

BygSoL - Learning at the Building Site

R.M. Ebbesen, Department of Production, Aalborg University, Denmark
(email: Randi@production.aau.dk)

Willy Olsen, Department of Production, Aalborg University, Denmark
(email: wo@iproduct.aau.dk)

Abstract

For more than 20 years different initiatives have been carried out to increase the productivity of the Danish Building Industry. However, the long lasting results of these have not yet materialised. This paper presents a development initiative in the Danish Building Industry called BygSoL. The focus of BygSoL is learning and cooperation at the building site supported by implementing elements from among other things Partnering and Lean Construction, and by offering educational programs at the building site. The initiative includes more than 10 building projects, educational institutions, research institutions and the labour market partners, and therefore covers a broad range of actors in the industry. It is claimed that by involving the broad range of representatives in the sector and at the same time having focus on the building site, the initiative points in the right direction for making long lasting development of the building process.

Keywords: development initiative, workforce training, empowerment, action research

1. Introduction

This paper stems from the massive critique of the lack in development of productivity and innovation in the building sector [1], and particularly in the Danish building sector [2-4]. As a response to the critique several development projects have been initiated with the objective to try out new ideas and concepts with the aim of making the building process more effective [5]. The core issues of these initiatives are new ways of cooperation (e.g. Partnering); new ways of planning and production control (e.g. Lean Construction); new IT-cooperation tools; and industrialized building processes. The development projects showed great potential and the evaluations of the projects were very positive. Many networks, meetings and conferences have been arranged to spread the experience from the development projects and many reports and reviews have been made with the same

purpose. Nevertheless, the new concepts and ideas emerging from the development projects of the last 20 years have not left clear marks in the practical work in the building sector [3].

This lack of implementation of existing ideas and concepts has several causes; firstly, the temporary organizational structure inhibits the long-term development, refinement, and implementation of the new ideas and concepts [6;7;7;8]. Secondly, mistrust and cultural differences hamper the implementation in multi-organizational settings [8] [1].

Project organisations in the building sector include division of practice into different trades, e.g. plumbing and carpentry. This tends to lead to sub-optimisation, which to some extent stems from the inappropriate learning culture in the building sector, which originates partly from the training of tradesmen. In technical schools the students and apprentices learn to focus on their own professions without having the interdisciplinary interdependencies in mind. The focus on own practice is further reinforced in the project organisation where the tradesmen do not usually communicate informally (or even formally) with people from other trades at the same building project. Most communication passes through the site manager who limits the communication to the needed work instructions. The lack of communication with other professions causes the learning to be sub-optimised because the tradesmen do not get a broader view of the building process.

The initiative BygSoL (Danish abbreviation for Cooperation and Learning at the Building Site) emerged as a response to the lack of long lasting effects from the earlier development initiatives. Instead of trying out new ideas, the focus in BygSoL is on implementing existing concepts by shaping and combining the concepts according to the requirements from the specific building project. The development initiative is not *the* solution, and there are some not foreseen challenges in the initiative, but it is in this paper claimed that the initiative points in the right direction.

The objective of this paper is to present the initiative BygSoL and the provisional findings with focus on how elements from the initiative counteract the sub-optimisation among trades at the building site. Moreover, the challenges in the initiative will be discussed with the aim to show that there is still room for improvement.

2. Method

This paper is prepared as part of the PhD project “Learning Processes in the Danish Building Sector” (www.leanconstruction.dk/innovation). The PhD project is incorporated in the research network of BygSoL. Furthermore, the authors are involved in more building

projects in BygSoL. This involvement in the building projects could be characterized as action research, including support to the building projects in implementing the concepts and learning activities, evaluating the process, and adjusting the implemented concepts according to the given conditions.

Some of the building projects within BygSoL have been formally evaluated, and the results from these are included in the section “Provisional findings” along with personal experience. The evaluations are performed using surveys and group interviews made by consultants from the project secretariat.

