

Process mapping and improvement in a Prototype Build Organization

- Enhancing process performance of material supply

Marcus Berg & Caroline Nilsson

*Department of Industrial Management and Logistics,
Lund University, Faculty of Engineering,
SE-221 00 Lund, SWEDEN*

ABSTRACT

This article is based on the master thesis Process mapping and improvement in a prototype build organization which was conducted at Volvo Bus Corporation during 2012. The purpose of the study was to analyze and map Volvo Buses' product development process, with specific focus on the material supply process within the Prototype Build and Test (PBT) department, to identify areas of potential improvement and suggest appropriate actions as well as developing suggestions for Key Performance indicators (KPI's) to measure future improvement of the process.

The study employs a systems approach to provide a holistic view of the studied organization and is conducted through a case study using mostly qualitative data. A literature study in the areas of process understanding, process mapping, process analysis, process improvement, process measurement and organizational structure is the basis for the analysis model used in the study.

The analysis identifies a number of issues negatively affecting the

performance of both the product development process as a whole and the prototype build sub process.

The results of the study shows that better control over material flow, increased communication and information sharing together with clear structured role- and responsibility descriptions is essential to increase the performance of the product development process.

1. INTRODUCTION

Product development in the automotive industry is characterized by a high demand on short lead times and efficient use of resources. This is no different for Volvo Bus Corporation, the second largest manufacturer of buses and bus chassis in the world, whose global product development organization is under pressure to find new ways to meet an increased amount of projects along with requirements on shorter lead times. For the PBT department, one actor in the product development process, this means that gains in process efficiency and effectiveness are needed to meet future demands.

The initiative for this study was taken by the PBT department as much of the documentation and information needed to make informed decisions on how to improve the performance of the process was lacking. The objective of the study was to analyze the prototype build and test process, provide the department with an “as-is” process map and suggest an improved process to address the identified issues and improve efficiency.

Based on these premises the following research questions were formulated:

- How can the process be mapped to expose problem areas?
- How can the process be improved to enhance the efficiency?
- How can stagnation in build and delays in projects be prevented?
- Why are the material deliveries unreliable and how can the reliability of material supply be enhanced?
- How can the organizational structure be changed to facilitate efficiency gains in the process?

The study was limited to analyzing only the PBT site in Gothenburg and it was also decided to focus on the material supply process, the core process within PBT which was early on identified as having the greatest need for improvement.

3. METHODOLOGY

An important aspect of the study was to identify and understand the relations between all of the actors in the product development process to see how each sub-process, like the PBT process,

affects and is affected by other parts of the process. For this reason a systems approach was employed to enable an analysis of the entire system and not isolated parts of the system.

The thesis was conducted as a case study as this research strategy was most suited for the situation. This assumption is made due to the ‘how’ and ‘why’ nature of the research questions and the focus on contemporary events, as suggested by Yin (2003) and LeCompte & Preissle (1993). The case study is also an appropriate research strategy when applying the systems approach (Gammelgaard, 2004).

The bulk of the empirical data was gathered using qualitative data collection methods. These data collection methods were mainly semi- and unstructured interviews with representatives from all parts of the process complemented by observations. Some data was also collected through reviewing documentation and archival records, although the extent of this data collection was limited. Two rounds of literature reviews of existing theory were also conducted to create and subsequently expand on a theoretical frame of reference.

4. THEORETICAL FRAMEWORK

The purpose of the thesis was to find a more efficient way to organize the PBT department and to create a clear and structured process. This was the basis for the literature review that led to the development of the theoretical framework used for the analysis in the



Figure 1. Conceptual model of the theoretical framework used for analyzing the studied object.

study. This framework includes six areas:

- Process understanding
- Process mapping
- Process analysis
- Process improvement
- Process measuring
- Organizational structure

The idea of the framework, which is presented in figure 1, is to visualize what is required to succeed with business process development. At the beginning an understanding of the process concept must be established. After this the process can then be mapped, analyzed, improved upon and measuring can be employed both to verify improvement efforts and to identify further improvement needs. In order for this all to work there is also a need for an organizational structure which facilitates and encourages process enhancement work.

5. ANALYSIS

The analysis of the product development process was conducted on multiple levels. To ensure that a holistic analysis was made the entire product development process was first mapped and analyzed. Subsequently a more detailed mapping and analysis of the

PBT process was performed. This led to the identification of a number of issues with negative affect on process performance both in the product development process as a whole and in the PBT process.

The first issue was a lack of process orientation within the product development organization. Much work had been done to create detailed processes for how the product development was supposed to be carried out, but not enough focus had been put on ensuring the commitment and dedication of the process users. Many employees did not know of, or work with, processes at all.

