

KNOWLEDGE MANAGEMENT AND THE ANALYTICAL METHODS FOR DECISION SUPPORT

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Abstract: This paper presents a synthesis of the diverse methods and techniques used in decision support and an analysis of how these methods can be seen from a modern approach to strategic thought on knowledge. It describes the importance of knowledge for modern-day organizations and presents some academic definitions involving the two principal theoretical classifications for organizational knowledge: knowledge viewed as a resource and knowledge viewed as a process. The paper closes with the suggestion that research agendas on the role of analytic decision support in knowledge management and in the context of a knowledge based view should necessarily seek new indicators and measurement techniques well as on the study of problems of knowledge management which can be modeled quantitatively in a company. It also points out that the importance given by companies to initiatives which seek to mount structures providing analytic decision support tends to increase as knowledge becomes more scarce and in demand in the near future.

Keywords: Scarce resources; Strategic competences; decision analysis; multi-criteria decision aiding; knowledge management.

Introduction

In modern management we should only worry about managing scarce resources, as it is not a good idea to allocate investments in the management of resources which are not limiting

factors to any process. A quotation attributed to Barnard which begins one of Ghemawat's books illustrates this question well: "If we wish to increase the production of cereals in a determined field and the analysis shows that the soil is deficient in potassium, it can be said that this is the strategic or limiting factor" (Ghemawat, 1999). Indeed, the close relationship which exists between the planning of strategic actions and the scarcity of resources can be proved in various ways.

The concern for establishing knowledge management is already, by itself, a tacit declaration of the scarcity of knowledge and the strategic importance of this resource. Its importance is continually being confirmed as, for example, in the study carried out by the consultant McKinsey in 40 companies in diverse sectors in Europe, Japan and the United States (Hauschild et al., 2001). The results show a clear correlation between the success of some of these companies and the adoption of management knowledge techniques. In addition, in the same study, it is possible to see that the senior executives share a belief that knowledge – or that which is conventionally called such – is, today, a generically scarce resource which should be considered in the formulation of the competitive positioning of the companies.

Knowledge-resource vs. Knowledge-process

The first studies to recognize the importance of knowledge in economic relations are relatively recent. They arose in the middle of the 20th century, in the theories of Marshall, Schumpeter and Penrose (apud Nonaka and Takeuchi, 1995). But it was Hayek (1945) who was the first to call attention to the importance of implicit knowledge or knowledge of the circumstances, specific to the context, and differentiate it from scientific knowledge.

The pioneering studies by Sveiby on intangible assets in the second half of the 80s (Sveiby, 1997; Edvinson and Malone, 1997) and Stewart's contribution (Stewart, 1994; 1997) on brainpower during the 90s - which would later give rise to the term intellectual capital - sought to make clear that, increasingly, the assets capable of producing financial flow for organizations would not be listed on their balance sheets. But would this only be the characteristic of a few companies or the trend in the whole of the economy?

One of the first theorists to attempt to answer this question was Peter Drucker. In his research, Drucker (1993) defended the thesis that this was indeed a trend and that in a short

time the whole economy would be in a new era where the scarce resources would be, in some way, based on the most important intangible asset that individuals and organizations can hold: knowledge.

The impression that we know more than we can say was first studied by Polanyi (1996). According to Polanyi, knowledge which can be expressed in words and numbers represents only the tip of the iceberg of the mass of knowledge as a whole. His studies sought to establish a division between two types of knowledge: tacit knowledge and explicit knowledge. For Polanyi, tacit knowledge is personal, context specific and, thus, difficult to formulate or communicate. It is to do with the experience of the individual. Explicit or codified knowledge however refers to knowledge which is transmittable in formal and systematic language.

Polanyi's definitions are widely used and practically represent unanimity in studies on knowledge management. Nevertheless, this is only one way we classify knowledge.

In the field of definitions of what knowledge is we can note two important currents of thought. The first is born in the confirmation that, even with the differences which arose in the ancient past between rationalism and empiricism, western philosophers and academics have for a long time used the concept introduced by Plato that knowledge is a justified true belief. This, shall we say, classic definition, clearly supposes knowledge to be a resource and this brings it very close to the concept of information, generating countless theoretical discussions about the possible differences between them.

