ATTEMPTS AT GIVING AND RECEIVING HUGS IN THE ARMS-LENGTH CONSTRUCTION INDUSTRY

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ABSTRACT
The paper focuses on new ways of organising product development projects in the construction industry. We discuss two such projects, one in Denmark and one in Finland where different forms of 'network organisation' have been tried out. The paper looks at how the existing structure in the construction industry affects the product development projects 'organised-as-networks'.

INTRODUCTION AND PURPOSE OF THE PAPER
Using relationships and networks as a form of organisation has been claimed to improve efficiency and the rate of innovation at the firm-level, as well as the industry-level. The purpose of this paper is to discuss how attempts at creating 'interorganisational networks' for product development in the construction industry is affected by the existing structure of the construction industry. By taking two product development projects 'organised-as-networks' as the point of departure, we illustrate and discuss difficulties with introducing networks/ relationships as an organisation mode in the construction industry. On the basis of this, we suggest a number of factors which may be taken into consideration if firms within the construction industry try to manage product development projects by forming 'interorganisational networks'. Furthermore, we propose some policy implications for national councils, which may consider setting up programmes for changing the organisation form used in the construction industry.

THEORETICAL BASIS

As pointed out by Lundvall (1988), neo-classical economics has focused on allocation, efficiency and exchange of already existing commodities with known characteristics. The type of information, which is expected (or allowed for in the models) to be exchanged between firms in a 'market', is information on prices and quantities of already existing factors of production and products (Loasby 1976). Relying on the 'market mechanism' for providing equilibrium, the existence of relationships between firms is regarded as detrimental to achieving allocation efficiency. Issues related to innovation have in general been neglected within this stream of research.

However, innovation is regarded as important for the competitiveness and survival of firms as well as industries. Two distinctive features of innovation is its inherent uncertainty and learning (Dosi 1988). Acknowledging the uncertainty inherent to innovation, Transaction Cost Economics proposes that vertical integration is a (the) solution to handling issues of uncertainty and information exchange between firms beyond that of prices and quantities of given factors and products (Williamson 1975). The implication of this is that innovation is expected to be (best) carried out within hierarchies, and thereby primarily comprise process innovations (Lundvall 1988). As Lundvall (1988, p. 351) points out *"in the Williamson framework, as in the neoclassical world, we would expect product innovations to be exceptional. They should become internalized and transformed into process innovations through vertical integration"*. However, such suggestions concur poorly with the empirical observations of industrial activity, where co-operative product innovation among firms has been observed to be a relatively frequent occurrence, see e.g. Dodgson (1993).

One explanation for the merit of co-operative product development among firms is the type of information which may be exchanged within continuous business relationships, as well as the trust and/or mutual orientation between firms which enable them to co-operate in the presence of uncertainty regarding the outcome of innovative efforts. As suggested by Lundvall (1993, p. 56-57), the problem with vertically integrated firms is that *"the learning interface tends to become too narrow with vertical integration. Vertical integration will tend to exclude integrated units from interaction with the broader set of potential users and producers"*. In a similar vein, Loasby (1998, p. 156) argues that *"the development of a specialised skill depends on a variety of experience, but a variety which can be encompassed within a network of connections [..] (therefore) many firms encourage their suppliers to serve other customers in the belief that they will thereby learn how to become better suppliers than they could ever be by restricting their experiences to a single customer"*. Hence, the need for firms to be exposed to a variety of contexts from which they may gain ideas for developing new offerings is proposed to be crucial.

