

**IMPROVING LOGISTICS PROCESSES IN INDUSTRY USING  
WEB TECHNOLOGIES**

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**Abstract**

*The aim of this paper is to propose the concept of a system that takes advantage of web technologies and integrates them into the management process and management of internal stocks which may relate to external applications and creates the conditions to transform a Computerized Control of Warehouse Stock (CCWS) in the company. The importance of implementing CCWS is in the elimination of the claims caused by the human factor, as well as to allow the processing of information for analytical purposes and their subsequent use to improve internal processes. Using CCWS in the company would also facilitate better use of the potential tools Business Intelligence and Data Mining.*

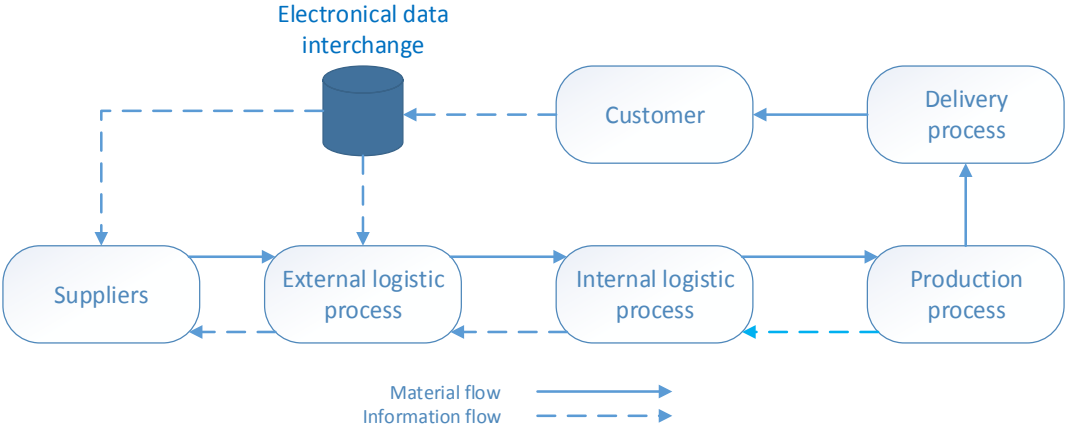
**Key words**

*web technologies, automotive, logistics processes, computerized management*

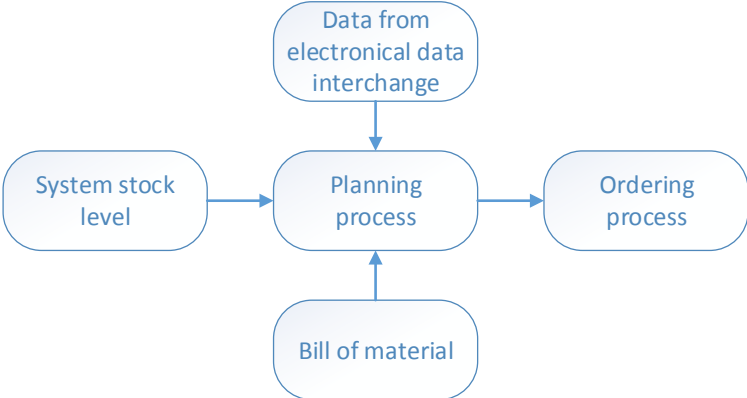
**INTRODUCTION**

The automotive industry is one of the most currently expanding industries worldwide. The pressure is to increase efficiency and ensure the competitiveness of a firm by finding effective, relatively inexpensive and quick solutions. In the case of production logistics, attention is focused on the quantity of available stock in the pre-production, production and post-production process. Therefore, requirements for the information systems in the automotive field are rapidly increasing (1). Stock affects the economic results of companies and therefore the quantity of funds available with which they can operate. It is important that these stocks at all stages of the pre-production, production and post-production process have been kept as low as possible. It is a philosophy of JIT, which talks about the elimination of all losses in the manufacturing process. Pressure in the logistics area is on minimizing stock

