INCREMENTAL LEARNING IN PROFESSIONAL SERVICE FIRMS: THE IMPORTANCE OF PROJECT AND CLIENT CHARACTERISTICS

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ABSTRACT

The topic addressed is the system of incremental learning in professional service firms (PSFs). The ability to learn and acquire new knowledge is generally viewed as a key capability in PSFs. Hence we ask: What characterizes a system of incremental learning that enables the PSF to enhance its intangible resource base? Enablers of incremental learning were examined in a sample of 196 respondents from 16 PSFs in 4 different industries. The respondents were asked about key characteristics of client projects resulting in high versus low levels of perceived incremental learning. Project characteristics that enable incremental learning in PSFs are: (i) high degree of innovativeness in the project tasks, and (ii) high time pressure. Client characteristics facilitating individual incremental learning are: (i) high degree of client interaction, and (ii) knowledgeable clients. Being exposed to innovative tasks and high client interaction are the most important factors that enable incremental learning in PSF.

INTRODUCTION

The topic addressed in this paper is the systems of learning (Helfat & Raubitschek, 2000) in professional service firms (PSFs). The ability to learn and acquire new knowledge is generally viewed as a key capability in PSFs (e.g. Fosstenløkken, Løwendahl, & Revang, 2003; Løwendahl, Revang, & Fosstenløkken, 2001; Morris, 2001). Morris (2001) particularly points out that individuals and groups in PSFs learn in the process of attending to client problems. Løwendahl et al. (2001) and Fosstenløkken et al. (2003) also recognize incremental learning through learning processes in everyday work within projects as essential for PSFs' value creation. Thus, the dynamic characteristics of intangible resources imply that choices related to clients and projects are essential elements of the systems of learning in PSFs.

Two types of systems of learning are identified in organizations: incremental learning and step function learning (Helfat & Raubitschek, 2000). Regarding incremental learning, individuals can learn by doing and/or by using. As stated by Itami (1987:161): "*The "learning by doing" effect enables the firm to accumulate the necessary invisible assets to carry out future strategy in the course of its everyday operations*". This means that the process of accumulating resources for the future can be a dynamic capability if the firm gains competitive advantage from this accumulation process. Step function learning involves fundamental changes to core or integrative knowledge. Step function learning requires ongoing feedback mechanisms that point to the need of new knowledge, e.g. benchmarking of competitors and knowledge of shifts in customer needs. Our focus is on the system of incremental learning in PSFs. Researchers that take a process oriented perspective on resources (e.g. Dierickx & Cool, 1989; Teece, Pisano, & Shuen, 1997), in particular point out that the idiosyncrasy of proprietary resources is likely to be achieved through accumulation and deployment. Knowledge based competitive advantages are often linked to such accumulation and deployment processes (Leonard-Barton, 1992; Prahalad & Hamel, 1990). Learning is an important activity in the development of resources. Learning may reflect dynamic capabilities of the organization particularly if its approach to learning is a systematic and persistent feature of the organization (Helfat & Raubitschek, 2000; Teece et al., 1997; Zollo & Winter, 2002). Dynamic capabilities are shaped by the co-evolution of learning mechanisms such as experience accumulation, knowledge articulation and knowledge

codification (Zollo & Winter, 2002). Our aim is to investigate knowledge creation routines and dynamic capabilities in capturing new and relevant knowledge in everyday work (Eisenhardt & Martin, 2000; Ethiraj, Kale, Krishnan, & Singh, 2005; Teece et al., 1997; Zollo & Winter, 2002). We argue that these are most likely to be found in work related to capturing new and relevant knowledge in everyday work (Eisenhardt & Martin, 2000; Ethiraj et al., 2005; Teece et al., 1997; Zollo & Winter, 2002). Thus, we focus on capability-building mechanisms (Makadok, 2001) related to incremental learning in PSFs. Hence we ask: What characterizes a system of incremental learning that enables the PSF to enhance its intangible resource base?

The paper starts by presenting the dynamic capability perspective with a focus on systems of learning and incremental learning. Hypotheses are developed based on theory and the results from an exploratory study investigating factors that enhance and constrain learning in the daily operations of PSFs. The next chapter presents the research methods applied in the empirical investigations. At the end of the paper we present the results from the data analysis, discuss the findings, and identify some areas for future inquiry.