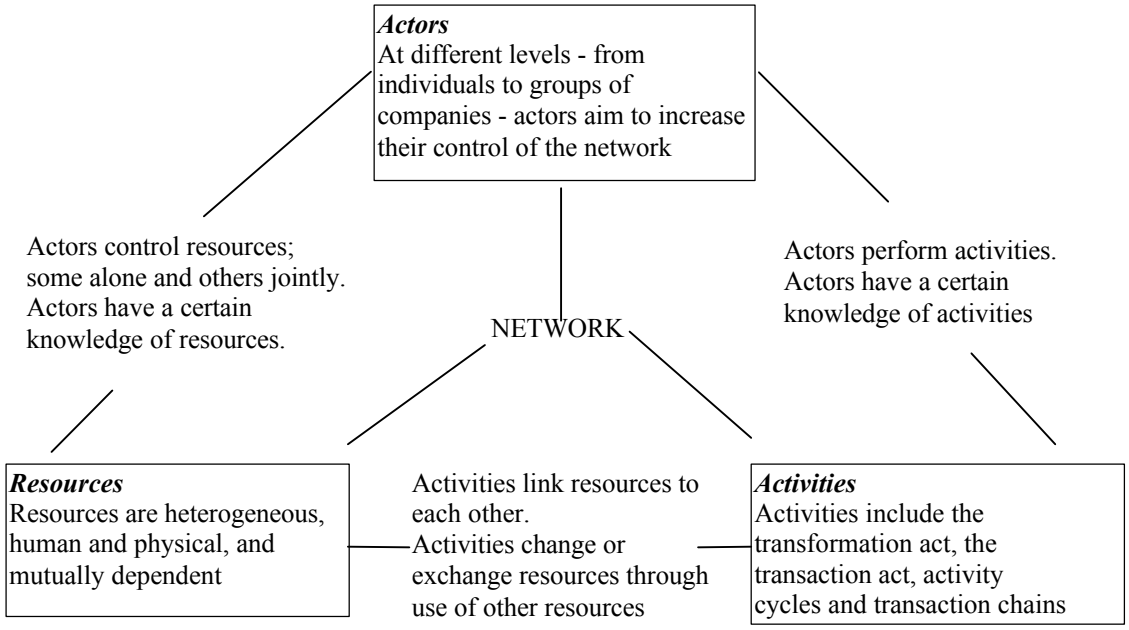
Although variety is assumed to be crucial to foster innovativeness, stability or continuity is assumed to be of equal importance. For example, Teece, Pisano and Shuen (1997, p. 275) argue that *"opportunities for learning will be 'close in' to previous activities [..] because learning is often a process of trial, feedback, and evaluation. [..] If many aspects of a firm's learning environment change simultaneously, the ability to ascertain cause-effect relationships is confounded because cognitive structures will not be formed and rates of learning diminish as a result"*. This statement accords within the suggestions by Loasby (1998, p.154) that such knowledge cannot be developed through anonymous contracting but requires continuous relationships. In brief, the innovativity of a firm is assumed to be a function of the extent to which it succeeds in actively engaging in a number of various

relationships over time – keeping the firm alert to possible problems as well as possible solutions beyond its boundary.

This line of reasoning is exactly what underlies the suggestion by Håkansson (1993) that interorganisational *networks* offer a mix of variety and stability which foster learning and innovativeness. The use of the term 'network' has grown during the last decades, and the large number of different meanings implied by the term threatens to evade it. When using the term 'network', Håkansson (1993) refers to a particular "*form of organisation"* (Håkansson, 1997, p. 232), which has been the object of analysis in a large number of studies carried out by the IMP Group and other researchers active within the Industrial Network Approach. The existence of industrial networks has been corroborated by a large number of empirical studies of industrial structures carried out by researchers within the Industrial Network Approach as well as researchers working from other theoretical points of departure, see e.g. Håkansson and Snehota (1995, p. 6-10) for a summary of the empirical observations.

The main theoretical basis of the paper is the Industrial Network approach as represented by e.g. Axelsson and Easton (1992), Ford et al. (1998) and Håkansson and Snehota (1995). The basic assumptions of the Industrial Network Approach are that a single firm is regarded as being embedded in a network of other firms (and relationships) to which the focal firm has substantial, continuous business relationships which, furthermore, are connected to each other. Hence, actions of a single firm must be viewed in lieu of the other firms in the network and the relationships between the firms in the network. Over time, a number of different models within the Industrial Network Approach have been proposed (see e.g. Holmen, Pedersen and Torvatn 1999 for a review). The models bear relatively close resemblance to each other and each of them can be regarded as representing the 'state of the art' model of industrial networks at different points in time. One way of depicting the network model is illustrated in figure 1:

