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Managerial action on improving learning behaviour in product innovation processes

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ABSTRACT

Learning in and by organisations has been of great interest to scholars and practitioners for a number of years now. Over the last three decades the concept has attracted many researchers. Despite all the interest, we still know relatively little about learning (processes) in organisations. The lack of understanding of learning processes is even more problematic when it comes to learning in product innovation processes since these are complex and dynamic activities that have been hardly researched from a process perspective.

An assumption in literature on learning is that it can be stimulated through the implementation of different enablers: mechanisms used to stimulate learning. If adequately applied, these enablers can have an influence on an organisation's attitude and practices in generating, transferring, interpreting, storing and retrieving knowledge (c.q. learning processes).

Based on results from 10 in-depth case studies and survey (interview) research (70 SME's in the manufacturing industry) in 6 countries in Europe and Australia, this article reports on research in which one of the aims was to identify effective managerial activities and decisions in stimulating learning behaviour exhibited by individuals and teams in product innovation processes. The results indicate that especially project planning and control and HRM policies have a strong effect on learning behaviour. Their impact however does not span the entire learning process and all levels of learning. For this, a configuration of enablers is required that amongst other things, is dependent on the strategy and goals of the organisation.

INTRODUCTION

Learning in and by organisations has been of great interest to scholars and practitioners for a number of years now. From an academic point of view learning in and by organisations is a very appealing and dynamic concept. It is an integrative concept in that it can unify various levels of analysis (individual, group and organisation) and incorporates ideas from different disciplines such as psychology, organisational behaviour, information sciences, organisational theory, and production management (Shristastava, 1983; Huber, 1991; Easterby-Smith et al, 1999). As such, over the last three decades the concept has attracted many researchers. Despite all the interest, we know relatively little about learning (processes) in organisations. The lack of understanding of learning processes is even more problematic when it comes to learning in product innovation processes since these are complex and dynamic activities that also are hardly researched from a process perspective.

The scattered nature of the field, the limited (although increasing) effort put into empirical research, together with the insufficient in-depth knowledge and understanding of organisational learning does not facilitate the development of practical management instruments for managing learning processes in order to help realising organisational goals.

This paper reports on research in which one of the aims was to identify effective managerial activities and decisions in stimulating learning behaviour exhibited by individuals and teams in product innovation processes (Gieskes, 2001). The results of this research in terms of effective enablers for stimulating learning behaviour will be presented and discussed, but first the theoretical background of the research is outlined in the next section. The third section deals with the research methodology. Then, the general results are presented in which the focus will be on two enablers that appear to have a strong impact on learning processes: HRM policies and project management and control. Their impact on different levels of learning is analysed and discussed, which results in propositions for further research. The last section discusses the implications of the results for future research as well as for practice.

THEORETICAL BACKGROUND

Learning in and by organisations.

The assumption that organisations are able of learning (Kim, 1993: *"all organizations learn, whether they consciously choose to or not ..."*) is not unchallenged in literature. Walsh and Ungson (1991) point towards anthropomorphism in the discussion on organisational memory, which seems to apply to the discussion on organisational learning in general. *"There is something paradoxical here. Organizations are not merely collections of individuals, yet there are no organizations without such collections. Similarly, organizational learning is not merely individual learning, yet organizations learn only through the experience and actions of individuals"* (Argyris and Schön, 1978:9). At the same time however, knowledge generated by the individual does not come to bear on the organisation independently. Models of individual learning (Kolb, 1984) can be linked to theory on organisations as behavioural systems (Cyert and March, 1963) and as interpretation systems (Daft and Weick, 1984). The result is a model of organisational learning that addresses the issue of transfer of information through the exchange of individual and shared mental models (see also Argyris, 1996). Glynn *et al.* (1994) refer to this perspective as the knowledge development perspective. A different categorisation of perspectives of the study of learning in organisations distinguishes (amongst others) the information-processing perspective: organisations are viewed as entities of processing information with processes of acquisition, distribution, interpretation and storage of information i.e. knowledge (Duncan and Weiss, 1979; Nonaka and Takeuchi, 1991; Huber 1991; Pentland, 1995). Within this perspective, knowledge is characterised as organisational knowledge when it is accepted by its members and exchanged within the organisation and learning is the continuous process resulting in improvement of this knowledge. In the setting of the research reported on in this paper both perspectives apply. Processing knowledge in/through the organisation is an important factor in the change of the mental constructs, both on an individual as on a group level.