THEORY AND HYPOTHESES

The relationship between resources and strategy is characterized by three processes; sufficient resource backing, effective utilization of current resources, and efficient accumulation of resources for the future (Itami, 1987). Our focus is on the latter process, namely how the firm can accumulate resources for the future. Effective strategy in the present builds intangible assets, and the expanded asset stock gives the firm more options in planning its future strategies. When firms use their resources well, they create new intangible assets. Learning may reflect dynamic capabilities of the organization particularly if its approach to learning is a systematic and persistent feature of the organization (Helfat & Raubitschek, 2000; Teece et al., 1997; Zollo & Winter, 2002). Dynamic capabilities are shaped by the co-evolution of learning mechanisms such as experience accumulation, knowledge articulation, and knowledge codification (Zollo & Winter, 2002).

An organization's ability to learn can be defined as a capability (e.g. Helfat & Raubitschek, 2000; Zollo & Winter, 2002). "*An organizational capability is a high-level routine (or collection of routines) that, together with its implementing input flows, confers upon an organization's management a set of decision options for producing significant outputs of a particular type*" (Winter, 2003:991). The ability to learn and acquire new knowledge in PSFs provides options for expanding the range of services the firm can offer to its current clients as well as targeting new clients (strategic renewal). The purpose of a capability is to enhance the productive value of other resources that are in the firm's possession (Makadok, 2001). The system of learning as a capability contributes to improvement of the intangible resource base of the organization (individual and organizational knowledge). The improvement of the resource base increases the firm's latitude of action regarding development of new services and abilities to target new clients, which again can have a positive influence on the firm's economic profit. As Makadok (2001:397) states: *"…, anything that enhances a firm's ability to acquire additional resources also enhances the value of its capability-building efforts*". This is in line with Itami (1987), who argues that intangible assets may appreciate with use, if used the right way, rather than depreciate.

Learning in organizations always starts by individuals (Crossan, Lane, & White, 1999; Huber, 1991). However, the ability to exploit the individual learning is related to both individual factors and to group and organizational factors. The processes of intuiting and interpreting take place on the individual level, while the processes of integrating and institutionalizing take place on the group and organizational level (Crossan et al., 1999). While it can be argued that the 4I's of organizational learning are central elements of the incremental system of learning in PSFs, we focus at the individual level as as a starting point of developing an understanding of these systems.

Projects and clients are essential in the value creation of PSFs (Løwendahl et al., 2001), and thus important arenas for individual learning and knowledge acquisition (Carlsen, Klev, & von Krogh, 2004; Fosstenløkken et al., 2003). Our aim is to identify the characteristics of projects and clients that have positive effects on intuiting and interpreting (individual learning).

The Exploratory Study and Hypotheses

In addition to relevant theory, the hypotheses are developed based on the results from an exploratory study undertaken by one of the co-authors. The exploratory study investigated how people in PSFs can establish the foundation for incremental learning at a micro level in order to improve the existing resource base (Fosstenløkken, 2006 forthcoming). Building on the assumptions that PSFs need to develop their intangible resources for value creation purposes, and that these processes take place in the micro activities of various actors, the study investigated the following research question: Which factors facilitate and constrain incremental learning in PSFs' projects?

The exploratory study had a qualitative design, where primary data of informants' perceptions of incremental learning facilitators and constraints at an individual level of analysis was collected through interviews. Based on a maximizing differences approach (Yin, 1989) with regard to firm size, number of employees, degree of established industry, and connection to professional organizations, two engineering design firms and two communication consulting firms were chosen as empirical settings. Open-ended interviews (Kvale, 1996; Patton, 1990) were conducted with 51 informants, selected based on variation in terms of education, experience, tenure, age, gender, and position in the organization. Written materials and observations of real work practice contributed to a triangulation of empirical materials. Despite selecting industries, firms, and informants with a view to generating contrasting results, the findings were remarkably similar among individuals within and across all four PSFs with regard to the importance of project and client selection for incremental learning. These findings can be divided into (1) project characteristics, and (2) characteristics of client and group composition. Results on the first showed that (i) innovative tasks and (ii) slack with regard to time pressure facilitated incremental learning. In terms of the latter characteristics, (i) direct face-to-face interaction with clients, and high levels of (ii) relevant client knowledge facilitated incremental learning. Below, a more detailed presentation of these characteristics follows, resulting in the generation of hypotheses.

Project Characteristics

The characteristics of the problem to be solved in the project are likely to influence the degree of incremental learning. Based on the exploratory study, professionals wanted interesting

work tasks in exciting commissions as this enhances learning. Such projects involve creativity and innovative tasks as opposed to routine and replications of prior assignments. Thus, we characterize a problem according to whether it relates to innovative tasks in contrast to tasks involving replication and routine. Previous research emphasizes that novel and unstructured tasks/problems (e.g. Piaget, 1969) increase the problem solvers' learning. This indicates that incremental learning is likely to increase when professionals are frequently exposed to innovative tasks. The following hypothesis is proposed:

Hypothesis 1a: There is a positive relationship between relevant innovative tasks in the project and the degree of incremental learning.

