Routines And The Problem To Create Learning Capabilities

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Abstract

The concept of routines has been developed in different ways and depends on different conceptual frameworks. Fundamental elements within an organisational study of routines include: cognitive learning, patterns of learning, responsibility distributed across an organisation, explicit policies and procedures, physical artefacts and arrangements, and social and political factors (governance and control).

The paper begins with an overview of the frameworks from which patterns of action have evolved. Secondly, it stresses the concepts of patterns of action, competencies, dynamic capabilities, and some concepts about evolutionary theory which are relevant to patterns of action especially for innovation process. After that, the relation between behavioural and representative patterns of action is discussed. This is followed by a look at the concept and characteristics of routines and their role in an organisation, especifically the problem of organizational learning and innovation management.

Introduction

Technological progress has to be considered in an organisational context. This means that the ability to create new innovations or the capability to increase competence requires the mobilisation of knowledge resources, capabilities and competencies within an organisation. However, there are organisational routines underlying this knowledge, which, given their often tacit nature, can make both mobilisation and understanding difficult. A firm “know-how” to do something because it manages appropriates routines. In other words, an organisation cannot do something that has not been reduced to routine (Nelson and Winter, 1982; Tidd, J. et al., 1997; Rumelt, 1995).

Fundamental elements within an organisational study of routines include: cognitive learning, patterns of learning, responsibility distributed across an organisation, explicit policies and procedures, physical artefacts and arrangements, and social and political factors (governance and control) (Burkhart in Cohen et al., 1995; Nelson and Winter, 1982; Winter, 1994, Winter, 1995a; Saviotti and Metcalfe, 1991; Reinaud, 1995; Hodgson, 1995).

Thus, the concept of routines has been developed in different ways and depends on different conceptual frameworks. These conceptual frameworks demonstrate how the concept has grown internally, and how it has benefited from other disciplines, such as organisational behaviour theories, cognition science, evolutionary theory and computer science, all of which have extended its boundaries. However, according to Reinaud (1995-1997) the level of analysis depends on the choice of such structures.

This paper looks at individuals and their relationship with organizational features of recurring patterns of action. In particular, patterns –or more specifically routines- are studied within the dynamic organization of firms, and in terms of their emergence.

The basic objective of this paper is to clarify the concept of a routine in order to carry out a coherent analysis of both management and organisational literature. In the process, the study will highlight existing differences in the emphasis which authors, belonging to different traditions, place on it. Recognising the conceptual diversity of routines is useful to improving the way in which firms are conceived. Without a clear understanding of such intricacies and the roles they play in practice would be difficult to understand well them, and would be difficult to performance innovation, through learning, of them as well.

The paper begins with an overview of the frameworks from which patterns of action have evolved. The first part stresses the concepts of patterns of action, competencies, dynamic capabilities, and some concepts about evolutionary theory which are relevant to patterns of action. After that the relation between behavioural and representative patterns of action is discussed. This is followed by a look at the concept and characteristics of routines and their role in an organizational learning.

Patterns of Action and Competencies

Dynamic capabilities and action patterns

Saviotti and Metcalfe (1991) argue that within a competence market, firms seek to differentiate themselves from other firms through different mechanisms of doing things. They consider that this process reflects random elements induced by the environment in which firms operate and undergo processes of variety of knowledge creation. These factors constitute the underlying basis of sustainable competitive development of an organisation.

In order to elaborate on this theoretic framework, some acceptable definitions are desirable. From a resource-based perspective and evolutionary theory, firms are heterogeneous with respect to their resources, capabilities and strategies. Capabilities will be defined in terms of the organisation and the direction of resources such as individual action patterns, collective action patterns, and capital resources, towards effectively creating, assessing, acquiring, diffusing and assimilating new knowledge (Romme, 1997; Cohen and Levinthal, 1990). A feature of technological capability performance includes a consideration of how firms may benefit from the diversity and heterogeneity of the type of knowledge available to or utilised by individuals and firms.

Teece and Pisano (1997), Prahadal and Hamel (1990); Foss (1996), and Nonaka (1994), argue that the core feature of an organisation is the ability[1] to develop various capabilities to accommodate changing requirements and to produce new competencies[2] from situations inside and outside the organisation. These abilities or techniques incorporated in capabilities correspond

[1] In this context, ability can be defined as the qualities that somebody has, which make possible it to do something.

[2] *Competencies may be described as the abilities to do this something well or effectively.*

to the knowledge base of a firm because these abilities reflect what a firm knows. Through this type of knowledge firms identify what they can do and how they can do it (Metcalfe, 1996).