Product Innovation Processes (especially New Product Development) can be viewed as learning processes by nature, since they have a primary role in generating new knowledge and distributing that knowledge throughout the organisation. As such the process of knowledge development and accumulation is equated with learning (Carlsson *et al.*, 1976; Nelson and Winter, 1982). Product innovation processes can also be viewed as one of the focal processes in an organisation, where learning is essential in order to stay competitive (McKee, 1992 Hughes and Chafin, 1996; Bartezagghi *et al.*, 1997; Caffyn, 1998).

Learning can be addressed by facilitating and stimulating a number of learning behaviours exhibited by individuals and groups related to the acquisition, generation, diffusion, storage and retrieval of knowledge. Changes in behaviour (on an individual, group and organisational level) can be indicators for learning to have taken place and as such is often mentioned in literature, though hardly operationalised and systematically empirically researched. When talking about learning organisations, Garvin (1993) asks, "*what concrete changes in behaviours are required*?"

Enablers for learning

An assumption in literature on learning is that learning behaviour can be stimulated through the implementation of different enablers: mechanisms used to stimulate learning. If adequately applied, these enablers can have an influence on an organisation's attitude and practices in generating, transferring, interpreting, storing and retrieving knowledge (c.q. learning processes). However, literature presents a rather fragmented picture with regard to enablers as they appear under different headings, such as learning orientations (Shrivastava, 1983; Nevis *et al.,* 1995), learning modes (Hedberg, 1981), learning skills (McKee, 1992), organisational learning mechanisms (Popper and Lipschitz, 1998).

A wide variety of enablers for learning is mentioned and authors point out that these enablers do not necessarily need to be used to specifically stimulate learning, but that the learning can be a consequence of enablers used to organise and manage (parts of) the product innovation process. Nevis *et al.* (1995:76), based on in-depth case studies, list a number of so-called facilitating factors *("structures and processes that affect how easy or hard it is for learning to occur and the amount of effective learning that takes place*"): scanning imperative, performance gaps, concern for measurement, experimental mind-set, climate of openness, continuous education, operational variety, multiple advocates, involved leadership, systems perspective. Other empirical studies also explicitly or implicitly identify enablers. The following categorisation can be made:

- ***Clarity of strategy and goals*** guides and focuses learning processes through communication on strategic decisions and activities (Senge, 1990; McGill *et al.,* 1992; McKee, 1992; Bowen *et al.,* 1994; Methé *et al.,* 1997; Cooper *et al.,* 1999). Apart from the presence of a clear strategy and goals, strategic development processes also are regarded as crucial activities (de Geus, 1988: 70 "Planning as Learning"; Morgan *et al.,* 1998; Crossan *et al.,* 1999).
- ***Performance measurement***, including benchmarking and reward systems, facilitates the development of a shared perception of a gap between actual and desired state of performance. Performance gaps are seen as opportunities for learning. A second contribution lies in the monitoring of improvement (Adler and Cole, 1993; Slocum *et al.,* 1994; Nevis *et al.,* 1995; Locke and Jain, 1995; Hameri and Nihtilä, 1998).
- ***Human resource management*** such as human resource development, job rotation, teamwork, education and training, bringing in people from the outside with new knowledge, provide opportunities to develop and change behaviours, skills and increase knowledge (Senge, 1990; Shaw and Perkins, 1991; Dixon, 1992; Leonard-Barton, 1992; Lei *et al.,* 1997; Inkpen and Crossan, 1995; Goh and Richards, 1997; Leroy and Ramanantsoa, 1997).
- ***Organisational arrangements (structural integration mechanisms)*** such as small teams, temporary teams, appointment of "gate-keepers" or "boundary spanners", connect the organisation to the realisation of its goals and relate parts of the organisation and

processes (Hedberg, 1981; Stata, 1989; Pedler *et al.,* 1989; Levinthal and March, 1983; Dodgson, 1993; Ulrich *et al.,* 1993; Crossan *et al.,* 1999; Cooper *et al.,* 1999).