Another important factor influencing individual incremental learning is the time and cost pressure associated with the lack of organizational slack. Slack is necessary for organizations to have room to adapt and change (Cyert & March, 1992; Lawson, 2001b; Senge, 1994). Incremental learning is difficult when employees are hurried or rushed; it tends to be driven out by the pressure of the moment. To become learning communities, project groups need to be given room to develop and collaborate (Stewart, 1996). Many PSF projects are characterized by time pressure towards deadlines and also face heavy cost pressure. Previous research emphasizes the need for organizational slack in order to innovate and create new knowledge (e.g. Lawson, 2001b; March, 1991b; Nonaka & Takeuchi, 1995b; Senge, 1994). Hence, the following hypothesis is proposed:

Hypothesis 1b: High project pressure decreases the degree of incremental learning in projects.

Characteristics of Client and Project Group Composition

Individuals and firms in the professional service industries act as knowledge brokers by achieving new knowledge when working for clients in multiple industries and identifying opportunities to use that knowledge by incorporating it into new services. As pointed out by Hargadon (1998:214): "*Knowledge brokers are those individuals or organizations that profit by transferring ideas from where they are known to where they represent innovative new possibilities*". These firms innovate by combining existing technologies in new ways that

result in dramatic synergy, and seek strategic advantage by gaining access to a wide variety of industries. These characteristics align with several PSF industries like management consulting, law firms, and IT-consulting. This provides opportunities in learning the diverse knowledge that resides within these industries, linking this past knowledge to solutions for current problems, and implementing these new solutions in the forms of new services and processes. The learning activities of knowledge brokers provide them with an inventory of potentially valuable ideas that help define and solve the problems their clients face. Client interaction provides PSFs with valuable ideas that they can use immediately or in later projects. They also learn about existing problems of an industry which are relevant competencies in selling and accomplishing new projects.

In addition, previous research on group processes and social networks (e.g. Håkansson, Havila, & Pedersen, 1999) argues that the nature of the relationship between individuals influences the degree of learning they gain in a group/network. Others have also emphasized that in order to learn complex forms of knowledge, face-to-face interaction is needed between partners and associates (Hitt, Bierman, Shimizu, & Kochhar, 2001; Lane & Lubatkin, 1998). Knowledge is created through the interaction among individuals or between individuals and their environments, rather than by an individual operating alone. In the exploratory study, informants point to interaction with the client as a major source of individual incremental learning. One of the informants referred to client interaction as a "symbiosis", a relationship between different "species" in which the parties involved benefit from the "cohabitation". In a PSF context, this means that individual incremental learning emerges through collaboration between client and supplier, which becomes learning that goes both ways. Interaction in client relations shows that external sources of knowledge are critical to the incremental learning process of project members (Fosstenløkken et al., 2003). The ability to exploit external knowledge then becomes critical and represents an important source for the generation of new knowledge. Thus, the following hypothesis is suggested:

Hypothesis 2a: There is a positive relationship between degree of client interaction and the degree of incremental learning in projects.

To the extent that research exists on the relationship between service providers and clients, the issue is predominantly investigated in a one way direction, from the service provider in terms of value added to the client (Dawson, 2000). The exploratory study showed that this interaction also "feeds" knowledge back to the service provider, particularly when working with highly knowledgeable clients (Fosstenløkken, 2006 forthcoming). In spite of the importance of the client, PSF research on the role of the client in service delivery in general has received only very scant attention. One exception is Mills and Morris' (1986) conceptual discussion of clients as "partial" members of service organizations in terms of client participation. Another is Bowen's (1986) discussion of the managing of customers as human resources in service organizations. These authors focus on the role of the clients as co-creators in terms of reducing *"costs associated with defining and enacting role behaviors that are required for production of the service"* (Mills & Morris, 1986:726), not on competence development processes as such. A third is Løwendahl and Revang (2000), who emphasize the need to match customers with adequate service provider competences through dynamic, flexible, and fluid organizational forms. The exploratory study, thus, extends the interpretations made in these three studies by showing empirically that clients are also crucial co-contributors in terms of enhancing incremental learning among professionals. This leads to the following hypothesis:

Hypothesis 2b: Client knowledge and expertise relevant to the project problem increases the degree of incremental learning.