However, this does not mean that what firms know within their capabilities constitutes a strategic asset or competences. These capabilities constitute strategic assets when they are utilised for a purpose or for an intention (Metcalfe 1996) in terms of organisational goals or objectives. Capabilities by themselves do not have these purposes.

Thus, technology strategy can be better understood as a process in which the organisation has the ability to deploy capabilities in order to be constantly developing technological capabilities in a continuous process oriented towards achieving and sustaining a competitive advantage.

No organisation is simply reducible to its patterns of action, because what individuals know and what they can do depends on their context and collective ability to operate capabilities with teams of individuals for a strategic purpose (Metcalfe, 1996).

Pattern of Actions

Pattern of actions in this context is a set of interactions "that expresses a group's way of handling a given issue of problems it faces" (Pentland and Rueter, 1994). They emerge as a result of learned and shared experiences with respect to what appears to work well. In other words organisations develop particular ways of behaving which become the way in which they do things as a result of repetition and reinforcement. Over time this paper can be termed as a pattern of action.

Normally, action patterns can be named 'routines'. There are, however, other actions in firms that are important to analyse (Cohen et al, 1995), such as heuristics and strategies, rules of thumb, paradigms, cognitive frameworks, habits and standard operating procedures. In this chapter recurring action patterns are taken to describe any of these actions.

Patterns of action can be considered either in terms of collective actions or of individual actions. Nevertheless, the emphasis here is less on individual behaviours and more on the social function of an organisation (multi-person action) and its effects in terms of the creation or maintenance of patterns of action.

In terms of evolutionary theory, for Winter (1995a) recurring actions are considered as *quasi-genetic traits* because they have traits that remain approximately constant in the firm over "a long period of time in an accumulative process of selective feedback" (Winter, 1995a). This latter is referred to as the role of selection pressure on shaping and evolution whereby they are tested by the environment.

The literature has shown that the concept of models of action can contain some attributes as follows:

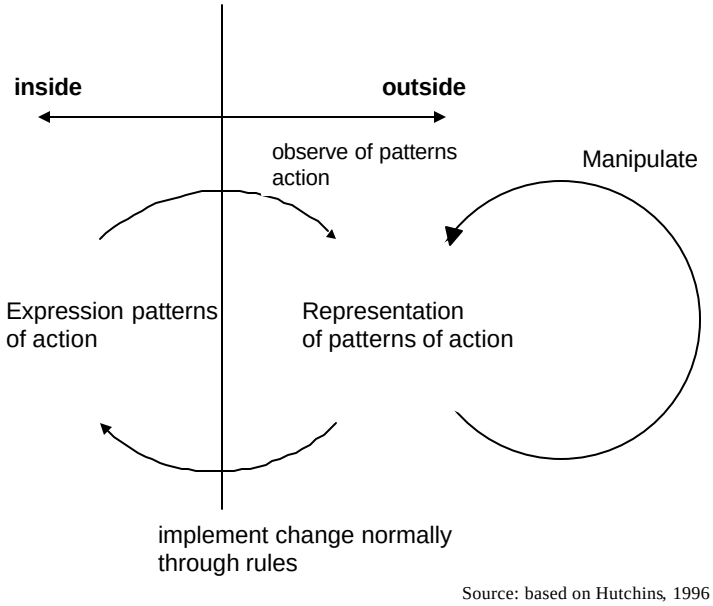
Expression and Representation

There are two implicit aspects in the concept of pattern of actions which need to be taken into account: the *expression*, which are those action repertoires in terms of observable actions (behaviour), and the *representation* (the code). The first group involves heuristics, strategies, and rules. They are "resources" for action but they cannot be understood as determining actions (Pentland and Rueter, 1994). The second group considers routines, habits, paradigms, and standard operating procedures (Cohen et al., 1995; Cohen, 1995). These later are actions of representation.

One example can be observed in the concept of strategy. Literature on this concept (strategy is one action pattern) discusses strategy in terms of manageable actions (i.e. rules) and not in terms of observable actions (behaviour) (Cohen, et al., 1995). Another clear example of these differences can be seen in studies of work place practices. The ways people actually work (behaviour or expression) usually differ fundamentally from the ways organisations describe that work in manuals, training progress, organisational chart and job descriptions, (codes) or representation (Brown and Duguid, 1995).