The second current holds that many people treat knowledge incorrectly as information, high level information, but still information. Recently some academics have come to defend the thesis that, in spite of information being an advanced form of data, knowledge is not an advanced form of information. They also hold the belief that to have information is not the same as to know and finally, that knowledge is the purposeful coordination of action. This, more holistic, contemporary approach supposes knowledge to be a process.

The relations between the definitions of knowledge-resource and knowledge-process and the concepts of tacit and explicit knowledge proposed by Polanyi can be summarized as follows: (1) this study will not make a practical differentiation between information and explicit knowledge and will classify them both as knowledge-resource; (2) while the definition of tacit knowledge involves a fluid mixture of experience and abilities, tacit

knowledge is not a process, so that in this study it will also be classified as knowledge-resource; and (3) knowledge-process, in its turn, will be more aligned with the cognitive capacity of individuals and organizations or with something which has conventionally come to be called cognitive resources.

Organizational Knowledge

In 1995, a little after Peter Drucker had launched his ideas of an emerging knowledge society, Nonaka and Takeuchi (op. cit.), published an ingenious theory to explain innovation in companies. Nonaka and Takeuchi noticed that, while many administrative theories arose in the 80s recognizing the importance of knowledge for society and organizations, they were principally concerned with the acquisition, accumulation and utilization of knowledge. In their theory, they concentrated on the explanation for the creation of knowledge in organizations.

According to them, Drucker had not recognized the need for human interaction in the process of conversion of knowledge. For Nonaka and Takeuchi (op. cit.), organizations produce new knowledge not only by aggregating knowledge from their individuals, but principally by the continuous interaction of this knowledge in a process called spirals of knowledge. The theory presented by the two engineers supposes that organizational knowledge is created when the tacit knowledge of the employees and the explicit knowledge of the organization interact continuously.

Knowledge and Sustained Competitive Advantage

The structural factors in a determined sector or industry explain, on average, only 10 to 20% of the profitability of a company. Around 40 to 60% of its performance can be attributed to variations in the economic context and the remaining 20% to 50% are credited to the way in which the companies compete inside their own sector. It is said that a company enjoys a competitive advantage when it obtains financial returns higher than its competitors in the sector.

Thus, in the same way as structural factors dominated the 80s, the last decade was marked by the emergence of a dominant logic of creation of value in contrast to the former logic in which only lower costs explained the competitive advantage of some companies over

others.

However, it is not enough to create a competitive advantage, it must also be sustained. Two contemporary mainstreams (Ghemawat, op. cit.) seek positions on the same problem: the view based on activities and the view based on resources (RBV). The first places vital importance on the complexity of the links between the activities performed by a successful company, the second holds that resources - tangible, intangible and capacity building - are the source of advantage over others. The view based on activities seems extremely useful in explaining the inimitability of the design of the business of the companies, but the view based on resources deals better with the dynamic questions of sustainability.

A synthesis of these two currents, under the name of dynamic theory, presents a combination of the two approaches in an interactive cycle of two stages for obtaining sustainable competitive advantage: (1) to make concentrated commitments of resources and; (2) to purposively orchestrate the activities carried out by the company in an incremental process often called capacity development (Ghemawat, op. cit.).

For a resource to be considered strategic by RBV, it must meet three basic pre-requisites: (1) to contribute to sustaining the competitive position of the company, known as the demand requirement; (2) to be difficult to imitate and remain rare for a long time, known as the scarcity requirement, and; (3) to be able to be used by the company holding the resource, known as the appropriability requirement. According to the RBV only if a resource meets these three requirements can it be considered a source of sustainable competitive advantage. Recently, Grant (1996) articulated the fundamental theories of the knowledge based view (KBV) which, as an extension of the RBV, maintains that the knowledge of the organizations is, in the last analysis, the key resource for obtaining sustainable competitive advantage.

Finally, if we use the concepts of tacit and explicit knowledge combined with the individual and collective faculties of the holders of knowledge we can study which types of knowledge fit in the RBV zone of value creation (Cook and Brown, 1999). In this way, for example, the view of intellectual capital, originally proposed by Stewart as “the value present in future financial flow resulting from the efficient exploitation of knowledge based assets” should be extended to consider the differentiation and importance of tacit-knowledge, or even redefined as the market value of the aggregated tacit knowledge of the

organizations.

The Cognitive Assets Approach

But where is the collective-tacit knowledge of the organizations? It seems obvious that collective-explicit and individual-explicit are dispersed in databases and reports and that individual-tacit knowledge is with the personnel, but it is not easy to see collective-tacit knowledge. This is because, in contrast to the others, it is not found individualized, but disperse and potential. It needs to be operationalized to be appropriated.

