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Development of Swim Lane Workflow Process Map for Sales and Inventory Workflow Management Information System: A Case Study of Petrospan Integrated Services, Eket, Akwa Ibom State, Nigeria

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Abstract

According to experts, sales workflow management system can impact overall sales effectiveness, vis-à-vis, improve the efficiency of sales people, accelerate sales follow-ups, increase sales and reduce costs. On the other hand, inventory management system can be used to avoid product overstock and outages by tracking inventory levels, orders, sales and deliveries. This paper identified the problems prevalent in the existing sales and inventory flow management system at Petrospan Integrated Services in Eket, Akwa Ibom state, Nigeria. Then, the analysis and design of a new sales and inventory workflow management system for the Petrospan Integrated Services was presented. The "as-is" sales and inventory workflow management system was first modelled using swim lane process flow map. Then, the swim lane process flow map was also used to develop the "to-be" or "should-be" sales and inventory workflow management system specifically to address the shortcomings of the "as-is" workflow management system as well as to facilitate the development and deployment of automated sales and inventory management workflow management system at Petrospan Integrated Services-Sales Eket.

Keywords: Process Map, Sales Process, Workflow management System, Inventory Process, Workflow

1 Introduction

Nowadays, organizations typically employ a vast array of computing technologies to

support their information processing needs. One of such tool is workflow management system [1]. Workflow is defined as “systems that help organizations to specify execute, monitor, and coordinate the flow of work cases within a distributed office environment” [1, 2]. Also, a workflow can be characterized with respect to the set of steps the workflow will perform [3]. Such steps may include generating or modifying a business object, generating and sending fax or an email, taking decision based on a query, and so on [3]. Ideally, workflow management system contains two basic components: the first component is the work flow modelling component, which enables administrators and analysts to define processes (or procedures) and activities, analyze and simulate them, and assign them to people. This component is sometimes called the “specification module” or the “build time system”. It also may be used to view work process statistics, and to make changes to processes [1]. The second component is the workflow execution (or enactment) component, sometimes called the “run-time system” [1, 4]. The run-time system is made up of the execution interface (which is the part that is seen by end-users) and the “workflow engine”. The workflow engine is the execution environment which supports in coordinating and performing the processes and activities. It enables the units of work to flow from one user’s workstation to another as the steps of a procedure are completed [1, 4].

Over the years, the advent and advancement of workflow management system have given rise to diverse business process improvement and automation systems [5, 6 7, 8, 9, 10]. For business entities that deal on the production or sales of products, improvement in the sales and inventory management system is essential for attending or sustaining competitive advantage [11, 12, 13]. Such process improvement can be pursued through workflow process improvement. In practice, at the beginning of any process improvement efforts, an “as-is” flowchart is required to help the people directly or indirectly engaged in the process to understand how the process is currently working [14]. The team may find it helpful to compare the “as-is” flowchart with a diagram of the “to-be” or “should-be” workflow process.

Typically, swim lane or deployment flowchart is normally used for modelling business processes. A Swim lane diagram is a process map that separates process steps by function, department or individual. Each lane represents a different department or individual. The process map is called a swim lane because the map resembles a pool with lanes identifying the different groups in the process [15] Swim lane, which is also called deployment flowchart, depicts the actual process flow and it also identifies the people, groups or units involved at each step. Horizontal lines define customer-supplier relationships. Importantly, deployment flowchart indicates how the individuals or groups fit into the sequence of steps in the process, and also how people or groups relate with one another in the entire process steps [16, 17, 18, 19, 20]. During any process improvement initiative, swim lanes will help to identify not only the bottlenecks that exist in a process, but it will also to identify which of the departments is responsible for the bottlenecks.

In this paper, the “as-is and the “to-be” workflow process models for sales and inventory Workflow Management Information System (WFMIS) is developed for Petrospan Integrated Services-Sales Eket. The “to-be” workflow process model is design to address the challenges identified with the existing “as-is” workflow process model at Petrospan Integrated Services-Sales Eket. The “as-is and the “to-be” workflow process management system are present using swim lane process map. In all, the proposed workflow process is meant to facilitate the development and

deployment of automated sales and inventory management workflow management system at Petrospan Integrated Services-Sales Eket.

2 Methodology

The focus in this paper is to present the development of swim lane workflow process map for sales and inventory Workflow Management Information System (WFMIS) for Petrospan Integrated Services-Sales and Inventory Management System (PIS-SIMS). First requirement engineering is carried out which involves requirement elicitation and analysis. Specific tasks carried out at this stage include among others, studying of the present system, interviewing of relevant stakeholders, modelling of the present system using low fidelity prototyping techniques, etc. Figure 1 depicts the different steps and method used in the requirement engineering and requirement specification for the system. Subsequently, the "as-is" and the "to-be" swim lane workflow process map for the sales process flow map and for the inventory process flow map of the present system are then developed.