- ***Project planning and control*** such as standard operating procedures, protocols, etc. constitute behaviour repertoires (Hedberg, 1981; Adler and Cole, 1993; Lei *et al.,* 1997; Duarte and Snyder, 1997; Leroy and Ramanantsoa, 1997; Hameri and Nihtilä, 1998).
- ***Computer based technologies***, including ICT and design tools and methods, can function as an opportunity for communication, co-operation and at the same time act as standardisation and normalisation means (Hedberg, 1981; McGill and Slocum, 1991; Huber, 1996; Adams *et al.,* 1998).

Despite the number of enablers in this categorisation, there is hardly information on the effectiveness of the different enablers.

RESEARCH METHODOLOGY

In the CIMA research project (ESPRIT 26056) a methodology was developed with the aim to help companies stimulate and facilitate learning behaviour in product innovation processes. Starting with a state-of-the-art literature review covering product innovation, organisational learning, continuous improvement, knowledge management and performance measurement in product innovation processes, an investigation framework was developed that was used to carry out ten in-depth case-studies in the six countries involved in the project (Italy, the UK, Ireland, Sweden, The Netherlands and Australia). The findings from the fieldwork, together with analysis of the state-of-the-art review resulted in a model for learning underpinning a methodology that subsequently was tested and applied in companies. The model and methodology as well as their development and application are elaborately described in Boer et al. (2001).

A core element of the model is formed by so-called learning behaviours (behaviours enacted by individuals and teams that can be considered to be related to learning processes). Examples of learning behaviours are for instance the use of strategic goals and objectives to focus and prioritise learning activities, using product innovation processes as opportunities to develop knowledge, use of part of the available time/resources to experiment with new solutions, integrate and transfer new knowledge within and between innovation processes and embedding knowledge into vehicles such as reports, guidelines and databases. The learning behaviours exhibited in specific product innovation projects were investigated by means of a questionnaire (to be answered by the responsible person for product innovation) of which the response was stored in a central database. Next to a mapping of exhibited learning behaviours also the enablers used for stimulating and facilitating these behaviours in different product innovation projects were investigated.

These data were collected from 70 companies (SME's in the manufacturing industry) in six countries and stored. The database formed the basis for the research that is reported on in this paper.

THE EFFECTIVENESS OF ENABLERS.

Based on the literature study and field research eight categories of enablers were distinguished that were hypothesised to be effective in stimulating learning behaviour, see figure 1.

Enablers	Specific examples
1 Product family strategies	Product family plans, carry-over policies, standardisation policies
2 Process definition	Stage-gate processes, company innovation procedures
3 Organisational integration mechanisms	Teamworking, matrix organisation, committees
4 HRM policies	Personnel rotation, departmental assessment and development plans, Reward systems, empowerment programmes
5 Project planning and control	Project termination reports, design reviews
6 Performance measurement	Comparison of measurements against previous results or with other subsidiaries or leading organisations
7 Design tools and methods	Standardised design methodologies and procedures, libraries of standard Design solutions, integration procedures (e.g. Quality Function Deployment, Design for Manufacturability)
8 Computer-based technologies	IT systems, computer aided technologies, prototyping technologies

Figure 1. Categories of enablers to stimulate learning behaviour

Regression analysis with enablers as the predictor variable for learning behaviour was used to test these hypothesis. The results of the statistical analysis are depicted in figure 2 (for details see Gieskes, 2001). These results concern partial correlation and regression analysis, which means that each independent variable (= enabler) has been researched separately for its correlation with the dependent variable (= learning behaviour).