3. Presentation of the BygSoL initiative

The BygSoL initiative started primo 2004 and was initiated by a group of provident persons with a practical background in the building sector. The initiative is joined by the labour-market parties, technical universities, technical colleges and schools, companies and 10 building sites of varying sizes. When the initiative ends ultimo 2006, it is expected that more than 2000 individuals have been involved. The budget for the initiative is 7.5 million € financed partly by The European Social Foundation and partly by the participants fifty-fifty cost sharing.

The objective of BygSoL is to make the building process more effective, efficient, and safe by supporting learning and cooperation activities at the building site. However, instead of developing new concepts, BygSoL focuses on implementing existing concepts and using the knowledge emerged from former development initiatives, which showed great potential. The core of BygSoL is the three elements: Lean Construction, Partnering and Learning at the Building Site.

Lean Construction is now a fairly well-known concept which builds on pull logistics instead of the traditionally push logistics. The concept is to a great extent formed – at least in Denmark – by practical experience and written work by Svend Bertelsen [4;9-11], Lauri Koskela [12], Glenn Ballard [13], and Gregory Howell. In short, Lean Construction aims at stabilizing the production flow by making the decisions at the last responsible minute, and the decisions are made by people with the best knowledge on the topic. This means that the practitioners to a great extent are involved in planning and coordination of their work. The involvement of the practitioners also call for more trust among the different trades, as they themselves coordinate their work and mutually have to agree on the short term work-plan.

Partnering is a way of cooperating. There is no clear definition of the concept, but trust, openness and cooperation are the core of the concept. In Partnering projects the different parties work out the project in collaboration and for the benefit of the project team as a whole [14].

“Learning at the Building Site” is based on earlier experience from a development program; BygLoK (Danish abbreviation for “Learning and Development of Competences at the Building Site”), aiming at developing the skilled and unskilled workers’ competencies through both formal and informal learning [15]. By securing a good social environment the scene is set for the workers to come together and discuss the work progress. There are three steps in the program; first, the workers come together at a noon-to-noon seminar with the aim to get to know each other. Secondly, there are weekly meetings, inspired from Last Planner System of Control, [13], where the workers discuss and coordinate their weekly work tasks. Thirdly, a midterm evaluation is made to secure the learning at personal and organizational level, [15]. Other important elements are the common room, where all the tradesmen meet at lunch, and social happenings at the building site.

The three concepts; Lean Construction, Partnering, and Learning at the Building Site complement each other and cover the whole project organization. Partnering focuses on the horizontal cooperation at the top of the organisation among the involved parties. Lean Construction points to a better work flow and better the vertical and horizontal cooperation between the involved trades. “Learning at the building site” is aimed at qualifying the tradesmen and at supporting the horizontal cooperation between the different tradesmen at the building site. In Figure 1 the concepts are illustrated. Together, the three concepts aim at getting a better work environment by focussing on cooperation, communication and coordination among the involved parties in the building project.