while fully ensuring continuity of production. The application of JIT demands exact coordination of all related processes and flows (2). In order for the company to achieve this state, considerable efforts are required in the area of human resource management, the level of communication, production management, planning of material resources and their efficient use. Competition in the automotive industry is very large and it is still necessary to control and minimize the cost and work to improve either logistics or production processes. Therefore it is necessary to find solutions that are efficient, fast and as cheaply as possible. Stock management is very important to ensure the accuracy of components. In practice are situations when the difference between the actual state and the systems state of supplies is so significant, that it may threaten the production (3). Therefore, it is important to have a system to minimize this threat as far as possible, while enabling continuous monitoring of material flow in the company and in real time provide the necessary information for inventory management (4). Figure 1 shows the top logistics process in the company. The article focuses on the management of the internal logistics process, whose activity affects production and the external logistics process directly as well as the overall economic performance of the company.



**Fig. 1** Main logistic process



**Fig. 2** Inputs and output of the planning process

Problems in the internal logistics are directly dependent on the system records. Management of internal stock and the correct system level of supplies has an influence on the entire planning, ordering and production process. The current system uses written records which is an outdated approach and does not provide real-time information for different levels of management. Employees have to record every change in supplies to the prepared tables. These tables are placed on the shopfloor. Information on these tables is not complex and does not allow to store information over time. Therefore, processing of this information is very complicated. Also it is very difficult to ensure updates, when information on these tables has to be changed.

The primary objective of this proposal is to control safety stock and overstock and also communication between the warehouse and the executive management, which ensures a smoother flow of material and information and shortens the reaction time in case of adverse situations.

## **METHODOLOGY**

For mapping business processes in the company, we used Business Process Model Notation. It is the methodology that is used for business process modeling. It is used to illustrate business processes in a graphical form, provide a clear overview of the activities carried out, and activities that are part of the process described above. This standardized notation enables organizations to communicate internally within the company or to communicate with other organizations on a standardized level, thus avoiding misunderstandings caused by unclear communication (5).

After mapping the business processes which have a key influence to the internal material flow in the company, we focused primarily on the design of these areas as evidence of internal material flow control, safety stock control and overstock.

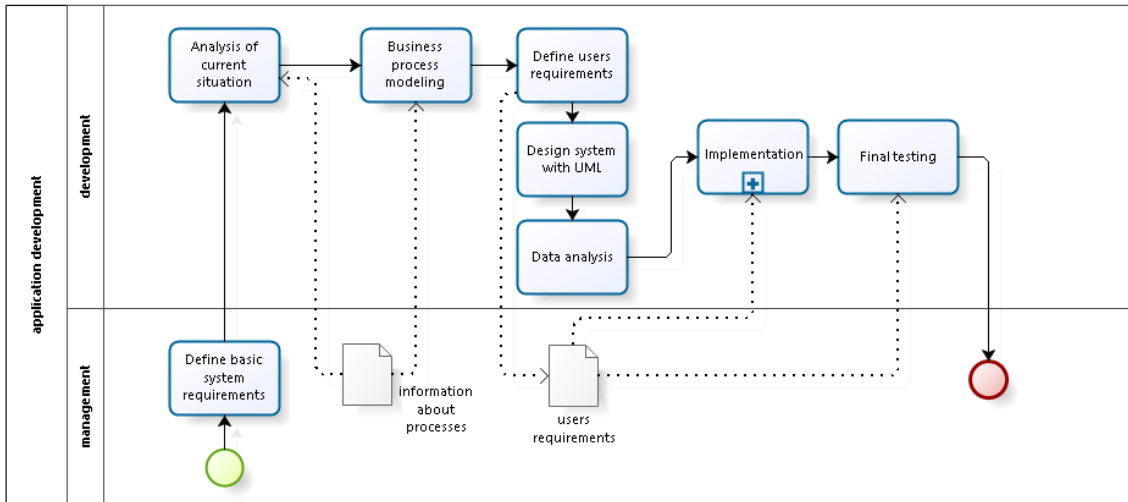
Then we proposed to model the system using the unified modeling language UML, which is the most commonly used graphical modeling system. The range of use of the modeling language is much wider in view of the extension mechanisms build in. It has been designed to connect existing best practice modeling techniques and guarantees the modeling complexity (6).