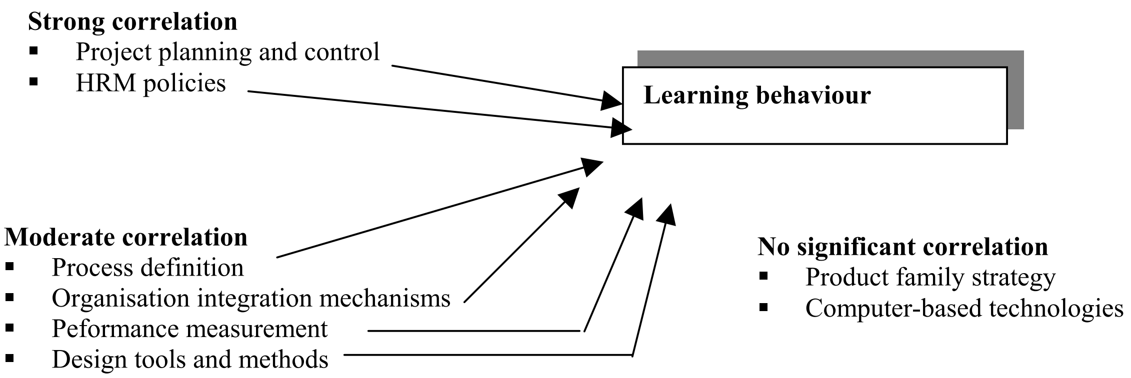

Figure 2 The effectiveness of enablers in stimulating learning behaviour

Three categories of enablers can be distinguished according to their relationship with learning behaviour:

- Enablers that have no significant impact on learning behaviour. Product family strategy and computer-based technologies exhibit no statistical significance relative to learning behaviour.
- Enablers with a moderate ($.30 \leq r \leq .34$) impact on learning behaviour: process definition, organisation integration mechanisms, performance measurement and design tools and methods.

- Enablers with a stronger ($r \geq .44$) impact on learning behaviour: HRM policies and project planning and control.

The results are interesting. Despite all that is put forward in theory on learning and improvement, the existence of a product family strategy does not stimulate learning behaviour. This can be partly explained by the phrasing of the enabler in the questionnaire (specifically asking for a *product family strategy)*, but further research is called for. The low impact of computer-based strategies can be explained by the fact that the respondents indicated that it was difficult to distinguish between this enabler and design tools and methods.

Analysing the group of enablers with a moderate impact it was decided to label this group as *punctuated enablers*. These enablers especially influence learning behaviour during their implementation. Examples are the implementation of a new performance measurement system, appraisal system, new working procedures and a new communication structure. The enablers have a formalising effect on behaviour, regulating effect on operational activities and facilitate the transfer of individual knowledge to group and organisational knowledge. The enablers help individuals "adjust" their behaviour and fine-tune it (getting better at doing the same things).

The enablers with a strong impact can be labelled as *continuous enablers*, i.e. enablers that have a stronger impact on individual and team capabilities to learn and as such continuously affect learning behaviour. They have an effect in extending and refining the knowledge base in the organisation. These enablers definitely are formalising behaviour and thus regulate operational activities, but at the same time they leave enough room for individuals and teams to operationalise the enablers according to their specific circumstances and thus they do not impede learning.

Project management and control define activities that have to be carried out, information to be gathered, transferred and stored, as well as where the responsibility and authority lies. Practice shows that the "amount" of project management and control increases with experience. HRM policies are regulating in a different way. Through activities aimed at improving individual and team knowledge, experience and capabilities the methods that individuals employ to control and manage their activities become more aligned and, to a certain extent, standardised. This facilitates and stimulates learning.

So far, the analysis has only dealt with the effectiveness of enablers on learning behaviour. The learning process as such has not yet been taken into account.

THE IMPACT OF CONTINOUS ENABLERS ON THE LEARNING PROCESS AND LEVELS OF LEARNING

The learning process has been described as the process of generating/acquiring, transferring, storing and retrieving knowledge. Each subprocess is not addressed by all learning behaviours simultaneously, but by a subset. The acquisition/generation of knowledge can be improved by addressing learning behaviours related to the development of knowledge, experimenting with new solution, abstracting and generalising knowledge and assimilating knowledge from external resources. The transfer of knowledge can be improved by addressing learning behaviours relating to the integration and transfer of knowledge within and between phases of the product innovation process. It's not difficult to see that enablers such as HRM policies, project management and control and organisation integration mechanisms can be very effective here. The storage of knowledge can be affected by learning behaviours related to embedding knowledge into vehicles (such as reports, manuals, databases) and assimilating knowledge from external resources. Enablers such as the existence of a process definition, project planning and control and computer based technologies serve purposes here. Finally the retrieval of knowledge can be improved by addressing learning behaviours that are also related to embedding knowledge into vehicles. Enablers useful here are for instance design tools and methods, computer-based technologies and performance measurement.

