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Building capabilities in the construction sector

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SUMMARY

Absorptive capacity (AC) refers to a relatively new perspective on learning and innovation. It is “..... the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends” (Cohen and Levinthal, 1990, p. 128). Absorptive capacity is a core construct in organizational learning literature (Lane et al., 2002), and it results in innovation throughout the firm. The absorptive capacity construct provides an understanding of how learning, based on new information originating beyond the firm, can lead to innovation within it.

This research is positioned in the Resource-based View of the firm, in which firms can be conceptualised in terms of resources, capabilities and knowledge involved. Examining the properties of resources and resource use, the resource-based view argues that only resources and resource use which are difficult to imitate and cannot be bought in markets can be the sources of sustainable competitive advantage. The consequence has been the identification of the knowledge of the firm as its most strategic resource. Though in early studies using the resource-based view the research object was the firm (Penrose, 1959), Spender (1992) concludes that the key to advancement in resource-based theory is resource *learning*: human resources learning about the possibilities of other resources. This position advocates the study of organizations on another level than that of the firm - at the level of the learning behaviour of groups and individuals within firms.

We are interested in the relation between innovation, learning and absorptive capacity. We suggest that innovation concerns problem solving. In order to solve problems, firms have to learn. However, not all organizational learning is directed towards innovation. Innovation involves a special kind of organizational learning concerned with information and knowledge that is new to the whole firm. The sources of new knowledge can be internal or external. Absorptive capacity is part of the innovation process and relates to learning based on external information which is new to the firm. It entails external learning with the aim of innovation. In this study we adopted the interactive process perspective on innovation because in this perspective individual and organizational variables and their interplay are the focus of research. The dynamic capability of absorptive capacity entails interaction between firms and their environment. The interactive process

perspective is particularly helpful in the study of the absorptive capacity of firms as it focuses on their interaction with the network of business relationships.

The indicator of external learning used in the research of Cohen and Levinthal (1990) and most other studies based on this seminal work is R&D expenditure. For this reason we paid special attention to this value as a possible indicator of absorptive capacity in the case of medium-sized firms. However, because R&D expenditure is simply lacking in about 50% of medium-sized enterprises, we needed to establish alternative variables to measure the level of absorptive capacity within these firms. Furthermore, we know that variable R&D does not fully cover innovation activities in medium-sized enterprises. We positioned R&D as a control variable in our study. Organizational learning is the result of the combination of the independent learning of individuals within firms. We explored how individuals learn in order to understand how learning occurs across the firm as a whole.

In case of absorptive capacity, external information is developed into knowledge that can be used in organizational task execution and innovation. Knowledge is neither ubiquitous nor easy to share or develop. New knowledge is firstly developed through the experience and learning of individuals in relation to the primary processes of the firm. Sensory or tacit knowledge is important in *innovation* processes and is hard to transfer or communicate. Prior related knowledge, the diversity of this knowledge, and the intensity of efforts to achieve it are crucial for developing and adopting new knowledge. The prior related knowledge of the firm is stored within the internal knowledge base. The effectiveness of the internal knowledge base in relation to innovation depends on the learning skill level of individuals as well as the quality of internal cooperation. The internal knowledge base is our first main explanatory variable of the absorptive capacity of medium-sized architectural and engineering firms. It contains the firm-specific knowledge of routines in the form of a combination of sensory and coded knowledge. The locus of absorptive capacity is an internal capability to use and develop *external* knowledge.

