THE IMPACT OF LABOUR PRODUCTIVITY ON THE SWEDISH CONSTRUCTION INDUSTRIES

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ABSTRACT

There have been debates concerning what can be done about the current low labour productivity in the Swedish construction industries. High production cost in the construction industries has been a burning issue for a long time. On the other hand, process industries and organisations have taken the advantage of labour productivity measurement to reduce their production cost and eliminate non-value-added activities. The purpose of this paper is to examine, why and how the process industries and organisations have taken action to measure labour productivity and to suggest ways of improving labour productivity. Case studies have been performed for six different companies and organisations, and these are discussed. The results show that increases in global competition have led industries and organisations to reduce production cost by improving labour productivity. To improve the construction project process, beside profit maximization, labour productivity measurement is essential. Furthermore, there is a need for measuring labour productivity in order to reduce production cost.

1. INTRODUCTION

During the last decade, the Swedish government has initiated three investigations in order to identify major problems in the construction industries. SOU 2002:115 (2002) focused on general problems, SOU 2000:44 (2000) has focused on the high production costs and SOU 1997:177 (1997) focused on general quality-related problems. But unfortunately none of these investigations has investigated the level of labour productivity or waste, even though there have been debates about the measures to reduce the cost within the construction industries in Sweden.

Labour productivity within the construction industries has improved by only 1.7% per year during the period 1963 to 1998, whereas manufacturing industries have succeeded in improving their labour productivity by 2.9% per year during the same period (Lutz and Gabrielsson, 2002). Lutz and Gabrielsson explain low labour productivity as a result of low competition existing in the Swedish construction industries, which is highly dominated by three major companies. According to Borgbrant (2000), the Swedish construction industries have no experience of taking lessons from prior projects. Detailed documentation of performance from prior projects is confirmed to be very low (Forsberg, 2007).

Production cost in the Swedish construction industries has increased faster than the consumer price index (SCB, 2005). Production costs for multi-storey building in Sweden have risen by 65% between the years 1995 and 2001 (SCB, 2005). Production cost includes client’s cost, cost for acquisition of land, building permit and contractor’s cost. The contractor’s cost is claimed to be 61% of the total production cost. According to SCB, 36% of total contractor’s cost goes to cover employee wages. Wages within the construction sector have risen more than for other industries’ workers. As wages have increased higher in construction, it is important to produce more per hour to reduce the

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1 Swedish statistics
total cost. Byggkommissionen⁡ has criticized the Swedish construction industries and states that the branch structure within building construction exerts very low pressure on competition due to factors like high concentration, vertical integration and weak competition in the field of imports and entrance barriers to the market (Byggkommissionen, 2002). These factors cause high prices, poor quality and low productivity within the industries. It can be mentioned that there is hardly any other branch that has been so scrutinized by the government of Sweden (Jonsson, 2005).

Production cost in construction industries has run away compared to the consumer price index (Jonsson, 2005). Borgbrant (2003) explains the phenomenon as lack of customer adjustment. The Swedish government has been worried about the productivity development in the Swedish construction sector over the years. Many reports show that there is a major need to improve efficiency in the construction industries (Jonsson, 2005). Furthermore, non value-activities are high and cause correspondingly high production cost. According to Josefsson and Saukkoriipi (2005), between 30-35% of a project’s production cost is caused by waste.

Waste and rework has an effect on total cost. How the craftsmen uses their working hours and convey value added work flow has a connection to labour productivity (Josefsson & Saukkoriipi, 2005). Their study was divided into three:

1. Direct value added work – work process that brings added value to production is about 17.5% of a craftsmen’s working time
2. Preparation – activities that are necessary for production that consumes 45.5% of the total production time
3. Pure waste – unnecessary activities that can be eliminated and can save 33.4% of the total cost.

Another study has been done by Alwi (2002) in the Indonesian construction industry. However his measurements of waste were limited to labour, machines and materials. There are other examples of waste such as material waste (Lindhe, 1996; Bossnik & Brouwers, 1996; Garas et al., 2001; Formoso et al, 2002) waste in labour time (Agbulos & AbouRizk, 2003) and poor quality costs (Burati et al, 1992).