One model which can help in the understanding of the appropriation of tacit-collective knowledge is that which considers the cognitive assets of an organization as keys to the creation and appropriation of organizational knowledge (Cataldo and Prochno, 2003). This cognitive assets approach supposes that the knowledge assets of an organization can be of two types: (1) assets based on information and; (2) assets based on cognition, or cognitive assets. The systematic and efficient combination of these two sets of assets brings excellence to knowledge management creating value for organizations.

Assets based on information represent all knowledge-resource which can be stored in some form or is at the disposition of the organization, whether in physical media or in the memory of individuals in the form of accumulated experience. According to this approach, information based assets are: (1) all explicit knowledge stored in the form of information or processes in physical media in the organization or which can be acquired outside it; (2) all the tacit knowledge of the individuals who belong to the organization or which can be shared by it.

Cognitive assets are those responsible for guaranteeing the integrity and efficiency of the multiple conversions between tacit and explicit knowledge, which create new knowledge in the organizations. Cognitive assets are (1) the individual cognitive capacity of members of the organization; (2) the transitional potential of each individual in the organization; (3) the environments conducive to the production of knowledge according to the Organizational Knowledge Creation Theory and; (4) all analytic decision support.

This approach therefore holds that excellence in the management of organizational knowledge is the fruit of the ability of the organization to: (1) acquire and keep available higher information and cognitive assets than its competitors and (2) combine them in a

more efficient way than its competitors (Cataldo and Prochno, op. cit.).

Analytic Decision Support

Decisions are part of the essence of human independence and represent the key to success in any organization (Arsham, 2002). A good decision never occurs just by chance. It is always the fruit of a combination of intention, effort, intelligent co-ordination and able execution. It represents the best choice among various alternatives. However, it is not possible to find in the literature available a single field of human knowledge which encompasses all of the research on decision-making. As we shall see as follows, the formalisation of analytic decision support is to be found dispersed in many research fields.

Operations Research, OR, Management Science, MS, Decision Science, DS and Multi-criteria Decision Aids, MCDA are some of these fields which study the decisions, based on scientific criteria (Figueira, J.; Greco, S.; Ehrgott, M., 2005). These scientific principles are based on analytic and quantitative techniques allied to computational techniques to construct algorithms and heuristic. At first, mathematics, logic and classical statistics and, more recently, fuzzy logic, neural networks, meta-heuristic, game theory and even psychology have made up the scientific basis for decision support.

The use of these terms in the writings on the subject far from represents unanimity. OR, MS and DS have their own characteristics and roots in distinct points of the contemporary history of administration, although, frequently they are interchangeable terms. On the other hand, some academics prefer to approach the trio OR/MS/DS as a single research field. It is worth noting that the term DS, in the singular, is a synonym of Decision Analysis, a specific field, but in the plural Decision Sciences is frequently used to refer to the group of all research fields which involve the study of decision. MCDA seems a theoretically better-defined field, isolated from the others, but it also approximates more to a sub-area of DS.

Would it be possible to synthesize the research fields seen up to now in one single approach?

It is not at all easy to obtain a synthesized approach in this area, as, for an approach to be clear and useful, it should not have more than two dimensions - three at most - and decision problems are presented in many dimensions: discrete variables vs. continual variables.; multi-criteria or mono-criterion; deterministic or probabilistic, among others.

Some authors consider what they call “the OR/MS/DS approach”, a synthesis. It allows analysts to be provided with the expertise and tools to understand the decision problems, puts them in analytical terms and, then, resolves them

Finally, if we begin from the definition of decision support as the activity which “based on models which are clearly explicit models, though not necessarily formalized, helps in obtaining elements for responses to the questions of the decision agent” and, in addition, we understand that the scientific foundation aggregates: (1) rigorous concepts; (2) formalized models; (3) precise calculus procedures and; (4) axiomatic order results, we can arrive at a concept of analytic decision support involving the OR, MS, DS and MCDA areas in which the objective is the “(scientifically) based recommendation of actions”.

Analytic Decision Support for Knowledge Management

Analytic decision support is linked to knowledge management by the binomial decision-action. As we have seen, knowledge-process is manifested in the purposeful co-ordination of actions and analytic support, in the last analysis, it can provide the foundation to recommend these actions. Therefore, it seems clear that it is not possible to discuss techniques for the creation, storage and utilization of organizational knowledge without also considering decision support techniques. In this aspect, the decision analyst is clearly a knowledge worker.