METHODS

Our empirical study examines characteristics of incremental system of learning in 20 PSFs in 4 different industries. The industries include (i) communication consulting, (ii) advertising, (ii) law, and (iv) engineering design/project management. A survey was sent to an initial sample of 196 respondents. 169 useable responses were received, which led to a response rate of 86%. We asked about key characteristics of projects which resulted in high versus low levels of incremental learning among the employees of the PSFs. The following characteristics of projects were analyzed: (i) degree of innovative tasks, and (ii) degree of

slack with regard to time pressure. The following client characteristics were analyzed: (i) degree of client interaction, and (ii) degree of relevant client knowledge.

Research Design and Sample

The objective of this study is to explore the system of incremental learning in PSFs. The research design utilized in the study is a descriptive cross sectional survey, which expands and tests conclusions from a qualitative case study conducted by one of the co-authors.

Research on PSFs is dominated by studies concerned with single industries or single firms (Elfring & Baven, 1994). In an attempt to shed light on the system of incremental learning from multiple PSF contexts the types of industries were chosen based on variation in key professional service characteristics (Løwendahl, 1992), such as level of customization and knowledge intensity (Hansen, 1999; Hansen, Nohria, & Tierney, 1999), degree of client interaction, and degree of professional membership (Fosstenløkken et al., 2003). Four firms from each of the chosen industries were selected based on a notion that firm size influences knowledge development (e.g. Starbuck, 1992). Hence, two relatively small and two relatively large firms were chosen within each industry. Building on Tsoukas (1996), we assume that no single agent can fully explain the complex picture of what goes on in organizations. Therefore, to understand the incremental system of learning in PSFs, it seems too limited to aggregate investigations of managers as representatives of the firm as a whole. Hence, in each firm, 10-12 individuals with various position, age, tenure, and background (experience and education) were included.

Data Collection

In order to ensure the relevance of the instrument for each PSF, and to get access to project members (respondents) in each company, a reference group consisting of one person from each industry was established. The reference group pointed out key firms in each of the industries and potential contact person in each firm. The contact person in turn identified relevant respondents. The reference group, together with some other external participants, was used as a test panel on the survey instrument.

By utilizing the characteristics identified to enable incremental learning in the qualitative study, it was possible to generate items that were used in the cross sectional survey. There is limited research on these characteristics, and the study being presented here is in this sense of an exploratory nature. Thus, the items presented below are preliminary suggestions for measuring the constructs. These measures need to be further developed in future research.

Project characteristics included (i) innovative task characteristics, which was measured as the degree to which employees perceived their own tasks to be routine or innovative, degree of customization and level of project difficulty and need for specialist competence in the project, and (ii) project pressure, which was measured as degree of time pressure as well as level of risk for the PSF in the particular project.

Client characteristics included were (iii) relevant client knowledge, which was measured as the PSF employees rating of the level of knowledge of the client in a project relative to what was delivered in the project and experience with other PSFs, and (iv) client interaction, measured through the use of three items using low-high scales: level of client interaction, level of client involvement and opportunity for direct communication between the service supplier employee and the client representative in the project.

Data Screening and Development of Measurement Model

The more advanced analysis of the data was conducted through the use of SPSS 11.5 and LISREL 8.54.[1] The analyses of the data were done in four different steps, using a confirmatory modeling strategy, also referred to as strong test, rather than a weaker test and a strategy of falsification. First, data screening was done, including elimination of missing items and control for univariate normality. Second, exploratory and confirmatory factor analyses were conducted to establish the degree to which the observed variables in fact represent the proposed latent variables. The output of this second step was the establishment of a factor model in LISREL. Third, the mean and variance of the latent variables were compared across the learning intensive and less intensive projects to determine the degree to

[1] Both LISREL and SIMPLIS command language were used.

which significant differences exist across the different project groups. Finally, a logistic regression analysis was conducted to determine the relative importance of the constructs proposed above as essential for individual incremental learning. In this analysis the latent variable scores were used as independent variables and the binominal learning intensity measure as a representation of the dependent variable. Each of these steps will be described in detail below.

Data Screening

In the process of screening the data it seems particularly important to account for the following characteristics: (i) sample, (ii) variable type (e.g. continuous or ordinal), (iii) missing values, and (iv) normal distribution. In terms of the variable type, the 7-point scale used to measure the presented variables is assumed to represent an underlying continuous scale (Byrne, 1998). While taking into consideration the ordinality of the scale would be preferable, the large sample size needed for conducting ordinal analysis was unfeasible for the research being presented here. Missing values were eliminated in the dataset through the use of 'listwise' elimination of cases. As a result, the sample n, including both learning intensive and less intensive projects, was equal to 308. Concerning tests of multivariate normality, descriptive analyses show that the skewness and kurtosis are limited and well within the 'rule of tumb' of |2|. Also, Olsson, Foss, Troye, & Howell (2000) have shown that the maximum likelihood estimator that will be used here is insensitive even to skewness and kurtosis as high as 5-6. There does not seem to be a need for exclusion of variables based on non-normality.