After modeling the system in UML, we created a database output from Enterprise Architect 12.0 in the form of SQL script that is generated from the physical data model. After generating the SQL script, we imported it into phpMyAdmin. After importing the database, we started with programming functionality of the system.

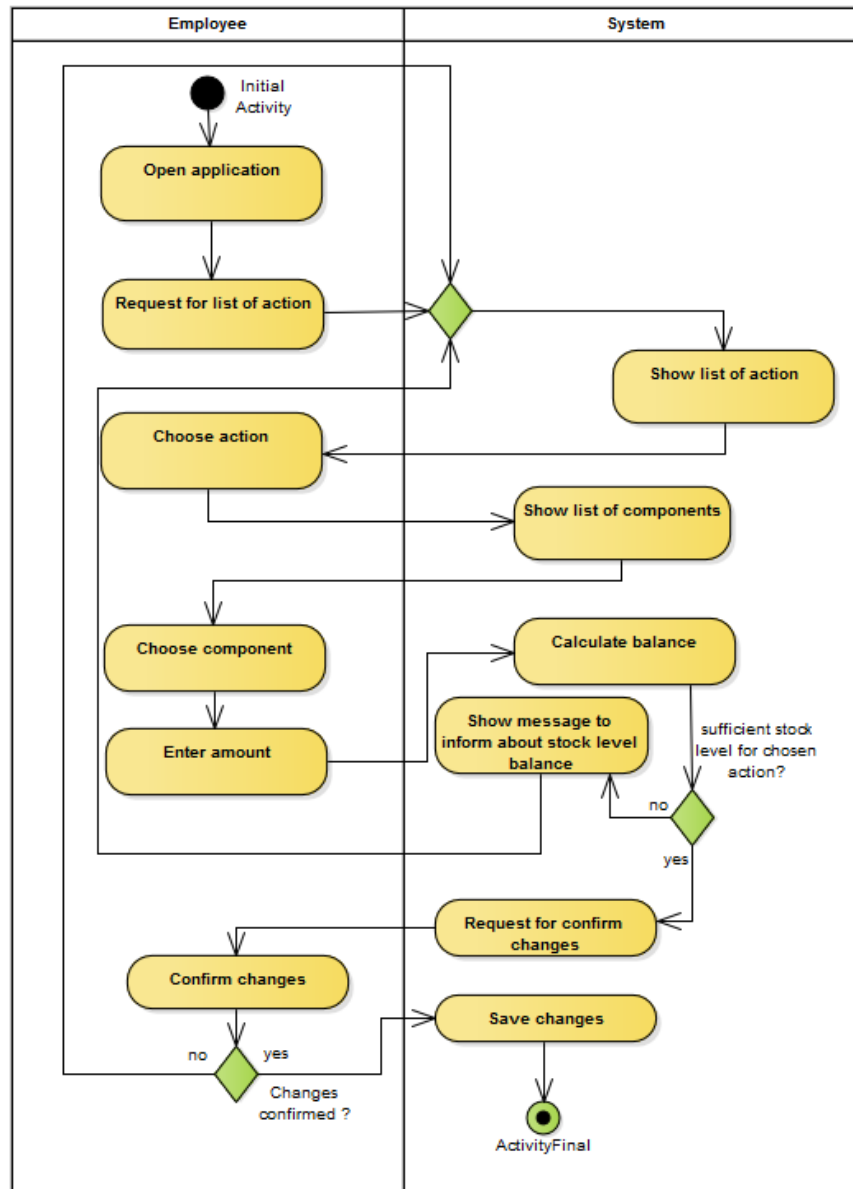
In the proposal of the user environment, we focused on creating the most intuitive environment given the fact that users of the system may have different technical skills. For the creation of a communication with the database, we used the open source scripting language PHP, which is compatible with almost all servers used today. Graphical illustration of the system development is shown in Figure 3.

