

# **BYGLOK – A DANISH EXPERIMENT ON COOPERATION IN CONSTRUCTION**

**Steen Elsborg<sup>1</sup>, Allan Dam<sup>2</sup> and Sven Bertelsen<sup>3</sup>**

## **ABSTRACT**

BygLOK is a Danish experimental project within cooperation and learning on building sites. The overall goal is to develop a process that will make the craftsmen more and more involved in and responsible for the daily decisions. In order to achieve this goal BygLOK focuses on improving communication and cooperation between the different trades.

The development was initiated through a value based process created bottom up, where all workers on the building site participated. Both managers and workers participating have evaluated the completed experiments very positively as having initiated a process where all participants across trades make significantly better use of each other's strengths.

On a more specific level it was found that in spite of (or maybe because of) the fact that all workers have spent one hour every week attending a meeting in order to discuss and plan the work, they have managed to deliver on time without any deficiencies.

In the evaluation of BygLOK the managers and workers – as well as the teachers and the action researchers acting as professional facilitators – agreed that it will be possible to create a synergy effect if the efforts are made more comprehensive. As a result the experiences from BygLOK are now being widened and integrated into the implementation of Lean Construction and partnering in a new industry initiative on cooperation and learning in construction.

## **KEY WORDS**

BygLOK, BygSoL, learning, construction, management

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<sup>1</sup> Steen Elsborg, PhD-Scholar, Danish University of Education, Learning Lab Denmark, Emdrupvej 101, DK2400 NV, [elsborg@dpu.dk](mailto:elsborg@dpu.dk).

<sup>2</sup> Allan Dam, project coordinator, Danish Technological Institute, Grgersensvej, DK2630 Taastrup, Denmark. [allan@teknologisk.dk](mailto:allan@teknologisk.dk)

<sup>3</sup> Sven Bertelsen, Strategic Counsellors aps, Morlenesvej 22, DK2840 Holte, Denmark. [sven@bertelsen.org](mailto:sven@bertelsen.org)

## **INTRODUCTION**

BygLOK – Leadership, Organization and Competence in Construction<sup>4</sup> is a Danish development program undertaken under the general LOK program aiming at the development of the skilled and unskilled workers' competences. Partners in the BygLOK effort were the Danish University of Education, the Danish Contractors' Association, the Wood-Industry-Build branch of the Labors' Union, five technical schools and training centers as well as a number of firms from the construction industry. (Dam and Elsborg 2003)

The societal background for the program is the general change in society towards a knowledge and competence based situation, where the skills of every employee are of high value for his own working life and of great importance for the commercial success of his enterprise as a whole. To the background should also be added that the Danish construction industry is characterized by a huge number of small and medium sized enterprises where a formalized education and training is not a part of the business culture. This may be a possible major reason for the lack of growth in productivity within the industry over the last 30 years.

The number of participants in BygLOK and their broad basis gave the program very wide objectives. For the schools the objective was to develop a new approach to their education, for the unions it was their members' own working conditions with an aim at the challenges to their basic skills. For the contractors the objectives were to establish a situation where the workers take more interest in their work and at the same time to develop their competence at their own initiative. Finally, for the University the objective was to establish a research basis for a work situated based learning and competence development.

The goal of the BygLOK program was – through a series of construction projects – to show a way to change the old-fashioned norms and traditions in the participating firms and on their construction sites. This should be accomplished by establishment of a close interplay between formal and informal learning. The learning process should be initiated bottom up and should have a focus on the development of personal and collective competences within co-operation and communication.

## **THE LEARNING METAPHOR IN CONSTRUCTION**

In 2003 the results from the European research program CEDEFOP pointed at the fact that when conducting an analysis of a learning environment it is necessary to take the interest of involved participants into consideration and relate it to the tangible structure as well as the intangible culture at the work place. In the CEDEFOP report it is concluded that when analyzing organisational learning a unified approach to the structure, the culture, the company and the individuals is needed. An additional conclusion was that in future practice there is a need for an interplay between further education and the development of the organization, and theoretically for combining the traditions within Adult Education with Organizational Learning.

