Adapting The SCOR Make Process to the Construction Industry Settings

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1 Introduction

1.1 Background
Since 2009, Linköping University has been running the Builder’s SCOR project. The project is supported by the research collaboration Brains&Bricks where Linköping University, the construction company Peab, and the municipality of Katrineholm participates to enhance the efficiency of the construction industry. The Builder’s SCOR model (BSCOR) is based on the SCOR model (Supply Chain Operations Reference Model) developed and supported by Supply Chain Council (SCC, 2012, SCOR, 2010). The BSCOR project is divided into several sub-projects and is still on-going. This paper reports on the third phase in the project where the Make-process of SCOR is converted to BSCOR in terms of process definitions. The first phase, the pilot study, used the SCOR model in a construction setting and evaluated how useful the model was. This work is reported in Johansson and Persson (2011) and Persson et al. (2009), where the need for something very similar to the BSCOR model is argued. The second phase included a case study of a mid-range construction project (turnover of € 1 – 10 million) where the SCOR-processes Source and Deliver were studied. This resulted in new definitions of processes and metrics in order to take the unique conditions of the construction industry into consideration. The work is reported in Persson and Thunberg (2012) and Thunberg (2011). The third phase, in this paper, studies the Make-processes in construction through two case studies of mid-range construction projects. This paper outlines the results of the case studies and defines the processes in Make at the three different levels of BSCOR. As the last phase, Deliver and Plan will be studied through interviews with personnel from construction companies as well as from companies that order and buy construction projects. A study on adapting the Return-process is not conducted as the results from Thunberg (2011) indicate that faulty construction materials are seldom returned. With the four phases outlined here, a complete BSCOR model will be defined and used in several construction projects. The aim is to broaden the scope of use to other construction companies outside the collaboration of Brains&Bricks.

1.2 The Builder’s SCOR model
In Persson and Thunberg (2012) the first version of BSCOR is presented, covering the Deliver-processes from the suppliers and the Source-processes at the construction site. At level 1 in BSCOR, the supplier side is modelled by Deliver in Builder’s SCOR (bD). At the construction site, Source bS, Build bB (Make in SCOR), and Transfer bT (Deliver in SCOR) make out the main processes. The process Return bR and Plan bP are also part of the BSCOR framework, see Figure 1. There are no Returns from the customer back to the main contractor, as no physical movements of construction materials exist.

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materials exist. Invocation of guarantee due to defects in the building object is not handled in the Return process.

Figure 1. The conceptual structure of the BSCOR model in level 1, bS – Source construction materials and resources, bB – Build, bT – Transfer ownership and/or management, bR – Return, bP – Plan (Persson and Thunberg, 2012)

At level 2, the processes Deliver bD and Source bS are divided into three sub-categories. Deliver (at the supplier) follows the SCOR model’s sD1, sD2, and sD3. The new processes, bD1 – Deliver Make-to-Stock Construction Materials, bD2 – Deliver Make-to-Order Construction Materials and bD3 – Deliver Engineer-to-Order Construction Materials are introduced. For detailed changes, please refer to Persson and Thunberg (2012).

For Source, three new Source-processes are introduced all based on sS3, Source Engineer-to-order products. Source of construction materials is divided into sourcing of the contractor’s material and the sourcing of the sub-contractor’s material. Also, a third sourcing activity that is highlighted is the sourcing of resources, such as scaffolding and crane. Source Construction Materials bS6, Source Resources bS7, and Source Sub-contractor Materials bS8 are the new BSCOR processes for all sourcing at the construction site. The main reason for this division is that the contractor and the sub-contractors need to be aligned when it comes to planning of source processes.

In Persson and Thunberg (2012) only bS6, bD1, bD2, and bD3 are defined at level three. In level three, the main contribution in the BSCOR model is the introduction of a two-step process of inspection of arriving construction materials.

A new metric is also proposed in Persson and Thunberg (2012) to support the process definitions. Notification as part of the Perfect Order Fulfillment metric highlights the need to notify all deliveries to the construction site.

1.3 Build-processes in BSCOR
The purpose of this paper is to provide a definition of the BSCOR process Build (based on Make) in levels 1, 2 and 3. The definition is based on empirical findings in two case studies and an extension of the work previously published in Persson et al. (2009), Persson and Thunberg (2012) and Thunberg (2011).

2 Method
During the spring 2012, two case studies were conducted and reported in Johansson (2012) and Javalds and Lokander (2012). The aim was to map the use of Make-processes at two construction sites in order to adapt them to a construction setting.
The first case (Johansson, 2012) was an apartment building in Västerås. From February 2012 until end of May, data was collected and analysed focusing on the Make and Return processes of SCOR. The second case (Javalds and Lokander, 2012) was an apartment building in Nyköping. From February until end of April, data was collected with the aim to find and analyse faults in the construction process. Also here, the focus was on Make and Return. Both cases were conducted at the construction company Peab with over 50 years of experience, an annual turn-over of about € 4,300 million and 15,000 employees. Their main markets are the Nordic countries and they have over 3,000 projects running in parallel every year.

Early in both projects, the Make-processes were defined to create the Build-process based on the sM3-process of SCOR. Through observations and measurements, the validity of the new process definition on Build was established.