However, this does not mean that expression of action repertoires is always a deliberative action. Some of them can be non-deliberative actions. Standard operating procedures can be considered as deliberative actions, and routines can be considered as non-deliberative actions. In other words, behavioural actions can be deliberative or non-deliberative actions. Regarding the latter discussion, some authors speak of the same situation in terms of automatic and non-automatic actions and planning and non- planning actions at the group level (Shneider

Figure 2



Source: based on Hutchins, 1996

and Angelrman, 1993), all of which are related to organisational level cognitive structures.

This double aspect (figure 2) representation and expression shows the complexity of replicating and imitating patterns of action or of being able to communicate and adapt them for two reasons: first because behavioural actions are inherent to cultural nature, and secondly, because patterns of action rely on experience (tacit knowledge). This character may reside in the individual or can be seen as a property of organisations.

In evolutionary terms, an organisational change is produced by modification of action patterns in part by evolutionary process and in part by a process of design normally defined by path dependence. Expression and representation is evolution and design. In this way, learning processes are important building this kind of process (Hutchins, 1996)

Repositories of activities

Another aspect important to the characterisation of patterns of action is how these patterns are maintained in the organisation. Cohen et al. (1995) Foss (1996) and Tidd et al. (1997) show that patterns of actions are repositories of activities within an organisation in the memories of the individual actors or groups. Although 'memory' is usually used as a process of storage of knowledge it can also refer to how knowledge is encoded, retrieved and stored.

The literature argues that collective practice and experience is stored and located in the collective memory rather that in its artefacts and records. Memory becomes embodied to be revealed only through activity. Nelson and Winter (1982) and Cyert and March (1963) stress that processes can become stored in the form of ´programs´ or routines.

Recurring actions

One important question about pattern of actions is whether or not these patterns are repetitive, or rather, whether they are recurring. In recurring action patterns, actions are taken by the same individual or group in the same or different time. Three examples of this are the process of approving a system of pay in the supermarket, checking in the car park, or the process of accounting in any firm.

Rules

There are several definitions of rules. Egidi (in Cohen, et al., 1995) considers that a rule is a relationship which allow individuals to trigger an action when a condition for it appears. The process of responding to this condition can be either automatic or deliberate and conscious.

Hodgson (1994-1995), defines rules as patterns of thought or behaviour, which can or cannot be adopted either consciously or unconsciously by individuals. When he describes rules as rules of action (behaviour), these rules can be routines as well, as will be shown later. Hodgson shows that, the main characteristic of rules can be defined by the logical structure (condition/action): in circumstances X, do Y. Thus in this paper, in this study rules will be defined in terms of representative code and in this sense rules define actions, yet they are not actions in and of themselves (Kieser et al., 1998).

In modern organisations, formal rules specify tasks and decision competencies more or less precisely for organisational members, hierarchical relationships, and work procedures. Summarising, rules are significant capabilities for generating action.

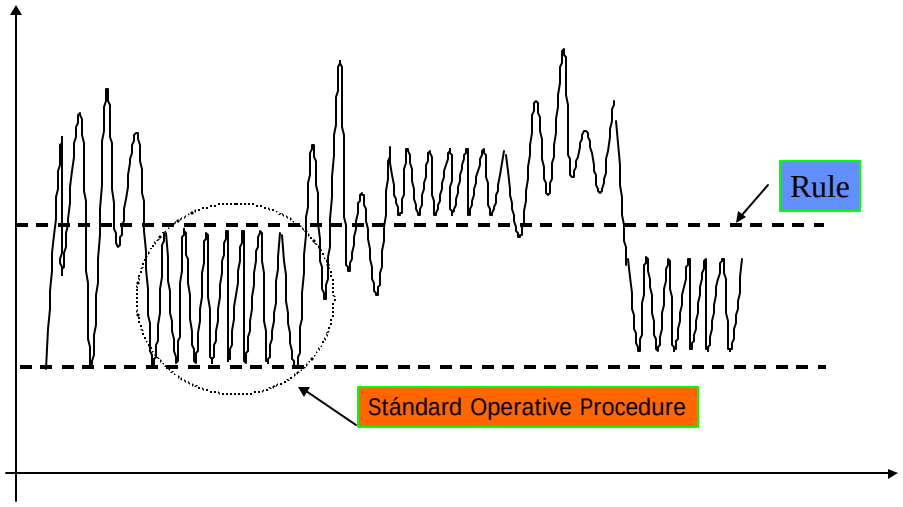
One of functions of rules within organisations is that of reducing information that is provided to workers according to a set of skills that they know. Rules do not define how people may do a good job, or even how to do a better job. To face numerous constraints the organisational behaviour imposes on these rules (Winter, 1995b).

