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# Logistic index for construction sites

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*The article is based on the report "Logistics Index for construction sites" written at LTH, Department of Technology Management and Logistics, in cooperation with Prolog Bygglogistik AB. The report has been written with the purpose of creating an index for the construction site's logistical activities.*

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The construction industry currently lack clear procedures and processes for dealing with logistical work on the various construction sites. Nor are observations and data that can be used for comparison between different construction sites available since very few factors are measured today. This lack of data in the Swedish construction industry stands out from other industries where production is controlled and monitored with the help of key figures. The thesis "Logistics Index for construction sites" aims to create a logistics index that can be used as a tool for a more controlled, measurable and comparable handling of the logistic activities on the construction sites in Sweden.

The results of the report are based on a survey in which 138 people, mainly supervisors and construction managers have responded. The main focus on the questions has been how different factors of logistics activities contribute to potential cost savings in a future change process. The result of the survey can be summoned within four areas that were considered the most important. Planning, deliveries, structure on the construction site and the APD-plan (disposition of the construction site). The Survey has been supplemented with a number of interviews in which people with experience in working on construction sites with challenging logistical activities contributed to the

survey. The purpose of the interviews was to investigate whether the four factors are possible to measure and how.

A currently used method for measuring the ability to plan a construction project is through the measurement PPC (percent planned complete). This measurement is a part of a planning method called Last planner or Lean project planning. The method is based on the classification of the coming week's assignments in specific and measurable activities. These activities are distributed to the various contractors in the project on a planning meeting every week. At the meeting the work of the previous week is measured with ones and zeros. This kind of measure creates a result in a percentage that indicates how many of the planned activities actually carried out and why other activities haven't been done as planned. These meetings creates a controlled flow of activities during every week of the project. As a metric PPC works excellent to see how well the planning and production interact, if a project does what it has planned to do. The measurement is well known in the Swedish construction industry but only a few projects actually use the measurement. The construction projects that do not use the PPC - measurements can instead use the short term production plan to coordinate planning without following up how well the production follows the plan.

As a complement to The last planner systems measurement PPC a measurement is needed for the construction sites ability to handle the supply change and in particularly the way of handling deliveries of building materials. A first step towards a more controlled way of construction is to first establish a current state. By connecting the regular control of deliveries to a computer based software in which information of the delivery is registered lots of new knowledge is gathered of how well this particular site is performing. At first, the measure should include the planned time of delivery, the planned way of unloading the truck and the planned amount of building materials. And the most important part, if there are any discrepancies. If there are, what went wrong and what was the reason. By using these sorts of measurements that indicates why discrepancies appear the contractors over time will gain knowledge of how well different logistic partners perform.

In addition to construction management's ability to manage the project through planning and supply management the actual construction site must be in a condition suitable for construction activities. Large quantities of materials, machinery and people moving around the area and the risk of inefficiency and unnecessary waste are big if the surfaces are used ineffective. A tool that the project managers can use to control this is the APD-plan. If the plan is used regularly, the area of the construction site can be structured in a manner appropriate to reduce waste in the production. The easiest way to measure how well a specific construction site uses the construction area is to measure how the different surfaces look like at different times. These visual measures should be made on both regular and irregular inspections. The control areas should preferably be crucial for the various flows on the construction site, such as: transportation roads should be free, unloading sites shall not contain materials

warehouse and storage areas should not contain waste or other remains. By establishing these sorts of control areas and monitoring them waste such as transportation, waiting and searching can be reduced and the safety on the construction site has increased.

The fourth measurement beside the ability to plan, the ability to handle the supply chain and the managers way of controlling the construction site through the APD-plan is the contractors view of how high the safety is on the construction site. The safety is measured by visual inspections of the construction sites. The measurement is based on a predefined scale between 1 and 10 in which 10 is a perfectly safe and well structured construction site and 1 is a dangerous construction site with no focus on handling waste and building materials. The grading is done by a foreman representing the contractors on a weekly basis. The predefined scale includes both written criteria for the different grades and illustrations and examples for making an objective measurement possible.

As important as the different measurements is the implementation of the measurement system. A requirement for the index to be both used and valid is that a active work is done with measuring all four measurements every week on the construction site. For this to be possible it requires commitment and knowledge among the construction managers and also among professional workers and subcontractors. This commitment is directly linked to the understanding of the purpose of the measurements. If no one from the staff understands the intention of the measurement system the interest and commitment to it will be low and the measurement system thereby unusable. The implementation of the system is therefore very important for the measurement systems development and existence.

To increase the understanding and enhance credibility of the metrics there are specifications developed for each measurement. The specification functions as a generally applicable statute for the four different measurements. Example of instructions can be descriptions of how the measurements are performed, the responsibilities for the operators, activities and contact information for any discrepancies. These specifications are controlled from a central organisation that answers for updates of the measurement system are made uniform and not specific on individual construction projects. This will over time ensure that the measurements are performed in a proper manner, and thus able to ensure comparability over time.

The way the results are presented on the construction sites is important in order to create involvement among the staff. The lead time between collected data and presentation of results must be short to produce timely and with relevant substance. The presentation of results should be visible in the construction sheds, well illustrated in several different ways to capture attention from as many workers as possible. Sub numerically in the form of tables, and structured in graphs or in an illustrative way in which colours and shapes may represent the development of the system.

By measuring and monitoring the construction process you create factual information about the processes that are creating value for your organization. The logistic activities such as planning, supply change management and an effective and safe use of the construction site is of high importance in managing a construction project. The knowledge created from the measurement system does not itself create value because it does not contribute to any improvement, but by the increased awareness it can be used as input to

improvements with substantially higher accuracy than without the system.

For example, subcontractors and suppliers are rewarded or challenged based on knowledge of how they actually perform. By following the development of metrics provides information on how individual suppliers deliver, the various contractors with access to production activity planning and how well the place of production are employed to reduce wastage limits. This newly created knowledge can be decisive in the procurement and planning of other projects in early stages, making the company or organization more competitive.

Another factor that the measurements system creates is the possibility to compare different project. This is of great importance when a company or a project tries to implement a change. In order to measure a change you have to have something to compare with. In order to make it possible to compare the system between different companies and between different projects it's necessary to use the specifications for the individual measurements. These specifications should be controlled by a central group that regularly work with upgrading the system and analysing results for companies or constructions sites. This group can also be used for education, and implementation of the system on new sites and for new construction managers.

Today there is a substantial lack of measurements in the construction industry. So there is a great need of a measurement system such as the logistic index, the question is in how much extra work the actual measures requires for being useful. Logistics index is currently made up of four different measurements. The idea was to complement these measurements by a number of supporting measurements. This proved to be unrealistic since the construction managers today already are

overloaded with work. Eventually, however, remains the vision of logistics index is enhanced and complemented by a number of additional measurements. But for this to be possible it requires that the

procedures for the actual measurement system are more implemented and that the index is used in a great number of projects.