FIGURE 1
The network model (Håkansson 1987, p.17)



In this model, the total industrial network structure is conceptualised as three interdependent layers: a network of actors, a network of activities and a network of resources. The actors can be on different levels of aggregation, and are characterised by their ability to perform activities and by their control over resources and activities. Activities are structured into activity chains in which there are cycles of connected transformation activities and transaction activities. Transformation and transaction resources are structured in relation to these activity chains. In the same way as the transformation and transaction activities are interdependent, the transformation and transaction resources are interdependent.

The most recent model within the Industrial Network Approach is the one proposed by Håkansson and Snehota (1995). This model is depicted in figure 2.

FIGURE 2
Scheme of analysis of development effects of business relationships (Håkansson and Snehota 1995, p. 45)

Function of a relationship

Substance layers		**Company**	**Relationship**	**Network**
	Activities	Activity structure	Activity links	Activity pattern
	Actors	Organisa-tional structure	Actor bonds	Web of actors
	Resources	Resource collection	Resource ties	Resource constella-tion

In Håkansson and Snehota (1995) the focal unit of analysis is business relationships. Consequently, the discussion and the main theoretical developments focus on the relationships level and thus on the three different substance layers of relationships, i.e. activity links, actor bonds and resource ties. These are, respectively, characterised in the following way: *"**Activity links** regard technical, administrative, commercial, and other activities of a company that can be connected in different ways to those of another company as a relationship develops. **Actor bonds** connect actors and influence how the two actors perceive each other and form their identities in relation to each other. Bonds become established in interaction and reflect the interaction process. **Resource ties** connect various resource elements (technological, material, knowledge resources and other intangibles) of two companies. Resource ties result from how the relationship has developed and represents in itself a resource for a company"* (Håkansson and Snehota 1995, p. 26-27).

Within the Industrial Network Approach, technical development is assumed to be an integral part of business relationships. Ford et al. (1998, p. 244) argue that *"Relationships have become a popular way for companies to enhance their technological development and there are now many articles about the importance of co-operative relationships, strategic alliances and joint ventures. But all relationships have a technological content and companies have always worked with their suppliers, with customers and with other on issues of technology. What has changed is that the increased awareness of technological co-operation"*. Thus, innovation and product development is considered not to be the result of the efforts of a single firm or innovator but, on the contrary, the result of an interplay between a number of different firms, see e.g. Ford and Saren (1996), Håkansson and Laage-Hellman (1984), Håkansson (1987), and Waluszewski (1990). The importance of external parties in product development has been observed and discussed from other theoretical perspective, by e.g. Biemans (1992) and von Hippel (1988). Studies of e.g. the automotive industry (Lamming 1993) and biotech industry (Powell, Koput and Smith-Doerr 1996) have also shown the importance of business relationships comprising some sort of joint efforts at innovation.

Håkansson and Snehota (1995) argue that the activity layer comprises links which are related to productivity, the resource layer comprises ties which are related to innovativity and the actor layer comprises bonds which are related to trust and identity. Hence, we would expect successful attempts at creating co-operative product development projects 'organised-as-networks' primarily to be reflected in creation of actor bonds (mutual orientation and formation of trust among individuals and firms) and resource ties (learning from counterparts' experience, joint learning, and adaptation of resources), which is also argued by Håkansson and Snehota (1995, p.144).

