

AN IT R&D-PROGRAMME WITHOUT NEW CODE?! STATE DRIVEN IT DEVELOPMENT IN DENMARK

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The paper evaluates a public R&D programme on IT in Construction. The particular programme theory is presented. We identify the vision, the means and the awaited effects of the programmes and analyse on the background of other public development programs how this one might work.

We use innovation network theory to establish the point that the program theory and its initial program coalition is weaved into a political process, that makes the development a emergent process of network building. Some of the main elements of the program are: There is no funding for developing new software. Rather the program supports the development of basic structures and guidelines in electronic tendering, classification of building data, lifecycle data management and other aspects of digital construction. Moreover a central driver in the programme is assumed to be three major professional state clients. These three clients of buildings cooperates with the consortia established in the programme and the assumption is that the construction sector actors will engage in developing a basis for a future legislated digital interaction with the public clients. The funding is in the same spirit limited (a total of 4 millions £) in combination with an estimated auto-financing of 30%. The main idea is moreover to adopt existing and developed generic software in the programme and configure this to support the developed basis. The program is developing a particular version of state driven development, namely one drawing on the power of the purchaser.

Keywords: IT R&D, Evaluation, Client as change agent, Denmark

INTRODUCTION

In a globalising western world and facing an IT-sector operating at high speed, launching local IT-programmes should generate a kind of national ambivalence. On one hand IT is equalised to future prosperity and on the other the speed and forces of international developments should introduce doubts as to whether national effort can make a difference. Nevertheless a range of European countries have recently launched public driven and funded R&D within IT in construction. Main arguments seems to be that construction being a long time laggard needs to be lifted into the information age, and IT might improve the disappointing status of the productivity in the sector.

The Danish state is no exception for such a general pattern. Nevertheless certain features of the design of the recently launched program “Digital Construction” can be seen as innovative and responsive to the conditions of possibilities for such development programmes.

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With a point of departure in innovation network dynamics, the contribution presents the R&D programme, its vision, means and envisaged effects. It focuses on one of seven instruments in the R&D programme.

We interpret the programme as strongly embedded in and characterised by the Danish institutional set up, a small country with a strong tradition of consensual interaction between parties on the national scene. We do not however in this paper develop further how this embedding impacts on the programme. Two organisations are however important in the present paper:

- Erhvervs- og boligstyrelsen, EBST - National Agency for Enterprise and Housing, Denmark, a public body within the resort of the ministry of Economy and Business
- BIPS (byggeri - informationsteknologi - produktivitet – samarbejde, meaning construction - IT - productivity - cooperation) is a non-profit membership organisation of more than 550 companies within the Danish building trade attended by –in principle -all parties within building, but with a large constituency of architects and consulting engineering firms.

EBST is the responsible for the programme management and BIPS is responsible for one out of seven main programme activities, creating a classification system for data on buildings and their components, a so-called “digital foundation”.

METHOD

The present paper is exploratory in character both in theoretical, empirical and analytical senses. It draws on innovation network theory (Freeman 1991 a.o. and evaluation theory (Dahler Larsen 2003, Patton 1990 a.o.) within an interpretive sociology.

The EBST and the programme council decided to initiate a process evaluation embedded in university research. Our position and relation to the programme as process evaluators is therefore to follow it at to interact with the program players in the development. Seeing the program from a process evaluation point of view, give us the possibility here to evaluate the early phase of the program. Since the program is recently launched we would only be able to develop qualified guessing on the future journey that the program might take, which we will refrain from.

Our position as process evaluators inhibits conditions of possibility (Patton 1990,1997,1998). One author represent a university institute active in engineering, the other engineering and architecture. The Danish author institution is part of the current process on IT development in construction. We recognise the possibilities and limitation that this gives rise to (see also Loosemore & Tan 2001).

The field work consist of interview with program managers from EBST, project managers for the seven consortia, participation in the workshops during the spring of 2004, desk research on written material from the program and superficial supervision of website dialogues and other communication traffic.

As noted in the introduction we interpret the programme as strongly embedded in and characterised by the Danish institutional set up. It is a limitation of the present contribution that we do not develop further what characterise this embedding and how it impacts on the programme. A possible reference for investigating these aspects is Bang et al (2001) in Manseau & Seaden (2001).