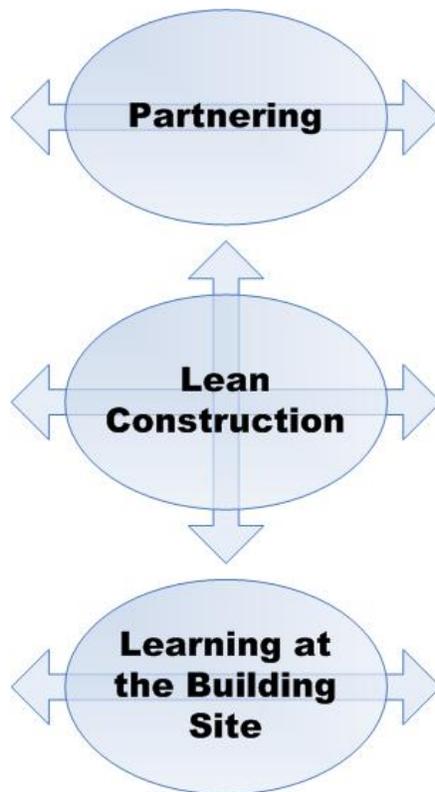


Figure 1: Illustration of the concepts used in BygSoL

In the BygSoL initiative the three concepts are combined in a holistic approach to fit the actual circumstances for the specific building project. However, the practical work in BygSoL has recently focused on “Learning at the Building Site”. For each building project a plan for the implementation of the concepts is made in cooperation among practitioners, clients and consultants, depending on the characteristics of the building project and the wishes from the involved parties.

4. The structure of BygSoL

The BygSoL Steering Committee represents the Danish Construction Association (employer union), and BAT (employee union, Danish abbreviation for Construction- Civil and Woodwork Organisation), the Danish Association of Constructing Architects and the responsible for the execution of BygSoL; the Danish Technological Institute. The project secretariat is located at Danish Technological Institute.

The working structure of BygSoL, which carries out the practical tasks, is illustrated at Figure 2.