THE CONSTRUCTION INDUSTRY

Contrary to the manufacturing industries mentioned above, the construction industry is characterised by a tender system which leads to a focus on standardisation of products and sub-contracting work, the ability to compare prices and choose the lowest price per product and sub-contract, competition between 'identical' and independent suppliers, and the use of different suppliers in each construction project. Furthermore, most work within the construction industry is organised as projects. The tender system as well as the 'project-organisation' of most work within the industry leads to a structure of firms with 'market-like' relationships - even if the firms encounter the same set of counterparts in various construction projects over time. It has been suggested that this structure with its lack of continuous, dense relationships between firms is the main reason for the lack of increase in efficiency and innovation in the construction industry (Cox and Furlong 1997). The lack of innovativeness within the construction industry comes as no surprise if one considers the previously mentioned reasoning by Lundvall (1993) that industrial structures characterised by arms-length relationships among firms are expected to impede development and introduction of new products. This accords with the observation by Dubois and Gadde (2000, p. 17) that *"strong reliance on standardised products and standardised interfaces between firms clearly does not foster technical development. [..] Therefore, it is not surprising that the only traces of product development found in this study were related to the input side of the material producers"*.

Experience from models of co-operative relationships which have been developed on the basis of studies within manufacturing industries where production takes place within controlled factory environments and where the supply of goods is merely a repeat process off a production line has been argued to be of limited use in the construction industry (Cox and Thompson 1997, p. 128). They continue with arguing that *"these models have very little application to an industry such as construction where repetition is rare and works are procured typically on a one-off project-by-project basis"* (Cox and Thompson 1997, p. 128). Hence, when inspiration for changing the organisation form in the construction industry is acquired from manufacturing industries, two issues arise.

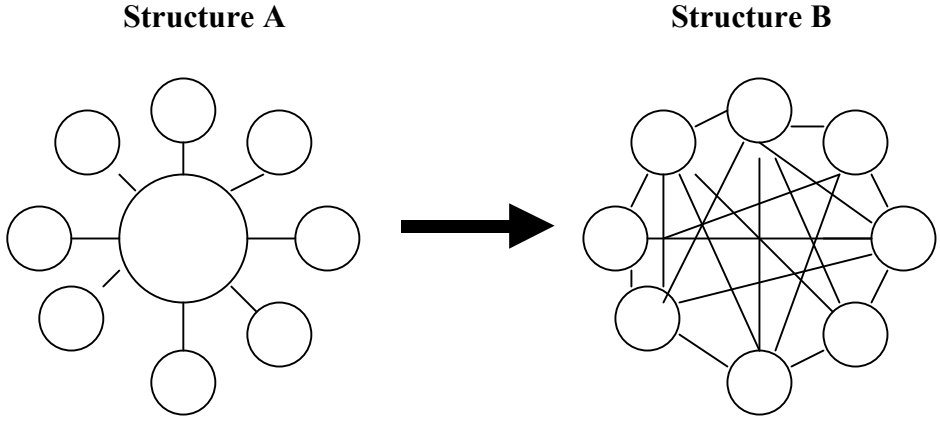
- Firstly, it is possible to question the extent to which the organisation form within the manufacturing industries is at all appropriate for the construction industry given the intrinsic differences between the two types of industries.
- Secondly, it is possible to question the extent to which efforts at introducing forms of organising taken from the manufacturing industries into the construction industry will produce the outcomes aimed at, e.g. increased innovation.

Regardless of the potential 'superiority' of the organisation forms developed within the manufacturing industries, introducing such forms in the construction industry may present difficulties, as the existing structure and form of organising may act to prevent the introduction and/or rooting of such forms. Thus, to illustrate and discuss these difficulties is the primary purpose of this paper.

EMPIRICAL BASE AND RESEARCH METHOD

Due to the lack of innovativeness in the construction industry, national councils in Denmark and Finland, respectively, have set up programmes explicitly aiming at changing the organisation form used in the industry. Among other things, the programmes aim to encourage and enable firms within the industry to try out co-operative forms of organising-for-innovation. In Finland, the Technology Development Centre set up the national technology program 'Wood in Construction Technology Program', for the years 1995-1998. In Denmark, the Danish Industry Council formed the programme 'Process and Product Development in the Construction Industry' (PPC) for the years 1994-2001. Some of the ideas in these programmes were to be implemented in projects containing product development projects as well as construction projects. (These projects containing both **P**roduct **D**evelopment projects and **C**onstruction projects, we shall hereafter refer to as PDC-projects). In Finland, the PDC-projects were organised in 'product part/business networks'. The change, which the Finnish Programme aimed at, is depicted in figure 3:

