developed by other firms or organisations.

The variables associated to this classification are shown in table 2 with more detail.

Table 2. Innovation performance variables (Arundel and Hollanders, 2008)

Variable	Id	Range
Organization has Carried out innovation activities before	InOn	0, 1
Organization abandoned its innovation activities	InAB	0, 1
Organization introduced a new or significantly improved product to the market	Inpdt	0, 1
How did product innovation happen?: 1 = led by the organization or the group where it operates 2 = cooperating with other firms 3 = mainly by other firms or institutions	InpdtW	1, 2, 3
Organization introduced a new or significantly improved process to the market	Inpcs	0, 1
How did process innovation happen?: 1 = led by the organization or the group where it operates 2 = cooperating with other firms 3 = mainly by other firms or institutions	InpcsW	1, 2, 3
It develops internal R+D	RrdIn	0, 1
Kind of R+D: 1 = continuous 2 = episodic	RdEng	1, 2
Main market of the company: 1 = local 2 = local/regional 3 = national 4 = international	SigMar	1, 2, 3, 4
Organization introduced new or significantly improved products which where new to its market	InMar	0, 1
Organization had done collaborative activities for innovation	Co	0, 1

Following these variables the firms can be classified in the four above mentioned innovation modalities.

5 Research Methodology

5.1. Empirical work

The empirical work has been developed analysing ten cases following the multiple case study methodology (Eisenhardt and Graebner, 2007). The organizations selected have different characteristics: sizes, activities, ages and geographies. The firms belong to various sectors such as food, aerospace, pharmaceuticals distribution, furniture, heavy industry, education, IT, electronics, consulting services, and advanced high tech machinery.

The variety of the industry context of these examples assured a quality research approach according to the guidelines pointed out by literature (Dubé and Paré, 2003; Yin, 2003 and Flyvbjerg, 2006). They have been chosen intentionally to demonstrate also that Actional Intelligence improves Innovation not depending on the kind of company or business activity.

The researchers analyzed the cases throughout a number of field interviews and conversations with firm managers and employees of the sample firms, as well as analyzing their results in terms of market penetration and innovation performance and strategy.

The paper will also contribute by proposing knowledge management variables based on academic literature and innovation performance variables based on the construct utilized by Arundel (when analyzing European innovation performance).

5.2. Main Results

Interviews were carried out among the ten firms following a prepared survey which was covering the items already pointed out in relation to the forms, practices and results related to Knowledge management and Innovation.

The following table 3 show the final results of the KM maturity level and the Innovation Performance ratios, once the survey results were calibrated and the resulting values projected in the firms classification.

Table 3. Results of survey.

Organization	KM Maturity Index	Innovation Performance	Innovation Profile	Kn maturity profile
Pharmaceutical Distributor	21	11	Adopter	Accidental
Aerospace Logistics	33	15	Intermittent	Passive
Software Consultancy	54	34	Strategic	Active
Training Firm Electronic Eq.Manufacturer	19	12	Non Innovator	Accidental
High Tech Equipment Consultancy	48	47	Intermittent	Active
	63	64	Intermittent	Active
	55	54	Strategic	Intentional

Industrial Bakery	26	20	Modified	Accidental
Furniture Manuf.	43	41	Strategic	Active
Automotive Supplier	43	22	Intermittent	Active

We could plot in a graph these results as shown in figure 5. As it can be observed there is a clear relation between the Knowledge Maturity level of the firms and their Innovation Performance level. Those firms with a strategic innovators profile have the higher level of KM maturity. On the opposite those firms which are mere adopters of innovation have the lower level of Km maturity.

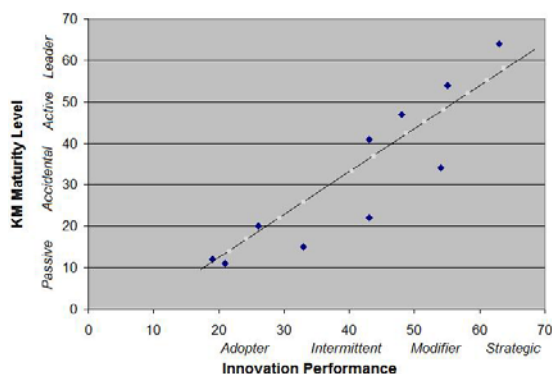


Figure 5. Classification of sample firms.

5. Conclusions and practical implications

The analysis of the results provides evidence of a relationship between the development of Actional Intelligence and Innovation Performance. To sum up, in the same way that innovation success doesn't depend solely on firm creativity, but on a number of firm capabilities and competences (i.e., organizational, idea development, marketing, etc.), knowledge management by itself doesn't assure results unless it is not properly actioned in a relevant way for the firm strategy.

It must be outlined that the aspects of a process activity related to knowledge management are relevant for its final efficiency. Many organizations consider knowledge management as a product or a technology information activity losing its learning and dynamic perspective.

This paper contributes to theory by linking knowledge management theories, learning models and innovation performance overcoming the rigidities of other approaches, such as knowledge management practices, or other theories that do not account with individual and firm values, or organizational attitudes. The model construct proposed will be useful for future studies for better determine how organizations can innovate in the way they are organized and managed. Based on the variables which determine the Actional

Intelligence of an organization, influence was found in their innovation performance.

For practitioners, the models provides a new insight and framework for accelerating and succeed in their consultancy daily practice on helping organizations and people inside them, to develop further and better. This, being, a basic requirement in a knowledge economy environment

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