Loss of productivity is caused by management of machines, wrong material, delayed material delivery, high reserve stock and ineffective distribution of workforce and material costs. On the other hand non value-added (waste) activities can cause low labour productivity. Contractors often aim to short-term high revenue, ”It is important to remember that productivity is often more of a marathon, not a one hundred yard dash!” (Adrian, 1995).

Substandard working organization is a possible cause of this low labour productivity (Lutz, et al, 2002) and the conclusion can drawn that labour productivity is very low and can jeopardize competition within the industry. Productivity or lack of it is a major challenge in the construction industry (Adrian, 1999). Construction is a labour-intensive process and labour is the only productive resource in construction (Jerges et al., 2000). Time used by a construction worker on productive activities averages about 30% of the total time available (Alinaitwe et al., 2005). Hammarlund and Rydén (1998) performed a study in the field of services installations (HVAC) and found that a worker in this field works effectively only for 3.5 hours of his 8 hours shift. Strandberg and Josefsson (2005) have shown that workers spent less than 20% of their time on directly value-adding activities. Personnel costs in Swedish are 16% (SCB) of the total production cost and 36% of total contractor’s cost. Up to 5% of personnel costs could be saved by improving labour productivity (Reliegh, 2004).

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⁡ Autonomous commission appointed by the Swedish Construction Industries
The purpose of this paper is to find out how and why other industries perform labour productivity measurement. This paper will also highlight the importance of labour productivity in the Swedish construction industries in order to reduce production cost.

2. RESEARCH METHODOLOGY

Case studies have been undertaken in six different companies to study labour productivity performance. Yin (1994) has discussed six sources of evidence for a case study and explains the strength and weakness of these six sources. “Interview”, “direct observation” and “documentation” have been selected as the source of evidence and the companies in question have been visited (except Fritidsresor). Information about Fritidsresor has been collected from the proceedings of the Lean Forum Congress in Gothenburg. The respective plant managers and project managers have been interviewed at their working places and the production plant has also been visited by the author in the role of a direct observer to get a better idea of the companies’ production process. A questionnaire was sent prior to interview to all the respondents and the questionnaire was then complemented by questions that arose during interview. To minimize misunderstanding and to get better accuracy due to poor recall (Yin 2004), all the interviews were recorded with the permission of the respondents and a copy of the interview summary was sent to the respective respondent for their comments in order to secure a better validity of the investigation.

3. RESEARCH PROJECT

Six companies are chosen to examine why and how they perform labour productivity. These companies are from different branches, but faced a great deal of competition from similar types of companies. Production type differs from company to company (see table 1). Some companies use prefabricated products in their production. Others build an entire house in an indoor plant and then move to the production site for assembling. NLL and Fritidsresor are included in this investigation to get an idea of how the service sector performs its labour productivity measurement in order to improve client satisfaction.

Table 1. Companies and organisations covered by the case studies

<table>
<thead>
<tr>
<th>Company</th>
<th>Branch</th>
<th>Type of product</th>
<th>Type of process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saab</td>
<td>Automobile</td>
<td>Car</td>
<td>Highly automated</td>
</tr>
<tr>
<td>NLL</td>
<td>Service</td>
<td>Health care</td>
<td></td>
</tr>
<tr>
<td>Lindbäcks Bygg</td>
<td>Construction</td>
<td>Multi-storey house</td>
<td>Semi automated</td>
</tr>
<tr>
<td>Alvsblyhus</td>
<td>Construction</td>
<td>Single house</td>
<td>Semi automated</td>
</tr>
<tr>
<td>Tomokuhus</td>
<td>Manufacturing</td>
<td>Single house frame</td>
<td>Highly automated</td>
</tr>
<tr>
<td>Fritidsresor</td>
<td>Tourism</td>
<td>Charter</td>
<td></td>
</tr>
</tbody>
</table>

A short description of the company background is followed by the summary of the interviews and knowledge obtained by direct observation is presented in this part of the paper. Company descriptions are partly taken from the company home page and completed by the information gathered from the interviews.