Already two years earlier the BygLOK programme took a starting point in the assumptions mentioned above, considering that the common tradition for formal and

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<sup>4</sup> The abbreviation BygLOK stems from the program's name in Danish: Ledelse, Organisations- og Kompetenceudvikling i Byggeriet

informal learning on the building sites was not enhancing independence, creativity and professional innovation sufficiently. The discrepancy with work place learning is often that there is no room and time for reflection. Evans et al (2004) shows that if education is being substituted with work place learning it is important to ensure that reflection takes place. The creation of a formal recurrent space for interdisciplinary reflection has been a central element in the developmental projects. The concepts “time” and “room” and the distinction between learning, reflection and practice have been the starting point for the specific adaptations of the BygLOK projects as proposed by e.g. Argyris and Schön (1996), Boud et al (1999), Ellström (2002), and Elkjær (2003).

### **THE LEARNING METAPHOR IN LEAN CONSTRUCTION**

Koskela and Howell (2002) challenges the traditional paradigm of project management by demonstrating that the underlying theory is obsolete, and they propose that management should be understood in a much wider context comprising flow and value generation as well. Bertelsen and Koskela (2002) puts forward a specific proposal for a project management based on Koskela (2000)’s three aspects of construction: Transformation, Flow and Value generation. These management principles were based on Danish experiences, where not least management of the flow aspect – process management – has been a great improvement in lean project management. This kind of management operates bottom up as opposed to the traditional top down approach in construction management, which Bertelsen and Koskela understand as management of the transformations by means of contracts. This new branch of project management is in its nature a learning process, where the involvement of the workers directly in the establishment of the weekly work plan stimulates them to increase their competence through looking at future activities and bringing all their knowledge into play.

Macomber and Howell (2003) proposes based on Flores (1982) that lean construction management should be understood as a series of conversations between the parties involved and that plans therefore may be seen as promises or commitments made by the participants to each other. Macomber (2001) explores the principles of making and keeping reliable promises and point at the importance of the person making a promise being also capable of fulfilling it. In this they reach the same concepts of management as a learning process on all levels as BygLOK set out to explore for the workers in particular.

Bertelsen (2003) demonstrates based upon Lucas’ (2001) general description of complex systems’ characteristics that construction is indeed a highly complex and dynamic system and recommend that the construction process should be organized and managed accordingly. One aspect of the complex system metaphor is that the system must be understood as chaotic, and that the reason that plans are never followed in practice is that they cannot be followed (Bertelsen 2004). This again leads to a new kind of management where the operational plans must be made locally and with a short time horizon as f.e. laid down in the Last Planner™ concept (Ballard 2000).

In total this new understanding of the construction process leads to a deeper understanding of the difference between construction and manufacturing. While manufacturing can be seen as a flow, which in general is ordered and under control – a laminar flow – construction must be seen as a turbulent flow, which not at all can be controlled in any detail through a top-down management. Where manufacturing deals with

local turbulence by pull systems, which in their nature are ‘mechanical’ top down management systems, construction must supplement its pull logistic with local planning undertaken by the individual or the group of workers. Therefore workers involvement and competence is of great importance to the very much needed development of a more effective and safer construction process yielding higher satisfaction to all parties involved.

The learning metaphor is indeed on its way into the concept of lean project management.

## **HYPOTHESIS**

The general idea behind BygLOK was – through a number of construction projects – to establish a work situation where the workers’ competence was utilized and developed through apprenticeship and entrepreneurship.

Apprenticeship is the traditional form of training within trades. In Denmark much of this traditional form of education has today been substituted by a formal, school based education. The program’s hypothesis was that the traditional form of apprenticeship still is important in the development of skills and competence within the industry and that it profitably could be re-introduced albeit in a new format where the workers collectively involve tacit knowledge and exploit each others’ strengths in planning and carrying out the work. The basic question in this connection was therefore how to develop apprenticeship into being a strategic tool to be used in the daily work for the exchange of experience between otherwise equal workers.

Entrepreneurship is a well-known characteristic within the construction industry that is rich in up-start enterprises. However, the program saw this characteristic in a broader context as a highly needed competence from everybody involved in the future construction enterprise. The challenge was thus how to utilize this competence in the daily work situation in an industry that by tradition to a high degree is managed top-down and the hypothesis in this connection was that also the development and use of entrepreneurship from workers could be facilitated by the activities in the program.