### ***Proposal of a system to improve logistics processes***

The UML diagram in Figure 4 describes the flow of communication between the employee and the system. Activity begins when the employee opens the system and chooses an action from the list. Then a list of components is shown, and the employee selects the component and fills in the quantity. The system recalculates a balance of components in the warehouse. According to this recalculation, a message is shown about the request to confirm this change or inform about suggested actions. Consequently, the activity ends when the system save the changes.

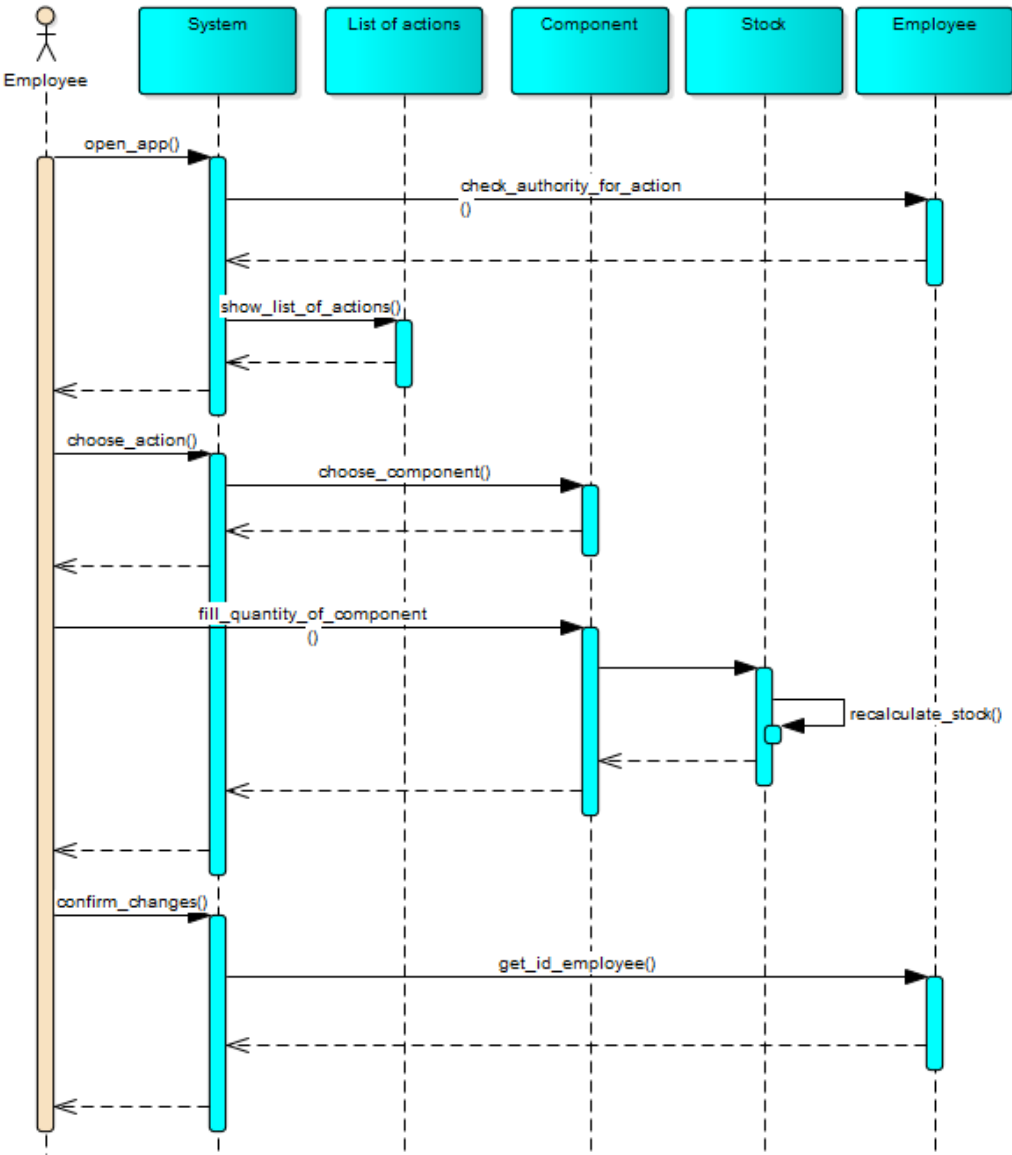


**Fig. 3** Process of developing system



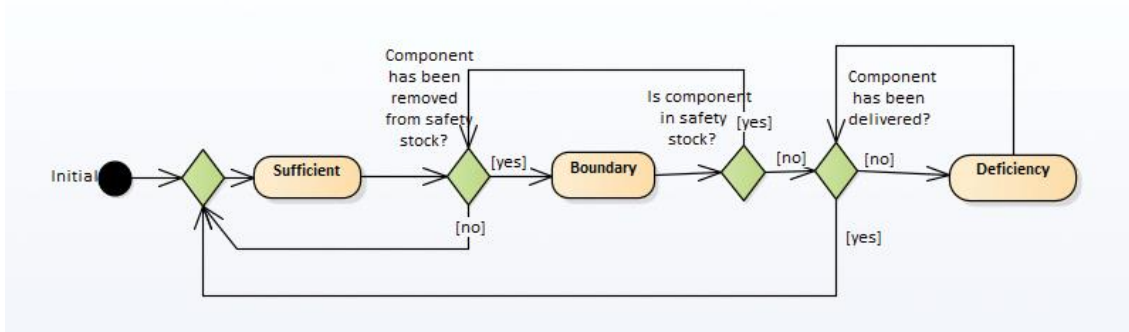
**Fig. 4** Process of working with a component in the system

The diagram in Figure 5 describes the flow of communication between employee and the system. When the employee opens the system, the system checks their authority level and subsequently shows a list of actions, which are allowed for the given level of authority. The employee chooses an action and quantity of components they want to work with. Then stock is recalculated. The employee can confirm changes and the system writes their ID to the database for this change.



*Fig. 5 Diagram of communication between employee and the system*

An important part of this proposal is to identify the general component states in the process. If the component is in stock and is not removed from the safety stock, then we talk about the “Sufficient” level of components in the process. If the stock level of the component decreases and it is necessary to use it from safety stock, a threat to production may arise and it passes to the “Boundary”. In the case of the exhaustion of safety stock, the production stops and the component state is changed to “Deficiency”.