The argument is that not one single learning behaviour is able to affect the entire learning process and that a configuration of learning behaviours is required. The configuration itself depends, amongst other things, on the goals and strategy of an organisation for its product innovation processes. For instance if an organisation has decided to emphasise knowledge sharing during a certain period of time, focus has to be on the application of specific enablers. An organisation (or part of it) that is highly dependent on the acquisition and generation of knowledge in general focuses on different enablers than an organisation that is more involved in the transfer of knowledge. Next to the goals and strategy, also contingencies (such as product and process characteristics) may play a role in the effectiveness of configurations of enablers and learning behaviours.

In section two it has already been stipulated that a difference can be made between individual, group, and organisational level learning. Apart from the distinction between these levels of learning also other levels of learning are distinguished. Probably the best known and most often quoted distinction is that between single-loop and double loop learning (Argyris and Schön, 1979). Single-loop learning involves the detection and correction of errors within a given set of governing variables. Because this level of learning occurs within a given (organisational) framework, it emphasises the type of association building that results from repetition and routine (Fiol and Lyles, 1985). Single-loop learning is often associated with incremental changes, where new methods and tactics are tried out in an attempt to get rapid feedback on the consequences in order to be able to make continuous adaptations. Double-loop learning involves changing the governing variables themselves. As a result of this type of learning "the way we do things around here" may be disrupted. Double-loop learning is linked to radical changes, such as product or process innovations, entering new markets, etc. Bateson (1972) distinguished a third level of learning: deutero learning, or learning to learn, a higher level of learning which implies that the organisation is capable of learning and deciding what level of learning is appropriate in what situation. Deutero learning is associated with learning capabilities, knowing how to learn and knowing what level of learning is appropriate in what situation, c.q. deciding on the right configuration of level(s) of learning.

In managerial discourse the levels of learning are often portrayed as being a hierarchy in which double-loop learning is superior to single-loop learning and deutero learning is even superior to double-loop learning. However, what is often lost in this discourse is what forms of (behavioural) changes are associated with each level of learning, and which are called for or appropriate in specific circumstances. The question following this question of which level of learning is desirable, is the one asking which managerial action/activity will stimulate (or at least address) the level of learning sought after. As McKee states (1992): "*At each of these levels, learning must be managed; it is not automatic*".

An issue that is hardly addressed in this discourse, is what level of learning is addressed by which managerial actions/activities.

From the previous section we inherit the knowledge that project management and control, as well as HRM policies are effective in stimulating learning behaviour. It is now interesting to know what level of learning the two enablers have an impact on.

The impact of project planning and control

This enabler helps controlling the product innovation process. If the process is under control, no resources are wasted on corrective actions such as putting in overtime, adding people in the final phases (all in order to finish the project in time) and no disturbances are generated in other activities/processes. In its nature, project planning and control achieve single-loop learning. The enabler does not affect the acquisition/generation of knowledge nor the distribution, but does address storage and retrieval of knowledge through planning (milestones, deliverables) and archiving (storage of deliverables).

Project planning and control has leverage on issues such as clear goals, focus, priorities, mile-stones/deadlines, etc. that can be understood by the team(s) and which are perceived as stimulating. Proper project planning and control provide opportunities for trying out new things, experimenting without introducing risks: encouraging learning. Spare time normally spent to compensate for project delays or other problems becomes available for challenging activities with a certain degree of freedom. Double loop and deutero learning are indirectly stimulated by this enabler through generating resources (both money and people). Figure 3 depicts the effect of project planning and control as an enabler.