Factor Analysis

As an initial part of the factor analysis, an exploratory approach was taken to develop an understanding of the degree to which the items in the study represent the constructs as assumed. The factor analysis was conducted in SPSS using principal component analysis, general least squares and maximum likelihood as estimation methods[2]. A varimax rotation was used to discriminate between factors, based on the assumption that the factors are

[2] A problem related to the exploratory factor analysis may be Heywood cases. This was, however, not a problem when running the analysis with a varimax rotation in SPSS. As the confirmatory factor analysis did not show these problems, the variables for which this was a problem were not excluded.

relatively uncorrelated. All these analyses showed highly similar results and the maximum likelihood analysis is reported. For this analysis, factor loadings below 0.30 were suppressed.

While some of the variables show relatively high loadings for more than one construct, all items load most heavily on the factors for which they were assumed to be indicators. An option would be to eliminate the variables related to level of difficulty and need for specialist knowledge. However, as this study is of an exploratory nature, the variables will be retained for the model specification. Even so, the multiple loadings by these variables should be taken into consideration when developing the confirmatory factor analysis and assessing the fit of the model (see Appendix 1). In addition to the exploratory factor analysis, a confirmatory analysis was conducted.

Identification

Before running the analysis and in order to understand if there exists a unique set of parameters consistent with the data, the feasibility of reaching a solution for the model was tested. Model identification is possible when the model contains more data points than parameters. Following the counting rule (Byrne, 1989; Kaplan, 2000), the model presented here is over-identified; containing 30 estimable parameters and 78 data points, and is therefore possible to estimate.

Model fit. The model was specified in LISREL through the use of LISREL syntax. The Root Mean Square Error of Approximation (RMSEA)[3] of the model was .058 and the chi-square over degree of freedom was 2.00. Thus, the model seems to fit the data relatively well. The analysis showed that an RMSEA for the model between .039 and .076 represents a 90% confidence interval for the solution. Even so, the p-value for the solution was .001, which indicates non-significant support for the similarity of the actual and predicted model. Thus, even though the model seems to fit the data, the p-test statistics suggest that the model should be rejected.

[3] Measure indicating the degree to which the model fit the data. The lower the RMSEA, the better the fit of the model. Value of RMSEA below 0,08 indicates good to fair fit (Kaplan, 2000).

Taking into consideration the indications from the factor analysis, it seemed interesting to look at whether removing some of the variables related to the innovative task latent variable could help increase the p-value (and the fit). To test if this were to be the case, each of the variables related to the innovative task latent variable was removed one at a time. The fit worsened considerably when only need for specialist competence was taken out. The fit and p-value, however, improved when only level of difficulty was removed (RMSEA = .045 and P-value equal to .02). Still, it is difficult to conclude that the model is good as the p-value was low. However, when taking out both specialist competence and level of difficulty the fit of the model was improved considerably, RMSEA=.027 and chi-square adjusted for degrees of freedom=.21. The p-value of this model was .22 and well above the level of significance at .05. The increased fit and the indication from the factor analysis encouraged elimination of the two items, leaving two measures as suitable indicators of the latent variable. The improved model can be found in figure 1.