## **METHODS**

The program comprised five cases. Obviously, these projects have all been different in size and contractual arrangements as well as in their implementation of the BygLOK scheme. The general approach, however, can be described as a three-step effort.

The first step was a team building session with all the workers involved. This session was most often undertaken as a noon-to-noon seminar at a conference center. This format, where the participants get together at noon the first day and spend the next 24 hours together opens up for formal sessions as well as for social activities. A great part of the session were dedicated to team building but was interrupted by discussions of common objectives for the project at hand and – as something crucial – the workers developing their own objectives and values for their cooperation on the construction project to come.

The second step in the effort was taken during the daily work on the construction site. In this the major element was the weekly time-outs. These began with a short – say 20 minutes – discussion of the work for the coming week, in which they came quite close to being last planner meetings (Ballard, 2000) even though the last Planner concept was not formally brought into use. The time-outs continued with a general discussion of the process in general

and of how well the objectives were being fulfilled. This part of the time-outs started with a follow-up on the decisions from the previous meeting where the workers discussed why things have developed the way they had and what could be learned from this. By comparing this to the agreed values, they decided on how to improve their cooperation. The time-outs were conducted by one or two professional facilitators whose primary function was to ensure constructive conversations. The general discussions at the time-outs were supplemented with more traditional development of personal competences focusing primarily on communication and cooperation. The duration of the time-outs was set to app. one hour – usually on Monday morning.

The third step was a more formal evaluation of the efforts undertaken. These evaluations took place when the construction project was app. fifty percent completed, in the form of a workshop to develop and collect action learning, and at the project completion as group interviews to develop and collect organizational learning as well as individual interviews to develop and collect individual learning.

## **FINDINGS**

The BygLOK projects have been reported in Dam and Elsborg (2003)

Given the challenge at the initial team building session: “How to create a good building site?” the workers involved expressed their own set of values for their work, which in general were:

- Respect and cooperation across trades and hierarchic structures
- A high level of information and a good communication
- An involvement in decision making and joint responsibility for the development

The cases were in general evaluated positively by the parties involved, and the companies are now implementing the ideas in their projects in general. In the final group interviews with workers, managers and teachers respectively the contractors pointed to the fact that BygLOK has established a setting where the workers cooperate across trades and take more interest in their work. The workers pointed to the fact that work has become more enjoyable and challenging, and the teachers reported a high level of engagement at the meetings.

The participating firms have mostly been somewhat reluctant to release specific figures on their business results, but it is reported in general terms that the projects did increase earnings, reduce construction time and improve quality. A zero point punch list was reported from at least one of the sites. Even though the numbers are rather small, an increase in workers’ safety also seems to be an outcome. At least one of the general contractors reported that savings in the construction costs were able to more than finance the time spend on the team building and the weekly time outs.

This clearly indicates that there is a huge potential for a development of the cooperation between managers and workers. The cases have nevertheless also demonstrated that it is hard work to exploit this potential. First and foremost it is a question of developing ownership to the processes among all participants.

In itself this demands considerable resources, because it requires for all involved to participate with a real say in designing the framework and the content. The implementation

of the decisions also requires systematic awareness and facilitation in order to avoid relapse to the old habits. Such relapse typically happens both actively – when problems occur – and passively – when novelty interest has worn out. This is a general problem that all developmental work must struggle to overcome. A significant reason for this is that it is difficult to alter the habits that consciously as well as unconsciously have been structuring our actions for many years – even if one has decided to do so on a conscious level. Change of this kind does not happen over night.

However, the BygLOK cases point to the fact that success in integrating the development of workers competences in the development of the organization is made by the workers experiencing a significant effect here and now of their involvement in the process. If the workers experience this, the results show that they have an interest in involving all their knowledge in the process and that they will collaborate with commitment and actively make the transition succeed.