FIGURE 3
The actor structure change



In Denmark the PDC-projects were organised as consortia with associated partners. The empirical basis of the paper consists of two PDC-projects carried out among a number of firms in the Danish and Finnish construction industry, respectively. In both projects, the new product is a multi-storey timber-framed building[127]. In the development of the such buildings, a large number of different types of organisations were involved in the two respective countries e.g. contractors, architect firms, consultant engineer firms, suppliers of wooden materials, research institutes, and professional associations.

[127] The empirical studies are part of the Nordic research project '**I**nterorganisational **P**rojects in **I**ndustrial **N**etworks' (IPIN).

The method adopted in the paper is case research which implies investigating a contemporary social phenomenon within its real-life context (Yin 1989). The material gathered for the case study is both retrospective and real-time, and multiple sources of empirical evidence are used e.g. industry conference papers, company documents and in-dept interviews with a number of people from the different organisations involved in the PDC-projects in which new forms of organising-for-innovation were tried out. Due to the limited number of cases studied, no attempt is made at statistical generalisations; instead the type of generalisation aimed at is *analytical generalisation* (Yin 1989).

ANALYSIS

In this section, a number of examples relating to the interaction and co-operation between the firms involved in the two PDC-projects are described. The examples are structured according to the creation of (1) actor bonds and (2) resource ties, respectively.

(1) Examples related to creation of actor bonds

- The point of departure for the Danish PDC-project was that the involved firms were to co-operate on a relatively equal basis. In the pre-qualification phase, the consortium partners (the contractor, the consulting engineer firm, and the architect firm) did interact relatively intensively, and a joint project group had their own room at one of the partners' premises. However, after an agreement was reached with a building owner regarding a specific construction project, it was decided that the contractor would be the 'main contractor'. Thereby, the 'leading role' and the legal responsibility for the whole construction project were assigned to the contractor, only, which is one of the typical ways of organising construction projects. Consequently, the consulting engineer firm and the architect firm became subcontractors to the contractor, as opposed to the earlier phases in which the three partners had co-operated. It was not necessary that the construction project be organised in this way. In fact, one of the main ideas underlying the PPC-programme was that the consortium was granted exemption from the tender-based system and usual 'arms-length' way of working. However, difficulties with departing from the existing way-of-acting arose. Having become 'used to' co-operating in the pre-qualification phase, the architect had expected this mode of working to continue in the construction projects. When presented with this less co-operative mode (e.g. a fee agreement allowing the contractor to reduce the architect firm's contribution to the construction project at the contractor's discretion) the architect objected and, actually stalled the construction project for half-a-year. One reason for the problems with the fee agreements was that the individuals from the firms who had participated in the pre-qualification phase were not the same as those who were involved in the construction projects. Thereby, the trust which had emerged among the individuals involved in the co-operative pre-qualification phase was damaged when new individuals, familiar with an 'arms-length' way-of-working, entered the project.

- Another instance in which the involved firms departed from a co-operative mode of working is the way in which the choice of and approach towards the producer of wooden elements (the sawmill) was handled in the Danish consortium. The consortium was unsure about how many buildings, in which the wooden elements

would be used, they were going to construct. Furthermore, they would not commit themselves to purchasing elements from the same supplier, regardless of the number of buildings which were to be constructed. Hence, the sawmill did not get any guarantee for production volume.

- In Finland, the responsibility issue within the networks was a problem because the firms were used to supplying materials - but not a 'total construction project'. The small sub-contractors are used to focus on their own narrow area of materials or competence, and were neither willing nor able to enlarge their legal responsibilities to also include the interfaces between their materials and the materials of other sub-contractors. In a construction project, many people and firms are involved and this creates a problem when the responsibility of faults, which are related to interfaces between materials, are analysed. Therefore, the small sub-contractors did not dare to take responsibility for the whole construction project. Hence, the responsibility issue was solved in the 'traditional way', with the legal responsibility for the whole construction project being assigned to the contractor, only.