A R&D PROGRAMME AS AN EMERGENT PROCESS OF NETWORK BUILDING

We suggest that although R&D programmes exhibit elaborate planning of its content and development of its program theory, the R&D programme would nevertheless develop as an emergent process of network building and negotiation amongst the actors mobilised. The R&D programme is viewed as a programmatic frame for or cluster of innovations. The programme theory, is understood as the implicit and explicit statement made in the initial programme rhetoric on visions, means and awaited effects (Dahler Larsen 2001). There is a waste literature within innovation studies that understands innovation as an issue of networks (Freeman 1991, Hakansson 1987, Jones et al. 2001 a.o.). Less have however studies the dynamics of the process of establishing the collaboration in networks. The imperatives for and dynamics of collaboration in internal and external networks tend to be different. A variety of collaborations can be identified. These include networks around specific artifacts, immaterial discursive innovations such as new management ideas as well as software development (McLoughlin et al., 2001). They involve dyadic collaborations between firms, 'hybrid' network organisation, university—industry collaborations, and more complex multi organisation networks. In our case it is the formation of a complex network organisation within a sector, which is of interest, especially of the community type (Koch 2003).

The prevailing image in the literature on innovation networks is one of collaboration being built on values and relationships characterised by mutuality and trust (Weyer, 1997; Jones et al., 1998, 2001). The orthodox position would argue that conventional product innovation in 'mechanistic' firms in contrast is portrayed as difficult to sustain and one best characterised by adversarial relationships between functions, hierarchies, employer/employees, suppliers, customers and so on (Burns and Stalker, 1961). The mechanistic form is politicised where networks are politics free. However, on a closer look innovation studies cover a variety of incorporation of political dimensions into the perceptions of the innovation process, its preconditions and its outcome. The orthodox dichotomy is neither characterising the field of innovation studies, nor studies of new product development (Brown and Eisenhardt 1995). In one of the studies, which are more sensitive to political processes, Dougherty and Hardy (1996), argue that developing an innovation first requires the winning of resources (finance, technology, knowledge, information). Secondly, the creation of organisational processes and structures, which enable collaboration and the establishment of clear linkages between product development and overall organisational strategy. However, these requirements are not easily fulfilled, especially in 'mature' organisations that have hitherto not been particularly innovative. In particular, problems may occur when trying to establish a smooth flow of resources. This requires project leaders to build effective coalitions of support, changing existing organisational arrangements and routines that act as a constraint on effective collaboration, creating meanings that enable others to understand the strategic significance and value of a new product development.

Indeed, from their own research Dougherty and Hardy suggest that the most successful innovators are those who were able to solve a high proportion of the resource, change and creation of meaning problems (see also Vendelø, 1999). Dougherty and Hardy (1996) are primarily concerned with internal collaboration and conducted research that focused on mature firms who hitherto had not engaged in innovation. Their analysis provides a number of pointers to the nature of the network building processes that may be involved in innovation in general, including those involving inter-organisational as well as intraorganisational collaboration. For example, they suggest that a focus on the personal power of individual managers to control resources (budgets, information, expertise, etc.) is insufficient (Dougherty and Hardy, 1996, p. 1147). They suggest that power also resides in the processes through which innovation occurs. Sustained innovation organisational systems are required permitting effective collaboration not dependent upon the actions of powerful individuals.

There is no reason to suppose that inter-firm interactions should not be shaped by political processes. Elg and Johansson (1997), who worked on an earlier study by Frost and Egri (1991), take up this point. They examine decision-making processes in asymmetrical relationships in inter-firm networks. The proposition is—based on a resource-dependency view—that network participants will seek to influence the decision-making process, advancing their specific interests and enhancing their position within the network. For example, organisations with more powerful positions will seek to exploit and preserve this position while weaker organisations will seek to alter the conditions of their dependency. Network participants will seek potential sources of network support and then seek to control interactions within the network in order to use these supportive structures. Much of this will involve the ‘observable’ exercise of power by one party over another. However, in a similar argument to Dougherty and Hardy (1996), it is suggested that more subtle political activity will involve the nonobservable ‘hidden’ exercise of power and the power embedded in ‘deep structures’ of ‘taken for granted’ norms, expectations and beliefs. In particular, the analysis of the distribution of power between network participants, provided by a resource-dependency model, is too static. As Thomas (1994) notes, while adequate for a single decision-event at a particular point of time, when examining the unfolding pattern of a series of decisions over time, such notions of the structural sources of power are less ‘realistic’. For this reason, power processes should be examined encompassing its relational characteristic and the importance of coalition building, enrolment and legitimation in mobilising and exerting power. Finally the actor network position takes a radical step further in its understanding of innovation as an issue of negotiations, translations and coalition building (Latour 1997).