Basically decision sciences can influence the management of organizational knowledge in two ways: (1) by contributing to increasing the stock of cognitive assets in the organizations and; (2) aiding in the solution of knowledge management problems.

Decision Potential as a Cognitive Asset

The OR/MS/DS methods can be seen as analytic cognitive processes and fit into the class of assets based on intensive knowledge in cognition. Thus, like individual cognitive capacity, conducive environments and the transitional potential of the employees, the analytic decision-making potential of organizations, when increased, improves the creation of knowledge in organizations because it increases the efficiency of the processes of conversion and mobilization of knowledge-resource. Like other cognitive assets, the decision potential, when exploited, is a source of the cognition necessary for the co-

ordination of organizational actions.

The OR/MS/DS Approach in the Solution of Knowledge Management Problems

At first, the initial idea of managers seems to be to use the analytic capacity of companies to model and automate the maximum possible number of activities. In fact, companies have followed this trend. However, some academics argue that this position has only contributed to increasing the quantity of information circulating in the organizations. An ever more complex business environment needs ever more information to be modeled, which in turn requires ever higher computational power. This is because, even the simplest of tasks are extremely complex if we try to automate them.

It is worth noting that the use of analytic decision support by companies should not be done indiscriminately. In fact, many companies which saw an opportunity to gain efficiency in the management of their activities by using the OR/MS/DS techniques are having to review this rushed option. This is because indiscriminate modeling of activities requires an almost unsustainable volume of information. The cognitive assets approach does not adhere to this, but presupposes that the companies which have and know how to exploit their decision-making potential increase the stock of cognitive assets which, in the last analysis, will generate greater appropriation of collective-tacit knowledge in the organizations. Therefore, it seems to us that the way in which the analytic methods are used in a company is as important as having them

On the other hand, the use of quantitative methods in the study of environments conducive to the production of knowledge is very welcome to the extent that it plays an important role in the project. Simulations of conversions and mobilizations of knowledge in organizations can, for example, help define the optimum size of self-organized teams, fundamental elements in the Organizational Knowledge Creation Theory.

Conclusions and Final Comments

The synthesis of analytical decision support proposed in this study allows us to conclude that, in spite of being dispersed in many areas, the analytically and scientifically based study of decisions is an instrument which should be seen in one single way when mounting company strategy. On the other hand, in spite of not yet being recognized as a formal

theory in the strategy field, KVB has supplied innumerable theoretical and empirical insights in the sense that we increasingly understand knowledge and its strategic importance for organizations.

The analytic decision support role in KBV and in knowledge management techniques relies on the structuring of KBV itself. Current research in this field seeks: (1) the development of more consistent taxonomies for the study of knowledge; (2) to join the two most important currents of theoretical classification to construct a bridge between the interaction of knowledge-resource and knowledge-process and; (3) the enrichment of KBV with ideas from other research fields such as sociology, psychology and evolutionary biology. The cognitive assets approach is a good example of a model which seems to fit this agenda. It involves the contemporary concepts of interaction between the forms of knowledge-resource and knowledge-process as well as using concepts of psychology and sociology.

A survey carried out in 1998 among members of both the US-based Academy of Management and the Iberoamerican Academy of Management led to an estimated comparison of the importance of various management areas. The comparison pointed out the area of business policy and strategy as ranked consistently high by members of both academies (Rivera-Camino and Gomez-Mejia, 1999). This fact per se fully justifies the setting of research agendas on decision support in knowledge management for this, as this paper tried to show, is a key dimension of strategic thought.

We therefore suggest that research agendas on the role of analytic decision support in knowledge management and in the context of KVB in the Iberoamerican countries should necessarily: (1) seek new indicators and measurement techniques for the cognitive stock aggregated by the set of quantitative methods which provide analytic decision support to organizations; (2) study the problems of knowledge management which can be modeled quantitatively in a company, principally the simulation of environments conducive to the production of knowledge

Lastly, it is possible to assume that the importance given by companies to initiatives which seek to mount structures providing analytic decision support should increase in the Iberoamerican countries in the near future. As knowledge becomes more scarce and in demand, so investments in OR/MS/DS in modern organizations should become more

important.

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