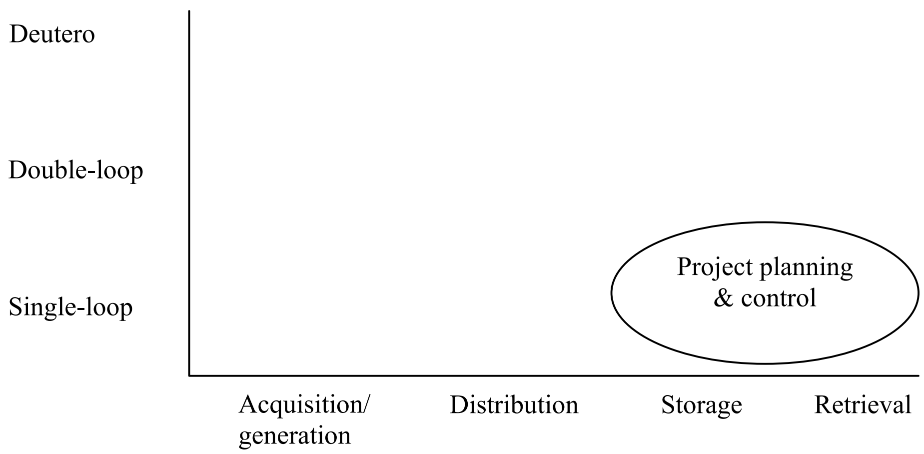

Figure 3 The effect of planning and control on levels of learning and the learning process

A proposition can be formulated that can be tested in future research.

Proposition 1
If properly applied, project management and control creates opportunities for learning, whereby a prerequisite is that individuals are motivated to learn and are "allowed" (i.e. given the resources and stimulated to use them) to learn.

It should be kept in mind that providing the resources does not automatically result in improved learning behaviour. This requires explicit management.

The impact of HRM policies

This enabler actually is a category of quite different activities such as personnel rotation, reward systems, empowerment programmes, departmental assessment and development plans, and career development. With this enabler the human aspects of knowledge acquisition/generation as well as knowledge distribution can be addressed. For instance, personnel rotation will distribute knowledge in the form of people, recruitment will inject knowledge from outside the organisation, empowerment programmes in general include education and training that address the acquisition of new knowledge on an individual or team level. Storage and retrieval of knowledge are strongly linked to the operational processes themselves and are addressed by this enabler indirectly in the sense that through HRM the storage and retrieval of knowledge within individuals can be addressed. This will result in repeated behaviour, which in time will build behavioural repertoire and capabilities.

HRM policies cover a spectrum of instruments possibly stimulating single-loop, double-loop and deutero learning. For example, reward/bonus systems can stimulate people to educate themselves, aim for the next career step, etc. They can induce individuals to search for new problems and solutions. This can be associated with double loop learning. However, reward systems can also inadvertently paralyse individuals by "punishing" them, either by emphasising costs of failures or by offering inappropriate rewards such as unclear tasks, etc. Instruments such as intervision, career plans, teambuilding and departmental development plans require reflection on the current situation, as well as the desired situation, thus providing the momentum for learning. This is typically associated with double loop learning. Empowerment, education and training have the potential to help individuals and teams to gain in-depth understanding of their immediate task-related environment and the way this is linked to the greater entity of the organisation and external environment. By initiating these capabilities, issues like "life long learning", the "train-the-trainer" concept are addressed, which are associated with deutero learning. The effect of this enabler is depicted in figure 4.

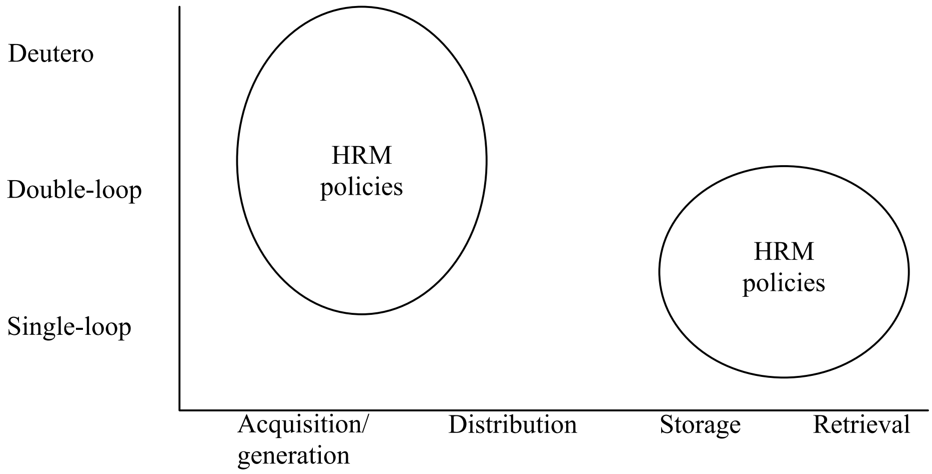

Figure 4 The effect of HRM policies on levels of learning and the learning process

From discussions on the results of the analysis with product innovation managers, it became apparent that HRM tools often are perceived to be the domain of the HRM department and less that of (project) managers in operational processes. He/she is held accountable for the project being realised within time and within budget, and not whether he/she has facilitated a learning process through stimulating the (individual) team (members).