(2) Examples related to creation of resource ties

- In the Danish PDC-project there were in total 21 development projects, the results of which were to support the specific construction projects. These development projects focused on issues such as IT, process development, logistics, organisation development, and technical issues related to e.g. fire resistance and noise insulation in wooden buildings. The responsibility for these projects was divided among the members of the consortium. The consulting engineer firm was responsible for the general technical construction system and specifications for the wooden elements, the contractor was responsible for co-ordination and logistics, and the architect was responsible for projects related to the outside facing of the houses, staircases, and wet- and bathrooms. The division of responsibility for and actual work in the development projects did not take place without problems. The consulting engineer firm wanted development projects partitioned according to a parts-of-building logic, i.e. floor, roof, wall etc. However, this conflicted with the logic the architect firm who is not used to drawing floors, walls, and joints separately. Instead they wanted to start with drawing an entirety, and after that go into the details. However, the logic, which eventually was pursued in the Danish project, was the parts-of-building logic, and the respective parties carried 'their' development projects out, relatively independently.

- In the Danish PDC-project, the wooden elements for the construction project were produced according to the detailed technical specifications made by the consulting engineer firm. After having been appointed the supplier of the wooden elements for the construction project, the sawmill had some interaction with consulting engineer firm regarding the construction of the wooden elements – problems and possibilities regarding how they could be produced. However, the sawmill felt that the design of the wooden elements did not benefit from their experience and ideas. Furthermore, there was no room for re-designs within a single construction project – the implementation of which the consulting engineer firm would have been in charge of. In general, production related considerations had not been incorporated to any considerable extent into the design of the wooden elements, and the

sawmill did not consider the elements to be 'production friendly'; hence, rational production was difficult to achieve.

- An underlying idea for the Danish PDC-project was that the results from the development projects should be tried out in a succession of construction projects – without overlaps, but also without long time-intervals between them. Thereby, continuity in the learning would be achieved. However, continuity proved difficult to achieve. Firstly, because different individuals from the main contractor were involved in the different construction projects. Furthermore, different architects as well as sawmills were involved in the different construction projects. The consulting engineer firm represented the main continuity between the successive construction projects. Thereby, the consulting engineer firm handled the transfer of experience between projects, and the experiences of the other involved parties were not transferred to any considerable extent.

- Lack of co-operation between the architect firm and the consulting engineer firm resulted in problems in the Finnish PDC-project. While the architect firm had made the plans ready on a fixed square metre basis the engineer firm had to calculate and design the technical solutions according to this. This resulted in very difficult technical solutions that could have been avoided if the architect firm and the consulting engineer firm would have co-operated from the beginning of the project.

DISCUSSION

The firms in the Danish and Finnish PDC-projects commit to each other to a low degree, and many of their actions do not reflect trust and mutual orientation. Some actor bonds involving trust and mutual orientation have been created between some of the parties. However, the trust which has begun to be developed, is easily destroyed if (when) counterparts, at a later point in time during the joint project, act in non-trusting ways. In general, the firms refrain from becoming mutually dependent. The parties want to keep open the possibility to change counterparts and, in some cases, they actually change counterparts within the PDC-projects. The firms do not interact across firm boundaries on technical issues to any considerable extent, and decisions on technical solutions are made, relatively independently, by the respective parties. The firms do not expand their 'awareness boundary' of each others' resources, and only few technical adaptations or investments in technical equipment, which are specifically oriented towards the counterparts, are made. As Håkansson (1993) argues, co-operative innovation requires 'collective learning' both learning from counterparts' experience as well as joint learning. As we see from the examples above, the participants have not succeeded in achieving joint learning with other consortium or network members to any considerable extent, and only to some extent have the parties learned from each other's experiences. Hence, few resource ties are created among the parties involved in the PDC-projects. In general, the parties involved organise and carry out the PDC-projects in order to avoid too much co-operation and commitment, i.e. only few actor bonds and resource ties are created.