We showed that external information which is new to the firm is crucial in innovation processes. We argue that the extent of external knowledge that can be gathered is one of the predictors of innovation activity across the entire firm. The amount of accessible external knowledge depends on the extent to which the firm uses its network. In preparing for empirical research on the external knowledge base of medium-sized architectural and engineering firms we have traced the external knowledge flows through established business networks which are important for innovation. The network of business relations of the firm is its external knowledge base. The external knowledge base

is our second main variable of absorptive capacity of medium-sized architectural and engineering firms. Collaboration, determined on the basis of the number of collaborative efforts occurring within the last three years, is positioned as a moderator variable, enhancing the effect of the internal knowledge base. The dependent variables of absorptive capacity are potential (PACAP) and realized absorptive capacity (RACAP). We distinguished PACAP I and II as the number of innovation projects directed towards the renewal of products, process and services (RENEW), and projects concerned with new products, processes and services (NEW), while RACAP is defined as the contribution to turnover of these two kinds of projects. We developed a conceptual model and a number of hypotheses in which the innovation outcomes of medium-sized architectural and engineering firms are related to explanatory variables. When combined, the competence of the Chief Innovation Manager, the knowledge behaviour of others in the company and the quality of internal cooperation provides a measurement of absorptive capacity at an *organizational* level.

In this research project we are interested in relative differences in absorptive capacity and innovation capabilities across innovating firms. In the results chapter we examine the results of the study and focus on the sub-sample of innovating firms (firms that report at least one innovation project in the three year period). It is crucial to the analyses that the Chief Innovation Manager is interviewed personally. A general description of non-innovating firms and innovating firms together provides contextual information on the research sample. The two groups are compared on a number of structural variables before we focus completely on innovating firms in testing our hypotheses. Constructs involved in first-order analysis were analysed and optimized using Cronbach's alpha coefficient before being entered into a correlation table (Pearson's Correlations) together with the other variables of the model. All model variables are related to hypotheses. All of our hypotheses indicate a positive relationship with the number of projects on renewal (RENEW) and the number of projects on things new to the firm (NEW).

Due to a lack of response on our question on RACAP we can not present results on this variable. The results indicate furthermore that the process of renewal (RENEW) and the process of developing products, processes and services new to the firm (NEW) are not similar in the sense of involving similar knowledge development behaviour of participants, as we had supposed. We found hardly any significant results related to RENEW, while our explanatory variables of absorptive capacity are significantly related to results on NEW. We expected that because of information flows from feedback loops, for example, to and from the market, we would be able to relate renewal processes to the wider context of the firm as a source of learning. In the case of innovation projects

creating products, processes and services new to the firm we can trace search behaviour and the use of information from the network. This is the essence of absorptive capacity. In the case of incremental innovation projects (RENEW) concerned with the renewal we did not find evidence of an important role for external information.

The picture for radical innovation (NEW) is a completely different one. It turns out that younger less experienced firms are significantly more involved in innovation projects concerning products, processes and services new to the firm. Apart from this difference, there are a number of other differences between innovating and non-innovating firms. Innovating firms have a higher average number of offices, are significantly larger in terms of number of employees, have a strategy orientation in which innovation is emphasized, and spend significantly more on R&D. Theoretically, we expected that innovating firms would have higher turnover and profit in comparison to non-innovating firms, however, we did not find significant differences in turnover and profit between the innovating and non-innovating firms of the research sample. In relation to the external knowledge base and collaboration, our results indicate that for products, processes and services new to the firm the use of external sources of information and knowledge are indicators of the level of absorptive capacity, producing significant results.

We can now conclude that the R&D expenditure variable is an insufficient indicator variable of absorptive capacity in relation to medium-sized architectural and engineering firms, despite the fact that R&D expenditure is high relative to the rest of the service sector and the construction sector. Contrary to this we showed that our explanatory variables of external knowledge base and internal knowledge base and the moderator variable collaboration are related to the explanation of variance in the number of innovation projects creating products, processes and services new to the firm. In combination with the capability level of the firm, these variables together explain 27% of variance in the number of innovation projects devoted to radical innovation. This demonstrates that the use of external information which is new to the firm is indispensable in the explanation of radical innovation processes in medium-sized architectural and engineering firms.

We found two explanatory variables and a moderating variable of absorptive capacity that are significantly related to more radical innovation activity in medium-sized architectural and engineering firms. These variables concern the knowledge development and search behaviour of key individuals within firms and can be measured without relying on the classic indicator variable of absorptive capacity: R&D- expenditure.

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