Through the analysis of the entire product development process issues concerning information exchange, communication, time- and resource planning, unclear distribution of responsibilities and unclear role descriptions were identified.

When analyzing the core processes of the PBT department it was made clear that the biggest issues were related to material supply. The overall control over inbound material was highly deficient. The three main issues were: delivery control, goods receiving and inventory

control. These three issues all lead to a large uncertainty in the material supply which manifested itself through standstills in the prototype build and poor utilization of resources.

6. RESULTS & RECOMMENDATIONS

In order to come to terms with the insufficient level of process orientation Volvo Busses needs to actively start working to introduce process thinking throughout the organization. Process experts should be enlisted to help in the design of a process orientation program aimed at infusing a process based view in the employees. All process users need to be committed and actively partake in improving the process.

This lack in process orientation is also connected to the problem of communication and information exchange not being sufficient i.e. the employees see only their own task and not the connection between themselves and other employees. What is needed to change this is a shift in mentality so that employees understand and value cooperation and communication.

To counteract the problem with unclear roles and responsibilities all of the actors within the process need to cooperatively formulate a common view of the process and the roles within the process. This will result in a commonly agreed upon distribution of responsibilities and role descriptions which will increase the efficiency of the process as less time is spent "re-inventing the wheel".

One major issue within the product development organization is that it is

often not realistically possible to conduct projects according to the time- and resource plans assigned to the project. The process for how these plans are created must be revised if the organization wishes to become more efficient and effective. It is crucial that input from the line organization, which must also be realistically formulated, is used as a basis for the creation of the higher level time plans and not the other way around. If it is deemed that a certain deadline must be met; the appropriate amount of resources must be allocated to the project.

For PBT it is essential to regain control over the material flow if the organization wishes to improve their performance and be able to meet the demand for shorter lead times. To do this PBT must implement proactive delivery control, improved goods receiving routines, improvements to the current inventory control system and improved warehousing routines.

The main issue with the current delivery control at PBT is that it is not proactive. This means that late deliveries are not discovered until they should already have been delivered and there is no time to plan ahead which leads to standstills and poor utilization of resources. This is a big problem as it is exactly what PBT does not want in its process. The solution is to work proactively and identify delays before they occur to avoid problems in the build process.

The goods receiving is a problem at PBT because a lot of material never actually gets properly goods received and material essentially goes missing. In

order to have an efficient building process it is essential to know where the building material is. Therefore every single material needs to be goods received. This also means that PBT's inventory control system and its warehousing routines must be improved to fit their operations. Unlike the current situation every movement of material must be registered, it must be possible to easily locate and pick material and all personnel working in the warehouse must follow the same routines.

PBT also needs to start measuring its performance. When you have a functioning measurement system it is possible to not only validate whether or not improvements are being achieved, but also to identify new areas where improvement is needed. For this reason a set of KPI's are suggested measuring delivery performance, goods receiving, and standstills in the prototype builds. Together, these measurements can show how well PBT are dealing with their biggest issues and where more work is needed.

Another important area that PBT, and indeed the entire product development organization, needs to work on is continuous improvements. The potential gains of having a culture of employee-driven continuous improvement are enormous and at almost no cost. To succeed in implementing a continuous improvement program the employees need to be educated in both the conceptual and practical aspects of the concept. They will also have to be provided with a set of continuous improvement tools to conduct the actual work. It is also important to note that

implementing a KPI measurement system is a good first step towards working with continuous improvements for PBT.

7. CONCLUSIONS

The study has shown that in order to meet short lead times and a large amount of projects in a product development process it is essential to work in a clear and structured way and to maximize communication and information exchange. For a prototype build organization it critical to keep close track of the material flow. The study has also showed the importance of process orientation in an organization working with business processes. If the users of the process do not possess a process-based view the full potential of the process concept will not be reached.

8. FUTURE RESEARCH

During this study it was discovered that not many studies within the area of prototype organizations had been made and consequently literature and theory is scarce. This study has attempted to fill some of these gaps but there is still a need for further research. Studies employing benchmarking between several prototype organizations would be an interesting field for future research.

This study was limited to a single site in a global product development organization with focus on a prototype building department. Needless to say the scope of the study was quite narrow and it would therefore be of great interest to expand the scope of a similar study to analyzing the global aspect of such an organization.

REFERENCES

Gammelgaard, B., 2004. School in logistics research? A methodological framework for analysis of the discipline. *International Journal of Physical Distribution & Logistics Management*, pp. 479-491.

LeCompte, M. D. & Preissle, J., 1993. *Ethnography and Qualitative Design in Educational Research (2nd ed.)*. San Diego: Academic Press.

Yin, R. K., 2003. *Case Study Research Design and Method (third ed.)*. Thousand Oaks: Sage Publications.