The amount of the involved parties' total business which is comprised within the PDC-projects is insignificant. Furthermore, uncertainty exists regarding the extent to which co-operation and mutual orientation pursued within the PDC-projects may be valuable in relation to, or become integrated with, the parties' existing business. In addition, some substitution of

individuals in the PDC-projects takes place, as these are involved in other projects which are given priority over the PDC-projects, the continuity of which is 'sacrificed'. The PDC-projects receive rather low priority, and the ambitions with regard to co-operation, which the involved firms pursue, are not 'path-breaking'. The parties carry the existing arms-length of working into the PDC-projects. This way of acting in PDC-projects is not irrational, and we do not argue that the way in which the involved firms act, and the trade-offs they seem to make between 'possible advantages from co-operation' and 'avoiding becoming interdependent', are not necessary and unavoidable. However, this way of acting to some extent conflicts with the objectives of the national programmes, i.e. to stimulate 'vertical integration' and creation of relationships. These conclusions accord with those made by Kreiner (1993) who studied projects within the EUREKA-programme the objectives of which were to encourage product development co-operation between firms. Kreiner (1993, p. 80-82 referring to Thompson 1967) concludes that the interdependence between firms participating in such projects tend to be 'pooled' instead of 'mutual' or 'sequential'. When firms approach projects with a logic of 'pooled interdependence', they co-operate in such a way that only few actor bonds and resource ties are created. This, in turn, implies that the substance of the relationships which is created during the PDC-projects, and which may form the basis for further co-operation and innovation, is limited.

MANAGEMENT AND POLICY IMPLICATIONS

On the basis of the two PDC-projects discussed in this paper, we suggest that firms (and managers) involved in 'co-operative projects' in the construction industry may benefit from:

- considering how small co-operative projects may be related to the way in which the firm, and the counterparts, are used to working. Trying to look for ways in which such projects may be positively integrated with the 'total business' of the firms - without destroying too much of the existing business. In other words, approach such projects as a possible 'seed' for further development.

- taking into account that difficulties may arise if the same counterpart is sometimes treated in an arms-length manner, and sometimes is 'embraced'. Occasional, unpredictable 'hugging' may bring about confusion!

- taking into account that counterparts act in relation to how they are treated[128]. If a firm (and the individuals acting on behalf of it) treat counterparts in an arms-length way, the counterpart will (may) act accordingly - regardless of the 'co-operative' objectives which may have been formulated.

- considering that substitutions of people within co-operative projects is problematic when the usual projects, in which they take part, are based on an arms-length approach. Individuals who are used to an arms-length mode of working may destroy the trust which has begun to develop, if they enter into such projects without being 'taught' to approach counterparts in a more co-operative mode. Although it may require considerable learning over time in order to become familiar with a new mode, introducing individuals to 'new rules' up-front may prove beneficial.

[128] This can be related to Weick's (1969) concept of enactment.

Furthermore, we propose some policy implications for national councils, which may consider setting up programmes for changing the organisation form used in the construction industry:

- involving the building owners to create continuity and volume in building new flats and houses. The building owners are the one requiring new houses, and thereby they affect the number of possible construction projects in which it is possible to try out different co-operative organisation forms.

- increasing the time period for the programmes. It takes a lot of time and effort to change the way in which the construction industry is working. Therefore, it seems necessary to formulate programmes with a more long-term view of possible changes.

- looking at PDC-projects in which more actor bonds and resource ties are created, and search for factors which seem to support their creation.

In conclusion, national programmes, which aim to stimulate co-operation and vertical integration between firms within the construction industry, offer the potential for creation of actor bonds and resource ties. However their creation depends on the extent to which the firms act in support of and take care of and further develop the potential offered. This, in turn, is restricted by the existing arms-length way of working within the industry, and the extent to which the firms depart from this mode of working within the 'small change projects'. This, in turn, may not appear to be beneficial for the firms in the construction industry unless more comprehensive changes are made within the industry - regardless of such changes being actively pursued by firms within the construction industry themselves and/or by national councils.

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