The following quotes from interviews with participating workers are included to illustrate some of the points mentioned above:

*"We really want to participate in thinking strategically and use our practical knowledge to ensure that the right decisions are being made"*

*"Many of us welcome the bigger responsibility – we want to have it, if we also get more influence on our working conditions"*

The consequence of becoming involved in the planning of the work and experiencing a real influence on ones own working conditions are among other things that the work to a much higher extent is integrated into the entire life of the worker. The workers' thoughts about work continue after closing time:

*"You can hardly say that this work place is ideal, but we have definitely moved in the right direction. We think in a more social way, and that really makes you a more happy person, when you get home. And there is no doubt that it results in a better quality in the work you are doing. That is definitely true. You have more energy to think twice for instance about ordering supplies in due time. And you do not shut your brain of at closing time - you actually sit in the bus on your way home and think about how you could do better tomorrow. This is actually what happens..."*

This quote also points to the fact that the organisations have an opportunity to include the workers thinking in the work free periods by making the decision taking more democratic. The fact that the workers are willing to make this trade is apparently the connection between the development of competences and qualifications and the quality in the (work) life also mentioned in the above quote. These connections will be subject to further research.

The workers pursue their own goals regarding a physical, psychological and logistical good workplace as well as the contractors aim at an efficient and high quality construction process. In this, it is decisive to begin by dealing with the problems that the workers find to be crucial and bring forward solutions for these problems. Otherwise it is not possible to

catch the workers' interest in working with the development. Also, from a pedagogical perspective the experiences show that it is vital to use teaching methods with high levels of activity for the workers.

## RESULTS

The BygLOK project sets out to investigate whether a learning process on the construction site could be established by bringing old skills such as apprenticeship and entrepreneurship along with a better cooperation back into modern times' construction process.

The cases demonstrated that this is the case if the proper initiatives are taken but also that it is hard work to accomplish.

The cases have furthermore developed a new basis for achieving a more nuanced understanding of the nature of on-the-job learning and competence development within ad-hoc, multi-skilled organizations at temporary work sites, which is currently being researched into.

According to the evaluation it is possible to change the habits that today constitute a barrier for the development, if one dares establish a new structure for communication and cooperation on the construction site.

The project has shown the importance of understanding that the workers differ in their view on their working life and how it relates to their life in general.

In the evaluation of the five projects four groups of workers were identified:

- Workers primarily focused on gaining influence on their physical work environment
- Workers primarily focused on gaining influence on their psychological and social work environment
- Workers primarily focused on gaining influence on a logistically efficient work environment and thereby on their earnings through the piece rate system
- Workers who are not at all motivated for gaining influence on their work environment at all.

The facilitators must realize this and also realize that even though the big majority of the workers wish to influence their work conditions, there are differences in the issues they primarily are interested in.

The experience from the cases is thus that these different views must be taken into consideration when planning changes along the lines explored. Those primarily focused on efficient logistics prefer to discuss concrete and impersonal subjects, whereas those orientated towards improving the psychological and social working environment are willing to spend much time on personal and for the organization and work more abstract items such as team building.

The cases showed that future efforts should not be focused on the development of the workers' competences only. The efforts should at the same time include the development of project management as well as the project organization to ensure a synergy effect. The evaluation also points at the importance of the external action researchers and teachers to be

more demanding in securing an optimal framework for development on the individual site. Working with project management the efforts should partly aim at developing the site managers' communication skills, and partly aim at giving the site management and workers a shared frame of reference, which they may use in order to improve the cooperation and communication.

The work with the managers should lead to:

- Managers able to communicate across trades and to establish a cooperation at the site
- Managers able to communicate with other managers and with workers, between companies, as well as with consulting engineers and architects.
- Site managers able to manage the sites as coaches
- Company managers able to facilitate the processes by creating the right frameworks that ensure a constructive interplay between the top down development created by management and the bottom up development created by workers

An optimum effort will also require a change of the project organization in order to support the concrete initiative about delegation of responsibility and decision making competences, and to ensure the development and use of personal knowledge.

Future efforts should therefore also contain concrete initiatives to transform the building site into a learning organization and create interplay and coherence between the development established top down and bottom up respectively.

The overall objective of BygLÖK activities should still be to support the development of a profitable work life founded upon:

- Workers working with a high degree of joint influence
- Workers constantly developing and using their professional and personal competences
- Workers taking ownership and working with a high degree of responsibility

The experiences up till now point to benefits for companies as well as for workers. New research has been initiated to find out how the results can be utilized in an optimal way. In this connection the research will also include how and in what ways the results can be utilized in other European countries.