The case descriptions from Johansson (2012) and Javalds and Lokander (2012) was then used as input to a normative BSCOR definition that took place during the case studies and were finalized (in this paper) after the cases have been finished as a cross-case analysis.

3 BSCOR Level 1 Process

In the existing SCOR model, processes and metrics are denoted with a lower-case “s”. The reason is that Supply Chain Council (SCC) develops and endorses a handful different model (e.g. SCOR, DCOR, CCOR, etc). In order to separate one model’s processes and metrics from another’s SCC denotes them with a lower-case “s”, “d”, etc. The intention with the BSCOR model is to keep it as similar to the SCOR model as possible, in terms of names, definitions, etc. Therefore, processes and metrics in the BSCOR model are denoted with a lower-case “b”.

Early on in the project it was identified that a proper name for Make processes can be Build. The term Build describes quite clearly what the processes intend to describe, i.e. to build a building object. As the SCOR model abbreviates each level 1 process with the first letter in the process name, and our intention is to keep to the structure of the SCOR model as close as possible, the abbreviation of the process Build will be “B”. The definition of the Build process will be:

The process of adding value to the building object through preparation, mounting, assembling, painting, and erecting processes.

The level 1 Build process contains the two level 2 processes, i.e. Build Subcontractor and Build Contractor.

4 BSCOR Level 2 Processes

Persson and Thunberg (2012) present the work with adapting the SCOR process Source. It is argued that it is necessary to separate between sourcing materials for the main contractor and sourcing subcontractor materials and resources. The benefit from this separation comes in the planning processes, where we now can emphasize the importance of reconciling contractor’s and subcontractors’ sourcing processes. In this paper we keep the separation of contractor and subcontractor in the Build process, with the same explanation as for the Source process. This makes it possible in the BSCOR model to emphasize the importance of reconciling the planning processes at
the subcontractors and main contractor. The proposal of the definitions of the processes *Build Contractor* (bB6) and *Build Subcontractor* (bB8) looks like:

*bB6* - The process of constructing, designing, validating, and ultimately finishing a building. The process to produce a building object based on the requirements of a specific customer. In general the *Build* process requires that work instructions may need to be defined or refined and a site layout may need to be added and modified.

*bB8* - The process of constructing, designing, validating, and ultimately mount, assemble and erect subcontractors’ construction materials into a building. The process is based on the requirements of a specific customer (typically a contractor). In general the *Build* process requires that work instructions may need to be defined or refined and a site layout may need to be reconciled with the main contractor’s site layout and modified.

If you compare the definitions with the different *Make* definitions in the SCOR model one can see that these two definitions resembles the *Make Engineer-to-Order* (sM3) process. The obvious explanation is that process of building a house resembles the process of producing a product based on engineer-to-order, wherefore the similar definitions.

5 BSCOR Level 3 Processes

From the studies of the case companies it was realised that proper activities in the level 2 process *Build Contractor* are:

- bB6.1 – Finalize Production to Engineering
- bB6.2 – Schedule Production Activities
- bB6.3 – Site Work
- bB6.4 – Foundation
- bB6.5 – Framing
- bB6.6 – Façade
- bB6.7 – Structure Completion
- bB6.8 – Interior Trim
- bB6.9 – Installations
- bB6.10 – Finalize Building Object
- bB6.11 – Release Product to Deliver
- bB6.12 – Waste Disposal

How the building process of subcontractors looks like is still unexplored work, but our intuition is that it is more or less similar to the building process of the main contractor. Activities bB6.1, bB6.2, bB6.11 and bB6.12 are direct replicas of the SCOR activities sM3.1, sM3.2, sM3.7 and sM3.8, respectively. The SCOR activities sM3.3, sM3.5 and sM3.6 are not included in the BSCOR model, as we cannot describe a building object as being packed (sM3.5) or staged (sM3.6). However, the complexity lies in that even if we cannot speak of any “packaging” or “staging” the building object has to be finalized before the residents can move in. This “finalization” consists mostly of cleaning and as such. A proper name would therefore to name the activity *Finalize Building Object* (bB6.10). Issuing materials (sM3.3) is a complex activity as construction materials are continuously issued throughout all activities along the construction project. Including a separate activity for issuing
materials is not as necessary in the construction industry as in the SCOR model. Instead, issuing materials is added in the definition of the level 3 processes bB6.3 – bB6.9.

The rest of the activities (bB6.3 – bB6.9) are based on the Swedish list of new construction of real estate buildings (BI, 1999), as supposed by Javalds and Lokander (2012). As mention earlier, in the definition of activity bB6.3 – bB6.9 we add the activity of issuing sourced in-stock materials, but we also add the testing of the activity. The one who know his SCOR model notices that we choose to remove the activity Produce and Test (sM3.4). Instead we choose to add the separate activities bB6.3 – bB6.9, as the term “produce and test” is too generic in construction, and add the activity of testing into the definition of each activity.

6 Summary of results

Figure 2 illustrates the different activities (level 3 processes) associated with the level 2 process Build Construction. As discussed earlier, how the building process of subcontractors looks like is still unexplored work, but our intuition is that it is more or less similar to the building process of the main contractor.

References