Summarising, We have argued for studying the building of innovation networks as a political process exerted inside as well as across organisations using the most conceptualized versions, like Dougherty and Hardy (1996), Elg and Johansson (1997) and Midler (1993). From these studies, one can derive focus on the process of coalition building, the intersection and tension between internal and external collaboration as well as between stability and social dynamics. These dimensions can be further elaborated by drawing on organisational politics, which is done elsewhere (McLoughlin et al., 2001), the development can however be understood as series of occasion of spaces (Clausen & Koch 1999, 2002) for developing and

merging interests, technical elements of solutions and other parts need to the programme.

“DIGITAL CONSTRUCTION”, A PUBLIC DEVELOPMENT PROGRAMME

The program was launched in 2003 after a *longue duree* of other programmes and public initiatives as well as programme preparation consisting of a – in a Danish context- classical mix of work of consensual commission(s), dedicated reports of consultants, public dialogues and political decision making. In this process certain element of present alignment of interest, hegemonies was reinstated and others renewed. Some of the more interesting (new) features of the interest alignment is that a private fund, RealDania is heavily engaged in co-financing and co-managing the programme with EBST. Another is an outspoken exclusion of the IT sector (software producers and others), which are not seen as possible partners in a program that focus on using existing systems and improving the implementation and use of those rather than developing a new IT-industry (in contrast to Finnish initiatives in the area). The program takes a consensual approach in mobilising construction sector players, which are believed to best being able to drive and develop new methods and procedures to be used by the sector in the future. The mobilisation is bothe direct through project engagement and more indirect by a series of communication and dialogue arrangement which is intended to encounter broader sector players. European Union regulated tendering of seven program areas each thus expected to be carried out by a consortium of construction enterprises and knowledge institutions (universities and others). Consulting Engineers and Architects was the most important bidders, more or less in alliance with contractors. Only in the program part of managing facilities have it been seen that property owners and facility management operators has been involved. The bidding and contracting process thus raised resources to the consulting engineering and architects firm predominantly and less to contractors and facility operators. In this sense the programme mirrors existing hegemonies in Danish Construction.

Vision

In the official presentations of the vision it is stated that it is “a vision of a unified, digitalised and coordinated information and construction process”, which has been given the name “Digital Building” (EBST 2003 p. 3). More over that “the use of ICT should be extended to all parts of the building industry and involve all players from clients/owners through consultants, general contractors, and trade contractors / tradesmen to suppliers of building materials”. In the light of this, the proposed actions is on two fronts:

- Development of ICT guidelines for public-sector clients
- Development of standards and “ICT bridges” between branches of the building industry.”

In verbal and other more popular presentation it was and is again and again emphasised that Digital Construction as a programme is aiming at using existing IT in a more productive way and that is those “low hanging fruits” rather than IT development that is the focus of the program. Moreover the object oriented building process is another explicit celebrated vision. (interview program managers).

Means

As noted above construction sector players, are believed to best being able to drive and develop new methods and procedures to be used by the sector in the future. The funding is in the same spirit limited (a total of 4 millions £) in combination with an estimated auto-financing of 30%. The main idea is moreover to adopt existing and developed generic software in the programme and configure this to support the developed basis. In doing this there is attention toward a potential danger that the general international IT development might overrule the program. Each consortia is therefore asked to establish mechanisms that assure that they are informed internationally. The program is developing a particular version of state driven development, namely one drawing on the power of the purchaser. The three state clients is directly involved in four of the programme activities.

The Program areas are

- Clients demands I: digitalised tendering
- Clients demands II: 3D models
- Clients demands III: Project web
- Clients demands: Delivering of data for operation/facilities management
- Classification of building data, (a digital foundation)
- Best practices in construction
- A learning network

Awaited effects

The awaited direct results of the four clients demands projects are set of standards and procedures, which has been tried out in practical building project. The intention is then to back this standards and procedures up, by implementing them by as state as the norm of purchasing in public building projects.

An example: Classification of building data (a “digital foundation”)

This consortium was special in comparison with the others formed by its complete embedding within one player, BIPS. And by its concept of dynamic sourcing of project managers and project members. The project was split up in an initial idea phase and the two following more development oriented phases. The initial project organisation consisted of a steering group, a secretariat and a idea group.

The formation of the idea group took onboard these various interests. Human resources covered institutional actors such as architects, consulting engineers and contractors as well as an IT developer and vendor, who were engaged because of his competences in IT for contractors.

The manager of the process was selected from the Danish association of Contractors. This manager's competence profile is within labour markets politics and institutional association politics and much less within IT, which can be seen as underlining two consensual intentions: to include contractors more and to develop compromises rather that paradigmatic choice in the idea phase.

The project start created a space and a occasion for getting away from a previous locked position: As an initial orientation point a classical debate within IT in construction had to be tackled: Object orientation versus pragmatics versus document orientation as paradigm for classification systems.