Standard Operative Procedure

The concept of *Standard Operative Procedure* was coined by Cyert and March (1963) in the book *A Behavioral Theory of the Firm*. In this book, a standard operative procedure is considered as a pattern of behaviour. This definition does not differentiate between routines and rules. However it has been useful to continue the analysis of recurring action patterns. In another definition, Egidi (1994) and Brown and Duguid, (1996) argue that a *standard operative procedure* can be described as a set of instructions that determine the actions to be taken when dealing with a particular circumstance. That is, they are formalised ways in which people work and normally they are described in learning representative models such as manuals, training process and job descriptions.

These definitions contain two characteristics: firstly, standard operative procedures are constrained by rules (as structure condition/action). Secondly, they are finite in their outcomes and the actions are defined completely once the rule is built. There are not two actions which respond to different conditions. For example, some banking costumes services, or several processes in chemical laboratories are defined in this group. What would be named as ‘routine’ in terms of computing systems, can be defined under these characteristics as standard operative procedure (Egidi, 1993; Reynaud, 1995-1997). These differences can be observed whether among rules and standard operative procedures is showed in the following figure:

Rules and Standard Operative Procedures



If standard operating procedures are available to solve certain kinds of problems, it is not necessary for the individual to develop problem solutions creatively each time this problem reoccurs because the programme or standard operating procedure will provide for the solution. However, the literature shows that real behaviour diverges substantially for formalised standard operating procedures. This situation can be seen in the studies of work place practices. They have shown that the ways people actually work usually differ fundamentally from how organisations describe that work in manuals, training process and job descriptions. This characteristics shows that standard operative procedure is close to a behavioural action. In other words, some patterns of action can be normative standing to condition/action established, and others can be routines in terms of behavioural actions (Brown and Duguid in Cohen 1996).

Routine

Definition

A routine is considered as a regular and predictable behavioural patterns of firms that is part of the recursive process that constitutes an organisation (Cohen et al, 1995). They have utonomy through their repeated application (Reynaud, 1996). Each routine relates to a given task, cognitive or physical, within a specific activity, and provides the action according to the instruction defined by rules depending on the circumstances.

Saviotti (1991), expanding the concept of Nelson and Winter (1982), shows that within firms, routines are constant patterns of internal activities that face “environmental stimuli” and are designed to solve a defined group of various problems. In Saviotti’s terms (1991), a routine is the union of a set of external stimuli with a set of internal organisational responses. Nevertheless, in terms of evolutionary theory, when an internal structure of a defined system fluctuates broadly to responses from environmental stimuli, it has neither coherence nor stability.

In the same way, Pentland and Rueter (1994) define routines as an ordained set of observed actions patterns, which have sequential structure and functionally similar. This definition clearly defines their behavioural characteristics.

Another definition, developed by a working group that met in Santa Fe in 1995 (Cohen, et al., 1995), presented a more extended definition of routine as "an executable capability for repeated performance in some context that has been learned by an organisation in response to selective pressures". This notion of routine has confluence with cognitive psychology in terms of selection, aptitude and learning, and the role of context. *Context* means that routine is formed by external memory or by representation of portions of routines. However, the emphasis in this definition is on learning which implies the possibility of the tacit and automatic character of the routine and the outcome of a selection process.

Routines allow efficient co-ordinated actions. Without them, organisations would not have efficient structures for collective action like a mechanism to create dynamic capabilities. That is, routines provide the ability to build internal and external competencies in order to face rapidly changing environments (Teece et al.,1997).