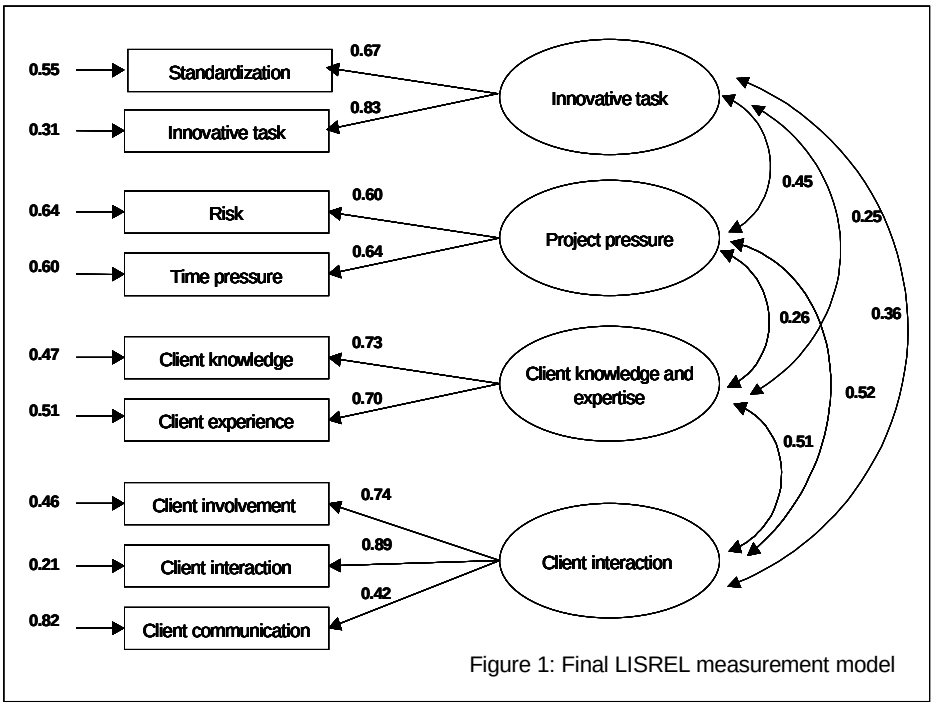

Figure 1: Final LISREL measurement model

The Goodness of Fit Index (GFI)-measure of this model is .98 and the Normed Fit Index（NFI) and Adjusted Goodness of Fit Index (AGFI) are above the recommended .90 level. These measures suggest that the model have high fit with the data. A problem with this

model is that it has three constructs that are measured based on only two items. Developing more items for each of these constructs should be a priority in future research. However, to the degree that the validity and reliability is high for the constructs based on this limited set of construct indicators, this is not likely to be a problem.

Construct reliability and validity. All the factor loadings were found to be significant in the factor analysis and higher than 2.58, which is the minimum t-value at the 0.01 significance level. The items related to the same factors were at the same time highly correlated, while the items were weakly correlated across factors. The Cronbach's alpha of the model was .7344 and well above the .70 limit for assuming appropriate reliability (Hair, 1998).

Relative to construct reliability, composite reliability was used to measure this. This measure showed that all, but one construct had reliability of .70 or higher. Project pressure had construct reliability of only .55, indicating that the measurement of this construct is questionable. In terms of the variance extracted, this construct also showed low values (.38) on this test, indicating that the latent construct to a limited degree accounts for the variance in the indicators. Even so, the exploratory study indicated that the pressure construct is an important indicator of learning intensity. While the measurement of this construct should be further developed in future research, the factor will be retained here in an effort to give some new indications of the effect of project pressure on learning. For all the other constructs the variance extracted was above .50.

Thus, while the model has important weaknesses, the model shows high fit and relatively good results on key tests of model appropriateness. The next step of the analysis will focus on developing a better understanding of the degree to which the factors of the model can are related to perceived level of learning in client projects.

Significance of Project and Client Characteristics for Incremental Learning

In addressing to what degree the different project and client characteristics identified above in fact are related to learning for individuals in PSFs, two alternative statistical approaches were taken. First, mean differences in latent variables were tested across the learning intensive and

less intensive projects. Secondly, logistic regression using factor scores from SPSS and LISREL as independent variables was applied.

Comparison of latent variable scores. The first step of the analysis of the significance of project and client characteristics in incremental learning consisted of generating latent variable scores, both in SPSS (through the use of equal weighing of items) and LISREL. In order to compare scores across the learning intensive and less intensive projects, a one-way ANOVA (Analysis of Variance) using SPSS was conducted to look at significant differences. In this analysis, perceived individual learning, scaled on a binominal scale (0 and 1), was used as the determining factor. The table below shows the results of the analysis using the LISREL latent variable scores. The outcome was however identical when applying the SPSS scores. As the analysis shows, all the project and client characteristics identified as important for learning in the hypotheses, were significantly higher in the learning intensive projects. Thus, the ANOVA analysis indicates that projects that are characterized by more innovative tasks, more knowledgeable and experienced clients, higher time pressure and more client interaction are likely to exhibit higher levels of individual learning.