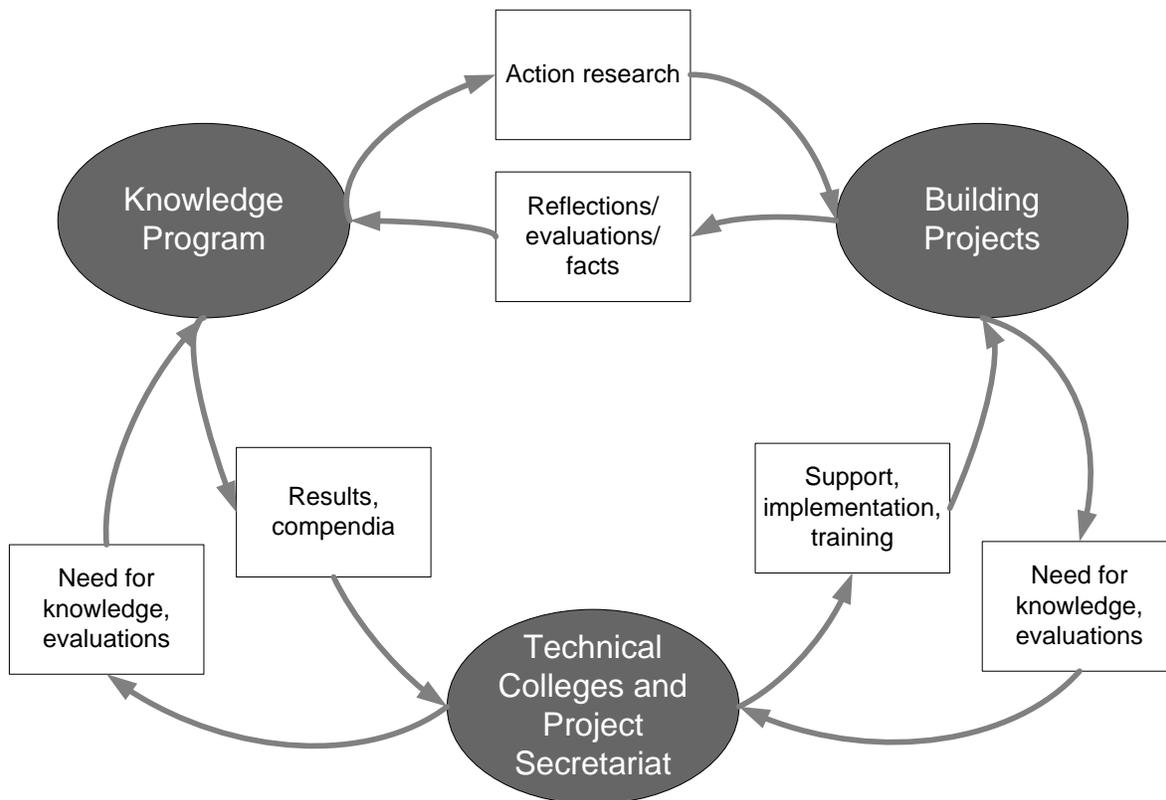


Figure 2 The practicing organization of BygSoL, the knowledge flow

As illustrated, the initiative consists of three parties, which mutually depend on each other. Most important are the projects, which are mainly building projects where elements of Lean Construction, Partnering and “Learning at the Building Site” are implemented. The support to design an implementation plan and the actual implementation comes from the involved technical colleges, technical schools, supplementary training centres and the project secretariat. The support is offered through coaching, supervision and regular educational programs executed at the building site. The educational courses undertaken at the building site are designed to meet special requirements at the specific building project. The cooperation between practitioners and educational institutions is a win-win situation. The practitioners are assisted in implementing new ways of acting, and the educational institutions obtain practice based knowledge, which can be used in other educational programs.

The methods and tools to be implemented at the building project are collected and systematised by the Knowledge Program. The Knowledge Program is a group of researchers and consultants who on daily basis work with topics relevant for developing the building process. The Knowledge Program’s objective is to provide the building projects

and educational institutions with relevant updated knowledge. Beside this, the Knowledge Program helps to evaluate the building projects and thereby obtain input to new research.

This means that the BygSoL-organisation functions more like a network than a typical organisation. The initiative causes people from various backgrounds to meet and help each other in developing the building process. In this way the researchers, the educational institutions and the practitioners get updated knowledge and get personal relations, which makes knowledge circulate between the different professions for the benefit of the building process.

5. A typical BygSoL project

Even though each building project in BygSoL is unique and a special implementation plan is made for each project, there are some common characteristics which will now be described.

The wish to join BygSoL usually comes from either the main constructor or the client after the ideas of BygSoL have been presented to them by consultants, teachers from the local technical school or people from their personal network. Hereafter a broad outline of the project and elements from the three concepts (Lean Construction, Partnering, and “Learning at The Building Site”) are summarised in an implementation plan. The implementation plan consists of activities with the aim of making the building process smoother. The implementation plan is made in cooperation between a consultant and the client and/or main contractor.

The implementation plan usually consists of the following elements: an introduction meeting with all participants in the project (usually tradesmen, foremen, and site managers); a noon-to-noon seminar with an introduction to the building project, teambuilding, determination of some common guidelines for the cooperation, and social events in the evening/night. During the period of construction weekly meetings are held between the foremen or the company owners to plan the work 5 weeks ahead; weekly meetings are held where the foremen and/or tradesmen plan the work one week ahead; other meetings are held frequently containing training activities; furthermore continuously evaluation of the activities and the progress of the building project are made. The training activities are planned in relation to the state of the building project, the training could e.g. be a supplier showing the correct installation method of the heating system, or the training could be guidance in safety-practice.

Normally, each trade brings its own workmen's shed. BygSoL recommend the building projects to invest in a shared room or temporary workmen's shed for breaks and meetings for all the tradesmen and the manager.

6. Provisional findings

In the following the provisional findings from BygSoL will be presented with focus on cooperation and learning between the trades.

It seems that the cooperation between the trades has improved significantly at BygSoL-projects compared to former building projects. At one building project, where the tradesmen in a survey were asked specifically if the cooperation in the work gang had improved, 49 % of the respondents agreed and only 2 % disagreed. 49 % also found that the cooperation between the different trades had improved, whereas 8 % disagreed [16].

The noon-to-noon seminar has a big influence on the atmosphere on the building site. Not only do the tradesmen get background information of the building project, the seminar also brings the tradesmen together as civil individuals. A tradesman says: “... *I think it was important, that we got the possibility to get to know each other as civil individuals – with our own clothes on*” [16]. Both managers and tradesmen also highlight the importance of all tradesmen participating in the seminar, which can be a problem because not all sub-contractors are identified in the early stages of the building project.