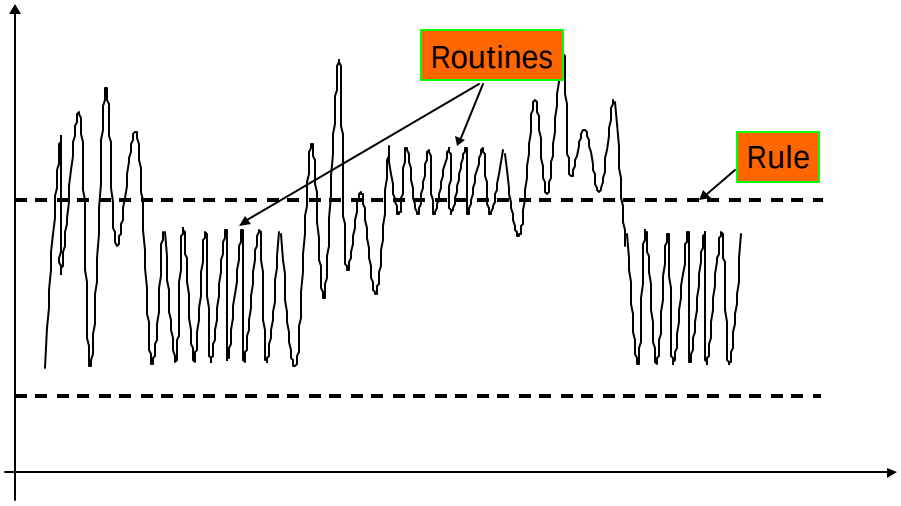
Finally, Reynaud (1995-1997) argues that a routine is a pragmatic means for the resolution of a problem to which the rule gives a theoretical, abstract and general answer. In this definition, rules form the background of routines. It is not possible to adopt routines without having rules. Routines are rule-based behaviours.

It is difficult to find only one definition for routine. However these definitions coincide with the following features: routines are rule-based behaviours; the term ´behaviour´ means that routines exist as a pragmatic means for the resolution of a problem, that is as a set of observe actions. That routines have confluence of learning, means that they can be learned either tacitly or explicitly.

Routines and rules

Distinguishing between rules and routines is not easy. The identification of sets of rules (condition/action) constitutes yet a more difficult task because it is necessary to reduce all the complex features of the organisational process to a 'few essential traits' which can be described in the condition-action set, or rather, in a rule. The limits seem to be found in the complexity of set of rules that can be achieved because rationality has limits (Egidi in Cohen et al., 1995). Next figure trait to show difference between rules and routines.

Rules and Routines



In other words, individuals do not memorise all the specific details of rules; however, they can recreate part of these rules in many different ways to create routines. Individuals can develop sequences of action that may be different from initial rules. In this sense, a rule can become a routine.

What is important to stress here is, firstly, that in collective processes a routine can arise more easily from a set of rules. In this sense, collective process is the most important action in creating routines. Secondly, that organisations are constrained by rules and not by routines. However responses to certain conditions can be unlimited within boundaries of routines and more unlimited depending of how wide the limits of routines are.

Characteristics and Functions of Routines

This issue explores further the concept of routines defined in the last part. Routines will be analysed with respect to their inertial properties, organisational memory, context dependence and cognitive demand. This will be followed with a look at some of their functions. The difference between routines as patterns of action and routines as a variable property of such patterns, explained in the last chapter, will be important to identifying the characteristics and functions of routines.

Characteristic of Routines

a. Inertial character

Inertia is the strong persistence of an existing formal function. Inertial processes arise specifically because of an organisation's resistance to unwanted change in routines on account of their lack of experience at doing new things (Nelson and Winter, 1982; Freeman and Hannan, 1984)

Some authors have analysed the concept of inertia in terms of efficiency of the firm whereby if the practices within a firm are efficient, inertia is beneficial. However, if the firm's practices are inefficient, inertia constitutes a problem (Rumelt, 1995). The most direct evidence of inertia is the persistence of inefficient forms and practices within an organisation (Argyris, 1992). If organisational routines and structures have not been altered for a long time it is likely that these structures do not change their fit when environmental conditions are changing. In the economics tradition organisational change in terms of economics is solved by incentive (Rumelt, 1995); however the habitual patterns of work have an inertial force that can be much stronger than any practical incentives. In this view, routines enable a firm to do its work, but also limit its ability to change. Freeman and Hannan (1984) emphasise the latter, linking organisational routines with structural inertia. Thus, organisations face a paradox between renewal and preservation. Leaving inertia out of an analysis, the outcomes of strategies could involve non-perceived changes and innovation process can be wrong.

Inertial character can be seen in the introduction of new patterns of action or implementation of new technology as a mechanism for the control of groups and members of the group within organisations. This is, groups may prevent moving into a new pattern to protect themselves and their interests (power[3], authority, etc.). And this attitude persists until there is some explicit reason to change, replace or abandon it, such as experience of failure, or for complete change in the organisational structure of the group that use it. Sometimes inertia can be related to an organisation's structural changes. Burkhardt and Brass (1993), for example, analysing relations between implementation of new technologies, actions of individuals, and structure and power, stress that routines can gradually modify structure. However, while a technological change may provide the opportunity for a redistribution of organisational structure and power, it does not guarantee this change, because power groups seek to perpetuate their power advantage in terms of structural inertia.

b. Context and path dependence

Most often the way in which rules are specified and routines performed depends on the context such as the existing structures and processes in the organisation that support the current ways of doing things. Furthermore, the power relation which exists within along with the goal of its managers and those of its members, and the strategies of the individual who put the rule into effect, are specific context characteristics of routines (Reynaud, 1996).