Table 1: ANOVA of factor scores across learning and less intenive projects

		Sum of Squares	df	Mean Square	F	Sig.
INNOV	Between Groups	167,193	1	167,193	192,788	,000
	Within Groups	265,375	306	,867		
	Total	432,568	307			
PRESS	Between Groups	120,128	1	120,128	70,592	,000
	Within Groups	520,724	306	1,702		
	Total	640,853	307			
KNOWL	Between Groups	47,566	1	47,566	31,030	,000
	Within Groups	469,064	306	1,533		
	Total	516,630	307			
INTER	Between Groups	75,584	1	75,584	73,626	,000
	Within Groups	314,140	306	1,027		
	Total	389,724	307			

Logistic regression of LISREL and SPSS factor scores. The final step of the analysis takes into consideration the degree to which the latent variables identified above relate to learning. In doing this, logistic regression, using the binominal categorization of learning intensive and non-intensive projects as a dependent variable, was used. The logistic regression showed relatively high fit when all the factors are included in the model (Table 2: Model 1), but the

Hosmer and Lemeshow test of this model indicated that there is likely to exist a considerable difference between the actual and predicted value of the dependent variables. The significance measures for each of the separate latent variables at the same time showed that the knowledge measure is non-significant. By excluding the client knowledge variable from the model, the fit was only slightly decreased and the difference between the actual and predicted value of the dependent variable improved considerably (Table 3: MODEL 2 on the next page). The same was true when the pressure variable was excluded (Table 4: MODEL 3 on the next page). The model's explanatory power was however considerably reduced when any of the remaining latent variables (innovative task and client interaction) were excluded (see Appendix 2 for model 1 and 2).

Table 4: MODEL 3: Logistic regression output

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	258,044[a]	,421	,562

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	9,708	8	,286

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	INNOV	1,461	,181	65,241	1	,000	4,312
	INTER	,767	,157	23,983	1	,000	2,153
	Constant	-3,550	,447	63,110	1	,000	,029

a. Variable(s) entered on step 1: INNOV, INTER.

Taking into consideration the explanatory power of the model as well as the degree to which the predicted model reflects the actual model, MODEL 3 seems to offer the best compromise. This indicates that the innovation and interaction constructs explain the most of the differences in perceived individual learning across the different groups of projects. While innovative tasks seem to be the most important variable, also client interaction is important for the perceived individual learning in a project.

RESULTS

Hypothesis 1a. According to the one-way ANOVA, perceived individual learning was positively related to innovative task characteristics. Also the results of the logistic regression indicated that there exist a relatively strong relationship between innovative task characteristics and perceived level of individual learning. The regression in fact showed that the task characteristic variable explained the most of the difference in the level of learning across the different project groups. These results support hypothesis 1a.

Hypothesis 1b. The results presented above in the one-way ANOVA analyses contradict the hypothesis and suggest that project pressure in fact is positively related to perceived individual learning. This is a highly interesting result. As pointed out in the theoretical discussion leading up to hypothesis 1b, previous research have predicted that higher project pressure is likely to decrease the level of individual learning. The result from the study indicates that hypothesis 1b should be reformulated to reflect his result.

Hypothesis 2a. The data showed that the reliability and validity of the construct related to client interaction were high. At the same time, the ANOVA analysis suggested that the interaction is significantly higher in the learning intensive projects. Additionally, the logistic regression indicated that client interaction were among the variables that to an important degree explains the difference between learning intensive and less intensive projects. The results from the data analysis strongly support hypothesis 2a.

Hypothesis 2b. The analyses showed high reliability and validity for the client knowledge and expertise construct. At the same time, the ANOVA analysis indicated that the client knowledge was significantly higher in the learning intensive projects. These results suggest that client knowledge is of importance for perceived individual learning for employees of PSFs. The logistic regression, however indicated that client knowledge are likely to explain a limited amount of the difference in learning across projects, suggesting that interaction and task characteristics are more important. Even so, the overall result from the data analysis supports hypothesis 2b.

DISCUSSION AND FUTURE RESEARCH

The results from the study show that characteristics of projects and clients influence the system of incremental of learning in PSFs. Project characteristics that enable incremental learning in PSFs are: (i) high degree of innovativeness in the project tasks, and (ii) high time pressure. Client characteristics facilitating incremental learning are: (i) high degree of client interaction, and (ii) knowledgeable clients. Being exposed to innovative tasks and high client interaction seem to be the most important factors for the incremental system of learning in PSFs.

In the quantitative study time pressure was perceived to be higher in the learning intensive projects compared to those with more limited learning. This was contrary to the findings in the qualitative study, and therefore also contrary to our expectations. Thus, while scholars studying learning and innovation in the past (e.g. Lawson, 2001a; March, 1991a; Nonaka & Takeuchi, 1995a; Senge, 1994) have suggested that slack is important for learning, the data from our survey show that time pressure in fact is likely to have a positive effect on learning in knowledge intensive firms. Taking into consideration that time pressure is likely to have negative effects on the workforce, we think it is premature to conclude that PSFs should be looking for projects with high time pressure to ensure learning. For instance, it may be that both too much slack and too much time pressure are detrimental to learning, whereas there is a U-shaped curve involved, where an intermediate level of time pressure is optimal. However, studies of creativity support the finding by pointing out that people often come up with their best ideas when time is tight, especially if they are on a mission (Amabile, Hadley, & Kramer, 2003). This means that they can focus on one activity for a significant part of the day and that they believe they are doing important work. If work, on the other hand, is characterized as a treadmill (distraction, highly fragmented work day, not important work, etc.), creativity is likely to be low. In sum the effect of time pressure on learning in PBSFs clearly needs to be further investigated.