**Fig. 6** General states of components in the proposed system

**Data analysis**

Data analysis provides information about the types of data attributes used in each class. At the beginning of the data analysis, we transformed the class diagram of the Enterprise Architect 12.0 into the physical data model. Consequently, it was necessary to change the data types that are compatible with the data types used by MySQL. Data Modeling we used to determine relationships between data objects of the system (7).

In Figure 7 is the physical data model of the system, based on the class diagram. All classes used in this model have direct connection, whether with external or internal logistics processes. The specific class is the class “zleps\_navrh” and is the resource class that will contain information about process improvements that are directly associated with the present logistics processes. Other specific classes are class “BZ”, “proces\_zaskladnovania” and “ps”, which contain the same attributes. Therefore they can be combined into one class. The solution with three classes instead of one we chose for easier adjustment in the future.

**CONCLUSION**

Management of internal stocks is one of the most important tasks of management of each production company. Therefore is necessary to ensure the most efficient management of processes related to internal stocks. Solving the problem of internal stocks management by integrating web technologies into the process and replace outdated processes for inventory management in the company allows for better tracking, controlling and data analysis of the logistics process. The proposal is based on the generally modification concept of internal stock management, exchange the classic system based on inefficient and risks bringing the physical transferring information to the computerized. This change also linked to external systems in the future will allow better use of the potential of data mining and Business Intelligence and subsequent prediction and elimination of unwanted events from the process of stock management.