A prerequisite for successful application of the enabler for achieving deutero learning lies in its credibility and stability. Hypes and fashions in the field of HRM can undermine the credibility with individuals and teams. For instance practising empowerment for one year will not pay off in the long run for deutero learning. This also applies for rotation schemes, training budgets, etc. Application of the enabler also requires capable operational managers.
The following proposition can be formulated:

Proposition 2
1. The effectiveness of HRM policies for stimulating learning behaviour depends on the capabilities of operational managers to apply the enabler in practice. 2. The effectiveness of HRM policies for stimulating learning behaviour over time requires stable and consistent application of HRM policies.

HRM policies are facilitating on the level of the individual, the team and the organisation.

CONCLUSIONS AND DISCUSSION

The research answers some questions, confirms insights reported in academic and practitioner literature, raises doubts to generally accepted postulations and raises questions.

First of all the results raise doubts with regard to the effectiveness of product family strategy as an enabler for stimulating learning, despite the emphasis in literature on the importance of strategy. Also it is not entirely clear whether design tools and methods and/or computer-based technologies can be regarded as stimulating factors. The literature on the influence of these technologies is not entirely consistent (see Tyre and Orlikowski, 1994; Hanseth and Monteiro, 1997; Henfridsson and Söderholm, 2000) and future research is to develop more knowledge in this area.

The strong influence of project management and control on exhibiting learning behaviour is somewhat surprising. Although in literature the enabler is mentioned as an enabler that constitutes behavioural repertoires, it is less mentioned than its impact suggests. A second surprise was that from literature it is easy to gain the impression that HRM policies are widely implemented and applied by project managers in organisations to address learning issues. The findings from practice however indicate that reality is quite different.

The effectiveness of enablers in stimulating learning behaviour appears to be related to the degree to which the enablers are effective in formalising behaviour exhibited by individuals and teams. Through this formalisation the enablers have a regulating effect on operational activities and thus freeing resources that can be applied for learning purposes.

Of the two enablers that have been discussed in more depth, HRM policies is the only one able (or has the potential) to address all the three levels of learning. It can be expected that the other effective enablers are hardly able to do similar. In general they will address part of the three learning levels. Stimulating learning behaviour that represents all levels of learning requires a configuration of different enablers. From the figures 3 and 4 it can also be concluded that a configuration of enablers is required to address the entire learning process. The choice of enablers depends for instance on the strategy and goals of the organisation. Future research has to provide information on the influence of contingencies such as product and process characteristics on the choice and effectiveness of enablers and possibilities to engage in specific learning behaviours. A last issue is that the choice may depend on the existing learning capabilities within the organisation. A meticulous configuration is important since it is possible for enablers to stimulate the innovation process and at the same time hinder the learning process. An example can be found in project planning and control. If the enabler is adequately applied to the innovation process, it is likely that resources become available, such as time and money. Management has the option to allow teams and individuals to use these resources to engage in learning. However, management can also decide to use the gains for efficiency improvement without stimulating the individuals and teams to learn.

The research was not aimed at developing guidelines for managers in product innovation processes. Nevertheless the results contribute to practice in an indirect way. The research goal was to identify enablers that can help improve learning behaviour. In effect this means that the research tested relationships between variables that in theory and practice were assumed to exist and on which managers in companies act on a daily basis. Practitioners can obtain leads from the results: enablers that have an impact on subprocesses of the learning process, enablers that only address a limited number of levels of learning, building configurations of enablers to stimulate learning behaviour and learning processes that are aligned with the goals and strategy of the organisation.

Managers are challenged to reflect on the way they have implemented and employed enablers. In addition, they can reflect whether they themselves have sufficient knowledge and capabilities to apply enablers.

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