3.1 Saab automobile

Saab Automobile (the company was founded in 1937 in Sweden and started its production by hand-building prototypes of its car (model 92001) in Trollhättan) is now

3 Norrbotten County Council
owned by the American corporation General Motors. The production plant faced lay-offs because of low productivity and loss of market share. Saab in Trollhättan introduced the Japanese lean production philosophy to improve its production process as well as labour productivity measurement after being taking over by GM. Today, Saab Automobile in Trollhättan is the most successful car manufacturing plant within the GM concern (Sveide, 2006).

Saab makes three types of car (model 9-3, 9-5 and Cadillac) in Trollhättan on the same production line. Labour productivity measurement is performed regularly to improve production results. Quality control is done in every part of production process, so that a mistake does not appear at the end of production.

*It’s the customer who decides the productivity/quality, build right from the beginning and come across waste*” (Production manager at Trollhättan)

The company has chosen the unit of measurement as the number of cars/employee/year, according to their company policy. They have increased their productivity considerably (see table 2).

Table 2. Labour productivity

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of employee</th>
<th>Total no. of car produced</th>
<th>Labour productivity Cars/employee/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>4538</td>
<td>72 762</td>
<td>16</td>
</tr>
<tr>
<td>2003</td>
<td>3721</td>
<td>114 120</td>
<td>37</td>
</tr>
<tr>
<td>2005</td>
<td>2481</td>
<td>103 494</td>
<td>41.7</td>
</tr>
<tr>
<td>2006</td>
<td>2022</td>
<td>125 755</td>
<td>62.7</td>
</tr>
</tbody>
</table>

In 1992, the plant produced 16 cars per employee and today (2006) they are making 62.7 cars per employee. Employee means all the employees within the company. It takes 32.5 hours to build a car, but that includes all other jobs such as administration, planning, purchase of raw material etc. The company would take only 3.9 hours to build a car if they did not take into consideration the above-mentioned process. GM has increased its number of sold cars all over the world and in Sweden sold 2167 cars in the month of April, 2006 which is close to 8.4% of the total purchase of new cars in Sweden.

*“Just now everything goes our way”* (Bengt Nilemo, CEO for Saab Automobile in Sweden (www.saab.se, 2007))

3.2 NLL

NLL (Norrbotten County Council) is an autonomous organization that takes care of public health. It has faced a great deal of criticism and is still facing it for its long waiting list for visiting a doctor or getting surgery done. A project called “Bra mottagning” (good reception) in cooperation with the northern county and municipalities has started to create a better atmosphere and a healthy relationship between the patients and NLL. To solve the problem, the project group started an inventory of all the problems within the problem area.

Unlike manufacturing companies, NLL has a much fluctuating flow of patients and number of surgeries to be held over the year. These uncertainties cause trouble for the planning of personnel in order to face the up and down stream of patients. Furthermore, hospitals have trouble in recruiting physicians because of the geographical position of the hospital (Niva, 2007).

NLL has started measuring productivity as:

- availability of information,
- time taken to a surgery,
number of patient taken care by a doctor  
opening hours  
number of patients on the waiting list.

"We have enough resource to face the problem, in consideration of the problem of recruitment of skilled physician“ (Project manager, Ann-Mari Niva)

Project members have evaluated all the problems and developed a better process in order to face the criticism. Reception hours have increased by 25% and generated 100 new opportunities over the year. They have reduced number of patients in the waiting list from 1652 (2006) to 868 (2005) in the orthopaedic department. They have carried out 6491 magnet x-rays, in the field of Resonance Tomography which is 42% higher than the year before without providing extra resources. Access to x-ray examination has increased by 25% (2143 patients to 2604 patients) between 2005 and 2006.

3.3 Lindbäcks Bygg AB

Lindbäcks Bygg was founded in the year 1942 by Frans Lindbäck. Its vision is to become the leader in prefabricated multi-storeyed (two to five storey) house building in Sweden. Its aim is to deliver flawless house in right time to create satisfied customers. To reach the goal, they work continuously to improve work processes. They have raised their turnover by 15% per year and today the company has a turnover of about 160 MSEK, of which 3% is invested in research and development. The company has the goal of achieving 5% profit per year.

The production plant has a semi-automated production system. An entire house is built as an indoor production plant and then assembled at the production site. Production speed is 125 m² house area per day and 2,000 houses per year.

"It is important to take good care of personnel to achieve a better and effective job atmosphere“ (Plant manager)

The plant manager works continuously to minimize unnecessary rework and to create a value chain to achieve good productivity. According to the plant manager, productivity is the unit of fulfilment for the company's targets.