New rules, and therefore routines, will be close to previous activities. Dosi, Teece and Winter (1992) argue that these are a result of a *learning* like process of trial, feedback and evaluation. They consider it possible that many parameters can be changed simultaneously while the ability to conduct these changes and learning diminishes.

Thus the firm's repertoire of routines constrains its future behaviour and is based on interpretation of the past more that anticipation of future. Firms may be expected to behave in the future according to the routines they have employed in the past (Nelson and Winter, 1982; March and Levitt, 1995; Metcalfe, 1996).

[3] Concept of power can be defined as the ability of one actor to overcome resistance in achieving a desired result, or the ability to affect outcomes or get things done (Burkhardt and Brass, 1993).

c. Tacit knowledge

'Tacit knowledge' is defined as that which involves know-how, crafts, and skills that apply to specific contexts. This involves schematics, paradigms, beliefs, and individual view points. This kind of knowledge is hard to communicate. Gilbert and Cordey-Hayes (1996) defined this concept as 'developmental knowledge', and argued that it enhances instrumental or explicit knowledge. One important aspect is that an individual can acquire tacit knowledge without writing and speaking languages and can learn through non-verbal language by observation, imitation, and practice. Thus, the key to acquiring tacit knowledge is experience through routines or another pattern of action (Nonaka, 1994).

New knowledge can be developed by the interrelation between routines of individuals and groups. Organisations play a critical role in articulating and amplifying that knowledge. However, in this process, tacit knowledge can create barriers in these interrelations because, the last objective of the transfer process of knowledge is for it to become assimilated into the core routines of the organisation (Gilbert and Cordey-Hayes, 1996; Nonaka, 1994). This concept refers to how organizations process knowledge and, more importantly, how they create new knowledge.

d. Organisational Memory

Nelson and Winter (1982) argue that habits and routines act as repositories of knowledge and skills, that is as the "organisational memory" of the firm. They integrate this function into an evolutionary concept. Also, they assume that the future behaviour of organisations, being based on routines, resembles behaviour that would be produced if they simply followed their routines of the past (Kieser et al., 1998).

Organisations store information of a routine basis, sometimes for operating reasons, and sometimes to satisfy the reporting requirements of other units or organisations. Organisational knowledge about how to do things is stored in the form of standard operating procedures, routines and rules (Huber, 1995). Memory may contain a protocol for a new product development stage that guides actions of members within an organisation. This "action guidance role" (Mooman and Miner, 1997) represents an important characteristic of organisational memory. Nelson and Winter (1982), for instance, emphasise the power of organisational routines in driving organisational action and emphasise that standard operative procedures achieve defined purposes (Cyert and March 1963).

Reinaud (1995-1997) considers that organisational memory could be an 'emergent property' of the interaction between the routines. However, organisational memory is not just the transposition of individual members memory to the level of the group as a set, because organisations have an interactive memory (Reynaud, 1995-1997). In the same way, Spencer and Eden (1998) have doubted about the presumption of uniformity shared between several minds and claim that these effects need a theory of cognitive collectively such as a Durkehim's theory of conscience collective or Halbawacs (quoted in Spencer and Eden, 1998) theory "organic solidarity".

Functions of Routines

The literature in the area of functional routines shows that organisations have many routines, some directed toward stabilisation focused on increasing efficiency, exhibiting co-ordination, or reducing uncertainty about how things are done. Furthermore, there are others oriented towards the elaboration or refinement of other routines for greater adaptability, or during their processes of action, the learning of these routines may be directed at the maintenance of existing routines (reinforcement); radical rejection or change in other of these routines. In terms of functions, routines can be studied as patterns of action and as resources to create patterns of action. Thus, it is necessary to consider these differences to classify the following characteristics.

Adaptation and stabilisation

Routines provide an essential rhythm and stability in day to day activity. Gersik and Hackman (1990) argue that 'social entrainment' may be a factor that contributes to the stability of habitual routines across time in dynamic environments. 'Social entrainment' is a concept borrowed from biology and refers to the "process whereby a system's internal rhythms is "captured" by a temporal process such that the rhythms of the system shift toward the periodicity and phase of the capturing process" (Gersik and Hackman, 1990).