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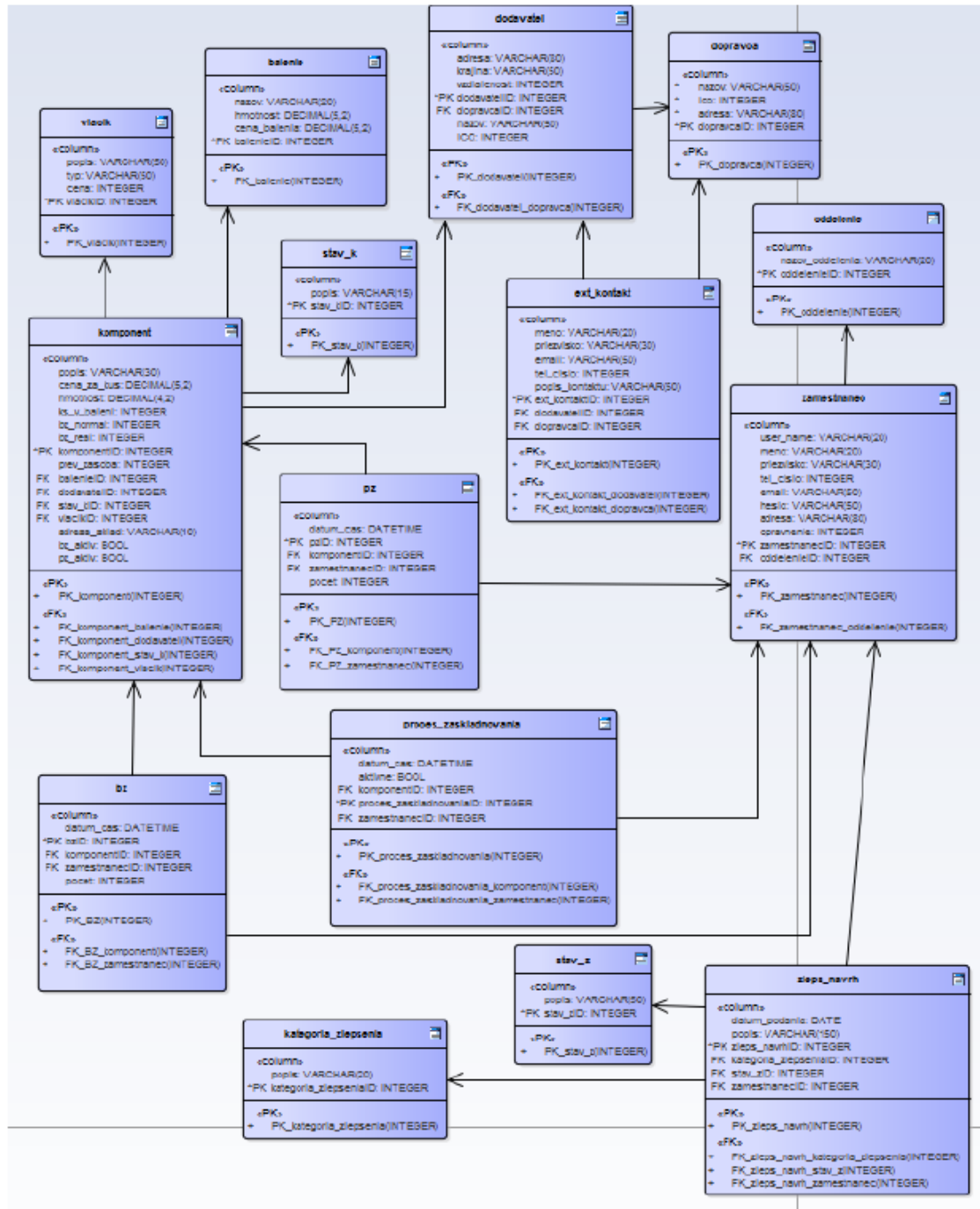


Fig. 7 Proposed Data model of improved system

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