Lindbäcks Bygg has plant/fabric based production and it is easier to work towards value added processes. Lindbäcks Bygg performs productivity measurement and the decision is made by all the employees, “otherwise it wouldn’t have any affect“ says the plant manager. Employee wages are based on the fulfilment of targets and the idea is proposed by the employees. The company sets production targets every week and it is important to fulfil the target. Due to the bonus system, every craftsman in the company strives to reach the target.

Their unit of measurement is:

- produced volume/hour  
- produced unit/hour  
- produced unit/week.

Knowledge of this measurement makes it easy for the purchasing department to plan for the required material for a certain project. Besides, it gets easier for the worker to summarize the production result after a couple of days and then to adjust the production speed to meet the target. Employees receive a bonus if they produce more than the target value. After every project, the bar is raised a little bit and a new target is set. The company sets a handicap system with a margin for their new project because of its uniqueness. The plant manager explains that they have only a few units of
measurement, because it gives them better control of production and a better basis for statistics. Quality control is very important to fulfill customers’ demands. Labour productivity has been fluctuated in the past, but in recent years it has increased.

“It is important for me to follow the branch and adjust the production process as well as productivity along with it” (Plant manager)

3.4 Tomokuhus

Japanese owned house-component manufacturer Tomokuhus was founded in 1991 in Insjön, Sweden. They build 45,000 windows and about 1,800 timber house frames per year. Whereas Swedish construction companies are facing competition from the low-wage companies in the Baltic States, Tomokuhus has created an example of reducing production cost by improving labour productivity. The plant manager explains the choice of the production plant in Sweden as good availability of skilled workers and access to raw materials.

The production process is highly automated and all the employees on the production floor are basically operators. Tomokuhus measures labour productivity regularly and takes advantage of the measurement for future projects.

Their unit of measurements are:

- number of components produced per day
- number of containers shipped per day
- number of units produced per day.

They have improved labour productivity by 6% in 2006. They have not raised their selling price by a single cent over 15 years despite high rises in wages and rises in the price of raw materials. The company produces components of a timber house that sells only in Japan. Components of an entire house fit in a container, designed by an architect, and shipped to Japan. Tomokuhus has a proposal box where every employee can contribute innovative ideas and be rewarded for proposals accepted. The plant manager works on constructing new machines to improve production processes to optimize and to improve product quality. The production plant has hardly any waste of material and continuous of improvement is everything, says the plant manager (Pettersson, 2006).

3.5 Älvsbyhus

Älvsbyhus was founded in 1944 and since 1960 they are producing timber houses and have sold more than 27,000 houses in Sweden, Finland and Norway (www.alvsbyhus.se, 2007). The company has raised turnover from 789 MSEK (2001) to 1,154 MSEK (2005). Revenue has gone up to 30% of their turnover, which is much more than any other house builder in Sweden.

Älvsbyhus builds timber houses in an indoor production plant and is one of the most effective manufacturers in Europe (www.alvsbyhus.se, 2007) and leads the list of timber house builder in Sweden (Blomgren, 2007). The production plant is semi automated and because of their rational transport and assembly system, they have become very competitive in the house builders’ market.

The company’s vision is to become the most successful single unit timber house builder in Sweden, to produce a quality product to a minimum price. Today, they are making 1,700 houses per year. The company measures labour productivity in monetary terms, for example production cost per built house. The company has worked with its production strategy for more than 45 years and has reached a good level of quality production. The personnel manager explains the motivation for their unit of measurement as an effective
tool to find the cost effective production system. Company has a target to reduce production cost by 3% per year. “Personnel cost is between 15 to 20 percent of the total production cost and that’s why it is important to work effectively” says the personnel manager.

The company’s salary system is a bit different from most of the other house builders in Sweden. Craftsmen’s salary is based on performance. Because of this system every craftsman is engaged and motivated. Production is very much customer oriented but their production is limited to a few house models. Every employee has an opportunity to come up with ideas to make production more effective and productive and gets rewarded for each accepted proposal.