The shared room is also a success, even though the tradesmen have to get used to deciding e.g. a smoke-policy in collaboration. The shared room is a place where informal knowledge diffusion happens through story telling and jokes during the breaks. The shared room is also used for meetings and educational training programs which is more formal information and knowledge sharing. The room is therefore a centre for information dissemination between trades (horizontal) and the tradesmen and the project manager (vertical). The shared room also affects the atmosphere towards being lighter and more trustful. As one tradesman puts it: “*It is difficult to run down tradesmen from other trades when you share your lunch with them*” (heard during evaluation at a building project in BygSoL).

The tradesmen also find the involvement in work planning very useful, and it gives them knowledge of why certain decisions are made. However, this demands the managers to be open and to bring the ideas and decision made by the tradesmen in action. At some building projects this has been a problem. Either the managers were not motivated to delegate responsibilities or he did not have the competences to do so. At some projects, the

managers return to the well-known style of managing (top-down) when the project entered critical phases.

Most of the participants find that BygSoL has had a positive influence on their learning. At the formal evaluation project 71 % found that they had gained experience that could be useful on subsequent projects, 59 % found that BygSoL activities such as practice based learning had been useful for the work at the building site, and 55 % found that they had gained experience that had a personal benefit on more than just the job. However, one manager found the educational training intangible, but he recognised a better team spirit and that the tradesmen had been more involved in planning, which had been an educational experience for the tradesmen.

In a broader view, the provisional result of BygSoL is mainly personal relationships and initiation of networks. Individuals from various professions, both practitioners, educators and researchers, have formed personal relationships. Through these relationships knowledge and experience disseminate informally as an alternative to formal knowledge disseminations at e.g. conferences or in evaluation reports. These interdisciplinary relationships can in future help to support a more coherent educational system, where apprentices and students are educated to handle the challenges in the building industry, not only in the methods and knowledge of the specific profession, but also interdisciplinary communication and coordination.

7. Discussion

Tradesmen typically do not like to be further educated, and their relations to going to schools are strained [17]. But in BygSoL the learning activities are carried out on the terms of the tradesmen; the learning is practical oriented and planned according to the state of the construction phase. This is done because the tradesmen do not see the relevance in paper and written work, instead the value knowledge is embodied and derived from practice [18].

However, some of them find the training programs too abstract and vague. This can be due to the traditional training programs held in more formal settings and being very specific on methods and materials relevant for the single trade. In BygSoL the scopes for training programs are often broad and interdisciplinary in order to address the problems of lack in communication and cooperation at the building site. Instead of supporting further specialisation, BygSoL focuses on the learning potential in the relations between human beings and between communities of practice. It is believed this will lead to some kind of organisational learning [18], and by involving more trades and professions in the learning

the tradesmen get a broader view on the building process. By combining the informal social relations between the tradesmen and the more formal educational programs held at the building site, BygSoL uses elements of both organisational learning and work based learning [19]. This is done to give the tradesmen competencies to involve themselves in the short term development of the building process at the specific building project. Hopefully, the tradesmen feel equipped to be changing agents and involve themselves in the long term development on subsequent projects.

The BygSoL initiative have shown that the tradesmen are highly motivated to take part of the development of the building process. It is relatively easy to change the atmosphere among the tradesmen and to implement new ways of cooperation. The real challenge is to support the vertical cooperation between tradesmen and manager, and between academic professionals (designers, architects, engineers) and the practitioners (tradesmen). The next step in BygSoL is to make the site manager, who is a key figure, more competent in handling the new building process where the tradesmen have more influence and make more demands to academics.