Once a routine has been stabilised in a group, the behaviour involved in executing that routine is likely to come under normative control or under mechanisms of standard operating procedures as part of jobs of other organisation members. If these routines can finally be converted to norms, they serve primarily to threaten sanctions, depending on requirements of each organisation. Habitual routines (as a characteristic of some routines) have traditionally been criticised by organisation scholars, because they reduce flexibility and are essentially conservative in nature. Their paradoxical nature arises in that they free resources for other task but also can block change (Postrel and Rumelt, 1992; Gersik, 1991). The mere existence of habitual routines will not be a problem in situations where change is not needed.

Avoid Uncertainty

For their characteristics, routines are uncertain behaviours for their your tacit elements. However, a central function of 'rules' is to reduce complexity and uncertainty for individual decision makers (Cyert and March, 1963). The basic mechanisms by which this is achieved are: departmentalisation, standardised operating procedures (programmes), hierarchy, or as we would say nowadays, organisational culture (Kieser et al., 1998). The departmentalisation process tends to reduce the number of criteria a decision-maker within a part has to take into consideration, i.e., personnel manager divisions.

Flexibility

If it is possible to talk about flexibility in organisational routines, which could be defined in terms of behaviour. However routines have not control by individuals that performance them. Control is only defined by rules in processes of decision-making in terms of representation, and

social control in terms of behaviour. However they specify limits not flexibility. Flexibility is including within limits. Flexibility in rules modifies, and delimits where routines can moving.

Egidi (1994) considers that when an action pattern is incomplete, this characteristic gives flexibility to the realisation of routines and facilitates their change. This is possible because agents are able to complete procedures by means of their ability to learn and to solve problems.

d. Generation

In general, if novel routines are required, the literature (Rumelt, 1995; Dosi, Teece and Winter, 1992) argues that macro-routines are important for this purpose of creating novelty. These 'routines for organisational learning' are shown as crucial because they determine how new practices, formal systems and procedures became embedded within organisational repertoires. They represent a capacity for changing routines. However, meta-routines, as a routine that uses routines and as inputs to be processed, would conflict with the assumption that implicitness is a fundamental feature of them. Thus, the concept of meta-rules will be preferred to meta-routines. The combination, imitation and replication, diffusion, manipulation and generation of new expressions or patterns of actions are inherent to the organisational learning process, however, only in terms of collective actions oriented towards the creation of mechanisms for development of dynamic capabilities. This does not mean that they are explicit processes of learning. On the contrary, it is important to stress tacit knowledge and implicit learning and the difficulty of manipulating them.

e. Replication

The existing routine serves as a template for the new one. In the replication of an existing routine, the firm seeks to impose a routine's order on an entirely new set of specific inputs. (Nelson and Winter, 1982). Routines can be replicated if a firm possesses the necessary resources that support the routine. However this process in not only related to resources, but to the hierarchy of structures which support them.

Obstacles which the process of replication faces include high cost, the tacit nature of knowledge embedded in routine, or inertial processes that inhibit replicating them.

Learning Process and organisational routines

Much recent discussion has focused on the concept of a "learning organisation", which sees knowledge as the basis for competition in the next century.

The learning process of an organisation lies primarily in the organising principles by which individual and functional expertise is structured, co-ordinated, and communicated. It is commonly believed that the skills needed to achieve success are centred on the promotion of a learning culture within organisations (Gilbert and Cordey-Hayes, 1996). Routines are learned patterns of behaviour, which become embodied in structures and procedures over time. However, Winter (1995b) stress that "The prevailing organisational routines do not mark the edge of what is feasible, but the point where learning stopped -or more optimistically, the point that learning has now reached" (Winter, 1995b).

There are many definitions of organisational learning (Dodgson, 1993; Huber, 1995). March, and Richard Cyert (1963) developed a theory of organisational learning. They assume that complex organisations learn by the ways in which individuals experiment from inferences, and code the lessons of history into rules. Organisational learning is based on routines and it is history-dependent and target-oriented. Argyris and Schon (1978) argue that organisational learning is the increased process capacity to innovate in the future within that organisational setting. On the other hand, Gilbert and Cordey-Hayes (1996) establish a more precise definition: 'The organisation must be adaptive and be able to respond to both the internal and external environments, and it must be open and be able to communicate'. In turn, Dodgson (1993) explains that organisational learning is the way firms organise the knowledge within their culture and adapt and develop organisational efficiency by enhancing their competitiveness. Subsequently, Shendler (1996) established that 'the *process* of learning rather than *what* is learned', is most important. However, It does not always increase the learner's effectiveness or even potential effectiveness. Learning doesn't always lead to true knowledge. In other words, it is possible to correctly learn that which is incorrect (Huber, 1995).