3.6 Fritidsresor

Fritidsresor, a Nordic concern in tourism business was established in 1961. Since 2000, Fritidsresor is a part of TUI (Tourism Union International) and represented in 16 European countries. The company portfolio consists of 284 hotels with 160,000 beds over 29 countries. The company’s main goal is to have the most satisfied customers and best profitability in the business.

Like other charter companies, Fritidsresor was struck by the Tsunami disaster in Thailand and by the impact of 9/11. During 2002-2003, the company posted negative results. In recent years, the company has introduced a modified version of the Japanese philosophy “lean” in its way of thinking and have called it “Blue Lean”.

It is the customer who makes them successful. To achieve the goal, company started collecting information about their customers. They asked questions like:

- What does the customer want?
- When do they want service?
- How do they want their service?
- What is their high priority during a vacation?

Then, they looked thoroughly into their value added flow to find out the area that must be improved to achieve better customer satisfaction and to reduce costs. To reach the goal they changed their theme from “wrong from start to the end” to “right from the very beginning” (Segertorp, et al, 2006). They have changed their process flow, reduced process time by 50% and increased telephone hours to create better availability. They have even changed their IT system to create a more effective invoice system between the branches over the world. The results create better customer satisfaction and increased revenue.

3.7 Analysis of the results

Unlike other branches Swedish construction industries have not been exposed to international competition. On the other hand manufacturing industries are facing competition all the time. They are competing constantly with the companies in order to secure market share. This is one of the reasons manufacturing industries are giving importance to improve labour productivity. The other reason is to cut down production cost. To survive in this competitive world, it is important to create a better value added work flow that can reduce production cost and, at the same time, make a better quality product to create customer satisfaction. Companies in the service branch (NLL) are facing criticism because of their long waiting list. The project “God Mottagning” (Good reception) has improved their queue system and showed a great improvement in their process management to deal with the fluctuated patient flow and better patient satisfaction.
Saab Automobile and Tomokuhus have reduced waste and production cost by improving labour productivity. The Swedish construction sector is blaming high production costs on the rise of materials, but Tomokuhus has succeeded in keeping the selling price to a constant over 16 years by improving quality and labour productivity. Saab Automobile in Trollhättan has improved labour productivity from 16 cars/employee/year (1992) to 62.7 cars/employee/year (2006) by reducing waste and eliminating unnecessary work.

Älvsbyhus has raised turnover by 365 MSEK between 2001 and 2005 (about a 46 % increase) and has increased revenue by 30% of turnover per year. Their rate of profit is way over other construction industries in Sweden. Due to their unique process thinking they can cut down their production cost by 3% per year. Because of the salary system which is based on labour performance, they have succeeded in motivating their worker’s and have secured a better market share.

4. CONCLUSIONS

Swedish construction industries are facing criticism for low productivity and high production cost. Labour wages and raw material prices are rising because of the high demand of construction work due to the strong economic growth in the Swedish economy. It is therefore important to produce more with the same input. As labour wages are high, labour productivity can be improved by raising human performance and by reducing non value-added activities.

To create dynamic competition between the supplier and clients, it is important that customers look for contractors who offer the best product for a reasonable price, which is unfortunately not possible due to high economic growth in the country. But international competition can change this scenario. Production cost can be reduced by improving labour productivity. In order to create a better market share the Swedish construction industry should take action to improve labour productivity to reduce production cost and enable better competition within the construction industries.

The Swedish construction industries need to change their way of thinking. A continuous process of labour productivity measurement and an effective analysis of measurement results are important. Furthermore, these results should be used to improve productivity. An improvement of labour productivity will automatically upgrade the level of value added activities and thereby reduce waste and cut down production cost. The Swedish construction industries have an old and traditional organisation structure and need updating. Every change in an organisation causes some consequences. Better knowledge and strong support from the management of the construction industries is therefore essential.

5. REFERENCES


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5.1 Interviews


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Eva Sjölund, Development Manager, Department of Surgery, Sunderbyn sjukhus, Luleå, Sweden, 22/01/2007.

Mats Blomgren, Personnel Manager (Former plant manager), Älvsbyhus, Älvsbyn, Sweden, 08/02/2007.


Stefan Lindbäck, Plant Manager, Lindbäcks Bygg AB, Piteå, Sweden, 16/01/2007.

5.2 Home pages

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