8. Conclusion

BygSoL is an initiative that among other things uses educational programs at the building site to give the practitioners competence to take responsibility for developing the building process. By placing the educational programs at the building site and in the context of the daily practical work, the tradesmen see the learning activities as a natural part of their work-life, and the tradesmen contribute to making the building process more Lean. By bringing the tradesmen together in interdisciplinary planning tasks and educational programs, the tradesmen get at broader view on the building process to avoid sub-optimization, and the tradesmen are better equipped to be changing agents at subsequent projects.

However, there are still some challenges that need to be dealt with in order to fully exploit the potential of the tradesmen's knowledge. The role of the manager should be redesigned to fit the new circumstances and the managers should get the needed support in order to handle the situation.

9. References

- [1] Winch,G. (1998) *Zephyrs of creative destruction: understanding the management of innovation in construction*. *Building Research & Information*, 26, 268-279.

- [2] Tarsk Force. (2000) Bygeriets Fremtid - fra tradition til innovation. Byggepolitisk Task Force. By- og Boligministeriet; Erhvervsministeriet. (In Danish)
- [3] Bertelsen, S. (2005) Håndbog i Trimmet Byggeri. Christoffersen, Anders Kirk, Henningsen, Peter, and Bertelsen, Sven. 0.1, Forening Lean Construction DK. (In Danish)
- [4] Bertelsen, S., Davidsen, H. & Pedersen, K.F. (2002) *Bygherren som forandringsagent - på vej mod en ny byggekultur*. Byggecentrum. (In Danish)
- [5] Clausen, L. (2002) *Innovationsprocessen i byggeriet, - fra idé til implementering i praksis*. Ph.D. thesis, BYG-DTU. (In Danish)
- [6] Bresnen, M., Edelman, L., Newel, S., Scarbrough, H. & Swan, J. (2003) *Social Practices and the management of knowledge in project environments*. *International Journal of Project Management*, 21, 157-166.
- [7] Bresnen, M., Goussevsiaia, A., and Swan, J. (2004) Embedding New Management Knowledge in Project-Based Organizations. SAGE Publications 25[9], 1535-1555, London, Thousand Oaks, CA & New Delhi.
- [8] Bresnen, M. & Marshall, N. (2001) *Understanding the diffuse and application of new management ideas in construction*. *Engineering, Construction and Architectural Management*, 8, 335-345.
- [9] Bertelsen, S. (2002) Complexity - Construction in a new perspective.
- [10] Bertelsen, S. (30-3-0004) Construction Management in a Complexity Perspektiv. SCRI Symposium. 30-3-2004.
- [11] Bertelsen, S. (2003) *Louise - En beretning om trimmet byggeri*. Niras. (In Danish)
- [12] Koskela, L. and Howell, G. (2002) The Underlying theory of project management is obsolete. PMI.
- [13] Ballard, G. (2000) *The Last Planner System of Production Control*.
- [14] Bennet, J. and Jayes, S. (1998) *The Seven Pillars ogf Partnering*. Thomas Telford Publisihng.
- [15] Elsborg, S., Dam, A., and Bertelsen, S. (2004) BYGLOK - A Danish experiment on cooperation in construction. 3-8-2004.
- [16] Teknologisk Institut. (2006) Slutevaluering af BygSoL - implementeringen på DPU. BygSoL. Teknologisk Institut. (In Danish)

- [17] Bønnelykke, M. (2003) Kvalitativ undersøgelse af byggeriets udførende virksomheders læring og behov for videnformidling for Fonden Realdania. Alsted Research A/S. (In Danish)
- [18] Styhre,A., Josephson,P.-E. & Knauseder,I. (2006) *Organization Learning in Non-writing Communities. Management learning*, 37, 83-100.
- [19] Elkjær,B. & Walgren,B. (2006) Organizational Learning and Workplace Learning - Similarities and Differences. *Learning, Working and Living* (Antonacopoulou, Elena, Jarvis, Peter, Andersen, Vibike, Elkjær, Bente, and Høyrup, Steen), pp. 15-32. Palgrave Macmillan, New York.