Developing innovation management involves a learning process concerned with building and integrating key behaviours into effective routines. Innovation management is the search for effective routines (Tidd, 1997). It deals with managing the learning process towards more effective routines in order to deal with the challenges of the innovation process.

The key to the process of organizational learning is **assimilation** of the results and effects of applying the knowledge gained. This requires a transfer of the results into the routines of an organisation. The meaning of assimilation incorporates the process of cumulative learning. It implies the notion of change in individuals, groups and organisations that is manifested as shifts or modification in cognition, attitude and behaviour as a direct result of the acquired knowledge. (Gilbert and Cordey-Hayes, 1996).

Conclusion

The aim of this paper has been to provide an overview of the interrelationship within firms' behavioural patterns of action, and in particular routines, toward understanding technology capabilities. Furthermore, this paper has identified aspects of competencies, technological capabilities, organisational learning, within implementation processes that can benefit from the use of understanding of organisational routines.

Despite the difficulty in finding only one definition for routine, definitions found in the literature do share several common features: routines are rule-based behaviours and they have confluence of learning, meaning that they can be learned either tacitly or explicitly. The term 'behaviour' means that it exists as a pragmatic means for the identification of a routine because it refers explicitly to observed actions.

Thus, routines can be conceived firstly, as a web of co-ordinating relationships connecting specific resources, without which routines could not exist. And secondly, routines can be understood as generating capabilities. Without them, organisations would not have efficient structures for collective actions like a mechanism to create dynamic capabilities. That

is, the ability to build internal and external competencies to face rapidly changing environments (Teece, 1997). However, the challenge for an organisation is to identify the various forms in which capacities of action become embedded in organisations in terms of strategies.

However, a central function of routines is to reduce complexity and uncertainty for individual decision-makers. The basic mechanisms by which this is achieved are through: departmentalisation, standardised operating procedures (programmes), hierarchy and organisational culture.

The concept of routine has become increasingly important as organisations want to be more adaptable to change. This study has established that routines can be developed through a process of learning, while emphasising the continually changing nature of organisations. This gradual shifting in routines of both the individual (habits) and organisations occurs due to the influence of such factors as structure, strategy, environment, technology, and culture and cognitive processes, all of which affect both the individual (habits) and the organisation.

What is important to note is that it is possible to create competencies when resources are transformed into capabilities and capabilities are aimed at creating competencies. However, if the routines are underlying the capacities, they are embodied or embedded to a large extent in its associated human, physical and organisational capital. This means that these routines are able to generate capabilities from the abilities that are contained in the set of their physical and human resources. Evolutionary theory sees these organisational capabilities as embedded in organisational routines (Winter, 1994).

Routines as processes of learning depend on the context and path which means that they are defined with respect to context, structures and processes and they are supported by current ways of doing things. In the same way learning can be seen as social construction, putting knowledge back into the contexts in which it has meaning. What is learned is profoundly connected to the conditions under which it is learned and embedded as routines.

Routines and rules are developed as experience of different stimulus that accumulate in the past and are represented in the present. They can become a foundation for future rule driven behaviour and organisational process of learning (Kieser et al., 1998). This view of history as dependent on routines through the learning process, close to evolutionary theories, has provided a serious empirical and theoretical challenge to the notion of an anticipatory choice in terms of guided action as a basis for organisational intelligence.

Thus the repertoire of routine of firms constrains its future behaviour and in addition, is based on interpretation of the past more that anticipation of future. Firms may be expected to behave in the future according to the routines they have employed in the past (Nelson and Winter, 1982; March and Levitt, 1995).

The problem, however, is one of finding a language for defining the ingredients of recurring action patterns and the architecture in terms of function and characteristics and of giving them coherence, which defines how effective patterns of actions are developed, and how such action repertoires are assembled, maintained and modified.

Finally, this thesis suggests that a deeper examination of organisational routines is required. Examining the way firms co-ordinate mechanisms that they use through their strategies and structures, use incentives to create or modify routines, and how such factors related to other industrial sectors and a firm's size, for instance, would be very valuable to understanding organisations. Interdisciplinary studies will also have particular value for the continuing study of recurring patterns of action.

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Title: Routines and the problem to create learning capabilities

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