Since a consensual approach was emphasised BIPS- players engaged in assuring a balance between those approaches rather than choosing one of them. BIPS as an organisation is as a whole heterogeneous on the issue, but the board and the secretariat is perceived as being exponents of a pragmatic document orientation. It was therefore important to develop an object oriented element in the project proposals, which was done within the 3D part of the idea phase.

Along with the project organisation a communication and dialogue was established with the other consortia and the sector through the learning network. In January a workshop was held as an opening of the idea phase and the process was culminating in May at a large conference presenting the four main project concepts developed. Moreover the programme website provided space for ongoing e-mail debates.

The consortium started its work in the shadows of a previous public R&D contract on classification that –in short- failed. Initially it had to develop a position as to whether and how the predecessor should be used. As noted above there has not been taken a paradigmatic choice, rather an attempt to merge the various positions has been exercised. Over the spring the work in the project and the dialogue in the programme four projects for the next phase was developed:

- Classification
- 3D work methods
- Logistics and Process
- Building Items Chart

In the final debate and prioritising in May and June several elements were taken out in order to meet an overall budget of 1,1 mil. £. The communication and implementation budget of the classification project, the graphical representation part of the 3D work methods, the production information part of logistics and process and finally the entire Building Item Chart was removed from the work programme. As a new issue emerged norms for measurements of buildings, which is currently debated.

The Object orientation has been “secured” space through the 3D work method project. Whereas pragmatic and documents positions are secured space within classification. Moreover logistics and process represents an area that contractors are interested in. Broad participation was measured at workshops and was obtained in the sense that more representatives from contractors than initially was mobilised. The design was challenged both internally and externally by website debate and in program council. Nevertheless the three projects seem to stabilise and the classification project has been granted funding and permission to commence, whereas the two others will probably commence in August or September 2004.

CONCLUSIONS

We have tried to demonstrate how the R&D program, its program theory and its initial program coalition is weaved into a political process, that makes the development an emergent process of network building. Within the classification/digital foundation activity an initial conflict had to be mediated and glossed and new broader interest brought in play.

The processes has involved gradual gaining of resources in the classification/ digital foundation activity, whereas the other projects begins when consortia gains the entire budget. Then human resources had to be gathered.

It is interesting to see how one consulting engineer, Rambøll, has been able to position itself quite central throughout the programme, whereas other large players are much less active. The Rambøll overlap and other overlaps amongst consortia and BIPS possibly could enable a closer integration of the programme in the coming phases.

It is moreover impressive to observe that a rhetoric of a common interest of the Danish building sector is mobilised from many voices in the sector. One should maybe expect the globalising powers were becoming too strong by now. The major players in Denmark are multinationals and four out of six largest contractors and consulting engineers are by now foreign owned. The official willingness of the larger companies to act as locomotives for the development is further underlined by a recent independent initiative by those large companies which publicly announced that they would strive for digital convergence in Denmark.

In a sense the combination of the strong involvement of the large companies and the strive for broad consensus can be seen as a delicate balancing and mediation of possible social dynamics that can make the programme a political success. It can become instrumental for a range of medium size players that otherwise would have had more problems obtaining public contracts, if another scenario the large companies as locomotives was over emphasised. In such a scenario the large companies would strive at creating an exclusive market position vis a vis the public sector.

Where the political success seems to be sufficiently tended, the technical is maybe more dubious. The vision and means of the program implies that it is not the IT-sector players; neither the existing nor possible new ones, that are in focus here. As the classification/ digital foundation activity case showed IT players are nevertheless directly and indirectly involved. Several consortia has so-called knowledge institutions (universities and others) involved, whereas leading Danish IT-research institutions is still excluded. Moreover several consortia have software houses directly involved, although major players such as Bentley, Autodesk or Microsoft are not involved in project consortia. Autodesk demonstrated its presence by arranging a major invent "in dialogue" with the program of digital construction in March 2004. Other IT- players are more discrete for the time being. During the programme and at least at the end of the programme, it will be clear whether the exclusion of IT sector and IT research will lead to a situation where the general IT-development have long overruled the visions and awaited effects of the program. The consortia are asked to establish mechanisms that assure that they are informed internationally, but the projects do not possess resources to make major reorientations. When the procedures and norms are ready however, investment in IT will be interdependent with the degree to which a particular software package can meet the developed norms. And if a sufficient amount of IT players choose to develop supportive software, then this becomes a major motor for realising the programmes vision.

The vision of an IT R&D-programme without new code thus seems to be vulnerable. It has so far shown a strength in enabling a consensus around the projects emerging, but only the future will tell whether the loose ties to the IT-sector is more a problem than a strength. But the program is creating occasions and spaces over the next two years for developing the strength.

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