Limitations and Suggestions for Future Research

Our results must be viewed in light of the study's limitations. First, informants' perceptions of different concepts may vary. Internal validity was sought enhanced by using a multi-method approach. The exploratory study served as a foundation for the development of the survey

instrument. In addition, previous research on PSF and learning served as a basis for the development of the constructs. The reference group evaluated the survey questions to ensure that they were applicable and understandable to employees of different PSF industries. In addition, beyond the reference group, the questionnaire was tested out on a small pilot sample from a variety of PSF industries.

Second, several scholars (e.g. Greenwood, Hinings, & Brown, 1990, 1994; Starbuck, 1992; Winch & Schneider, 1993) have tried to make generalizations across the population of PSFs by studying a limited number of firms within one industry. There is reason to be cautious about generalizing results from one industry to another. The factors that have positive influence on the development of the resource base may vary between PSF industries. When it comes to enablers of incremental learning, the industry differences were not emphasized in this paper since the overall focus was on general characteristics affecting incremental learning in PSFs. Industry differences, in terms of enablers of incremental learning, were however present in our sample. This shows that with a restricted sample of 218 individuals, representing 20 different firms within 5 types of industries located in one major city in our country, one finds variations in enablers of incremental learning. These differences will be further elaborated in future research. Although the threat to external validity arising from geographical restriction is likely to be quite low, the generalizability of our results may be limited to these industries only. Further research is needed to determine the applicability of these results to other PSF industries, and other types of businesses.

Third, some of the constructs measured in the study need to be improved. The evaluation of the structural model indicated that there were problems related to the estimation of factor loadings for some of the items used in measuring the innovative task characteristics. The result suggests differences in the factor loadings across the different group of projects, indicating that the support of the hypothesis may be questionable. Thus, further research, in particular related to the development of measurement indicators of innovative task characteristics, is needed. Future research should also address the relationships between project pressure and individual learning and how to measure project pressure.

Fourth, the knowledge strategy of a given PSF, in terms of focusing on utilization or development of knowledge, has also been neglected in this paper. As pointed out by Løwendahl (1997), some PSFs choose to develop standardized solutions that are only to a limited degree customized to the particular client, while others operate as unique problem solvers. The level of exploration (the degree to which new knowledge is developed), and exploitation (the degree to which existing knowledge is utilized) (March 1991), should be taken into account when making decisions about the type of projects that should be selected by a particular PSF. Hence, future research should further investigate the relationship between learning resulting from project and client selection, and its contribution to value creation and potential competitive advantage.

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Appendix 1: Factor Analysis

Table 1: Rotated Factor Matrix [a]

	Factor			
	1	2	3	4
Standardization	,607			
Difficulty	,722			,551
Specialist competence	,493			,381
Innovation	,833			
Risk				,547
Time pressure				,540
Client experience			,469	
Client knowledge			,986	
Client involvement		,672		
Client interaction		,825		,321
Client communication		,429		

Extraction Method: Maximum Likelihood.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Appendix 2: Logistic Regression – Model Test

Table 2: MODEL 1: Logistic regression output

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	245,810[a]	,444	,592

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	13,248	8	,104

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	INNOV	1,384	,184	56,458	1	,000	3,989
	INTER	,514	,177	8,418	1	,004	1,671
	PRESS	,404	,133	9,211	1	,002	1,498
	KNOWL	,260	,149	3,024	1	,082	1,296
	Constant	-4,505	,580	60,420	1	,000	,011

a. Variable(s) entered on step 1: INNOV, INTER, PRESS, KNOWL.

Table 3: MODEL 2: Logistic regression output

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	248,856[a]	,438	,585

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	10,014	8	,264

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	INNOV	1,388	,183	57,709	1	,000	4,007
	INTER	,642	,163	15,441	1	,000	1,901
	PRESS	,389	,131	8,754	1	,003	1,476
	Constant	-4,164	,524	63,098	1	,000	,016

a. Variable(s) entered on step 1: INNOV, INTER, PRESS.