## **BYGLOK AND LEAN CONSTRUCTION PUT TOGETHER**

The new understanding of lean project management as management of complexity (Bertelsen, 2004), where delegation of responsibility, cooperation and learning should be central principles, and the BygLÖK experiences on construction as a learning process are now being continued and tested further in practice in the Danish initiative: Lifelong Learning in Construction – BygSoL. (2004)<sup>5</sup> This initiative has been taken by parties from the industry

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<sup>5</sup> The abbreviation BygSoL stems from the initiative's name in Danish: Samarbejde og L ring i Byggeriet.



and is funded partly by the European Social Foundation and partly by the industry itself. Its aim is to develop and implement a new construction process yielding higher value and lower costs along with an increased workers' satisfaction.

The initiative is headed by the Contractors' Association and the Construction Workers' Trade Union along with industry representatives. The initiative has also established close cooperation with the technical universities in Copenhagen and Aalborg as well as with the Vitus Bering International School of Engineering and a number of training centers throughout the country.

### **OBJECTIVE**

The initiative's main objective is to implement a new industry practice in the design and construction processes. This objective indicates that it is no longer a time for experiments but for direct action, which therefore requires strategic commitments by the management of the participating industries. The better practice aimed for also calls for a change in attitude and behavior throughout the industry – from the management and down to the last worker employed on the construction site, and from the clients through the professionals to the contractors and suppliers of materials and equipment. This development calls for an ongoing learning process comprising each and everybody working within the construction sector, not least the many skilled and unskilled workers employed on the construction sites, but also professionals, contractors, suppliers and clients.

### **ELEMENTS IN THE INITIATIVE**

As elements of its objective the initiative will:

- Establish a better cooperation in specifying project value for the client in the early design phases and introduce value management principles to ensure that the specified values will be delivered
- Establish a better cooperation between consultants and contractors during the detailed design and construction phases in order to better design constructability and to improve the flow of work, materials and information and thus reduce waste.
- Establish a new site management training – from foremen over superintendents to site engineers – by putting focus on cooperation, teambuilding and training.
- Establish a better cooperation on operations level between the gangs and the individual workers across trade boundaries, and involve the workers in the day to day planning of the operations
- Establish increased quality and workers' safety through a higher involvement by all personnel working on the construction site.

Lean Construction calls for a new kind of construction management based upon cooperation, conversation, commitment and learning, where plans are seen as agreements not as orders. This is in strong opposition to the present top down management most often used in

construction, where projects are managed by contracts, critique and orders. This new construction management process therefore requires new qualifications and a different attitude to the other participants. The initiative includes a new education of construction management on all levels and also in the basic schooling of professionals working in practice. On the job training will also be a part of this.

The initiative involves the workers as equal parties in the creation of a new and better construction process. Indeed, the worker is the person creating the actual value specified in the design, and he or she is therefore the most valuable asset on the construction site.

All employees on the site will be stimulated towards an active involvement in the planning of the operations and the quality control, and through team building they will be stimulated towards a closer cooperation across the trade boundaries, in order to further increase the flow and reduce the waste. This will put the individual worker's professional skills into focus and it will thus stimulate to a continuous learning. This will be furthered by qualifying courses as part of the site activities.

These efforts will make the construction site look like a modern manufacturing company – albeit temporary – with its own policies as regarding cooperation, workers education and social activities.

Workers' health and safety becomes an increasingly more important part of modern management. Even one accident should be one too many in any industry. However, in this respect the construction industry has much to improve as it is reputed for its high accident rates.

Based upon experiences from Danish lean construction projects where the workers have been more directly involved in the planning of operations and the safety procedures, the initiative will introduce a new approach to the quality and safety issues. (Thomassen 2002; Thomassen et al 2003). These will not longer just be something about rules to be adhered to, but will be more a matter of attitude and cooperation. Quality and safety for all will be made a joint responsibility, just as it is known within the maritime and airline industries. Inspiration for this will be the work of Dr. Jens Rasmussen (1997) on nuclear reactor safety, works on cockpit safety etc.

Courses for everybody working on or with access to the construction site will be mandatory.

The results and experiences from these implementation projects will be compiled and analyzed in order to make a basis for further improvement within the whole program. It is therefore expected that the initiative will be a starting point for continuous learning and improvement within the construction industry, just as it is known within manufacturing industries.

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