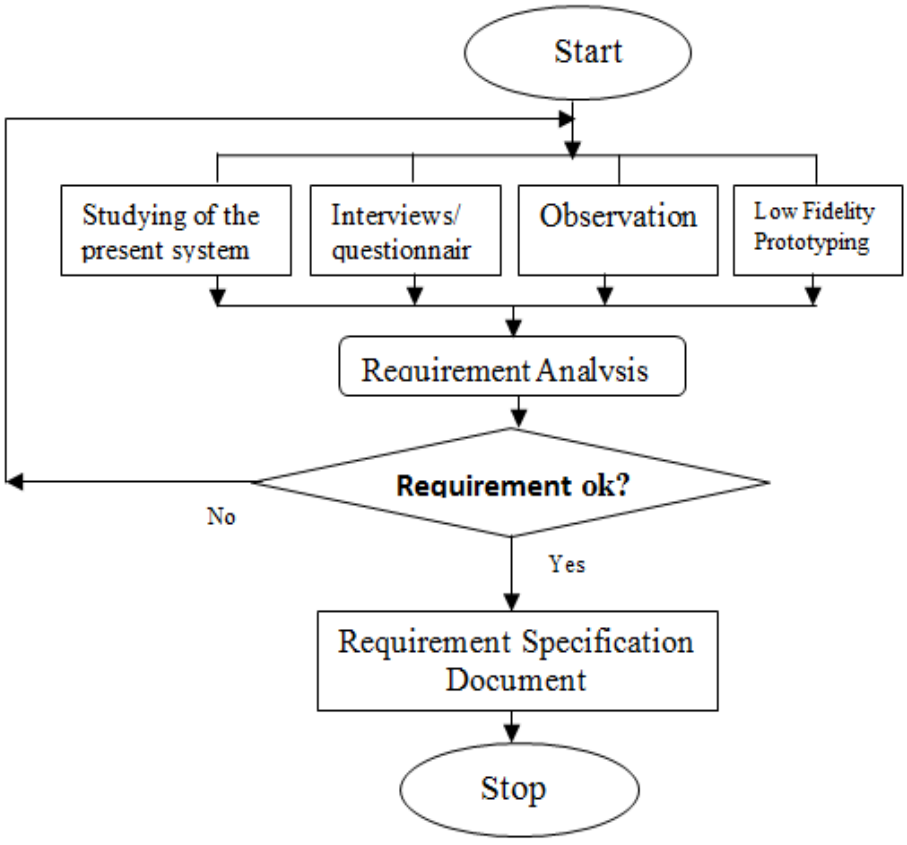

Figure 1: Requirement Engineering Process for the PIS-SIMS.

2.1 Brief Description of the existing ("as-is") system

According to the findings from the requirement engineering tasks conducted at Petrospan Integrated Services, the method of transaction is mainly manual, involving over 99% of paper work. After the requirements are analyses, the "as-is" sales process map of the current system is developed as shown in Figure 2.

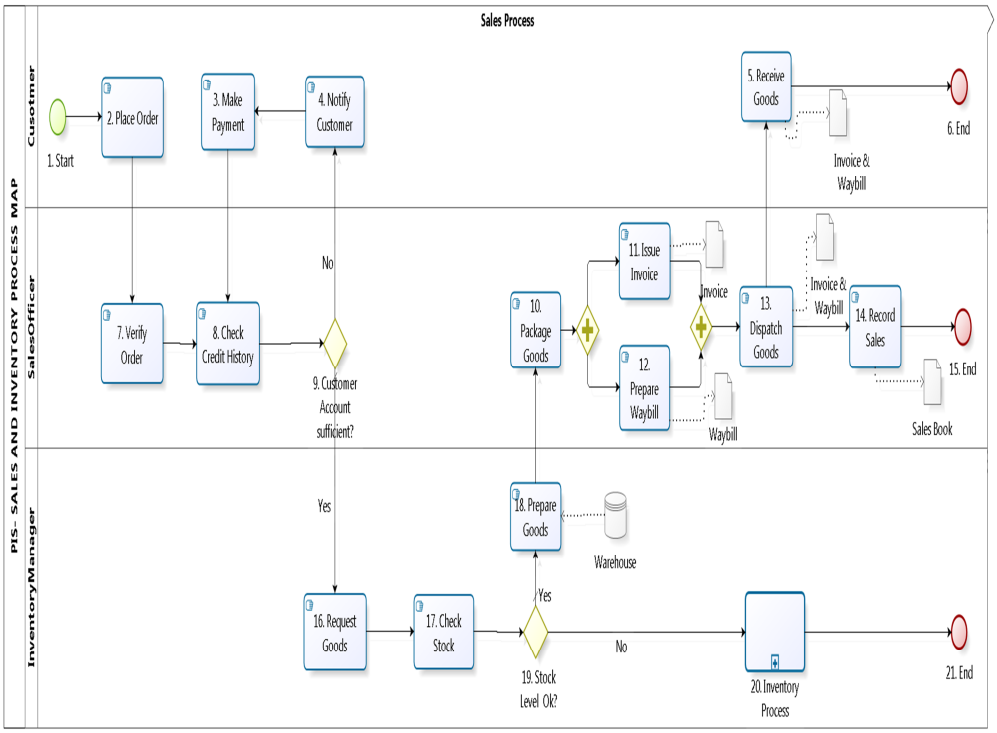

Figure 2: Sales Process map of the present System.

Figure 2 shows mainly the processes and steps of the present system taken by the sales officer. The *Sales Officer* is responsible for taking the order of the customer, confirms customer's credit status. The *Sales Officer* does this by checking the credit book and informs the customer about the customer's status credit. Then, the customer makes payment for his/her order. The *Sales Officer* takes the ordered goods from the warehouse; packages the goods for delivery to the customer; issues invoice to the customer and records' the sales in the sales book. The sales officer is also responsible for taking daily count of the stock and recoding them in the stock book. The administrative officer goes through the sale book and the stock book every week to confirm that the total number of sales from the sales book corresponds with what is recorded in the stock book.

The "as-is" Sales process map in Figure 2 starts with step 1, where customer come in and in Step 2 places order with the sales officer. In Step 7, the sales officer verifies the order and Step 8, checks the credit status of the customer from the credit book. Then, the customer in Step3, makes payment to the sales officer, and in step 9, the customer confirms if the amount is sufficient and sends a request in step 16 for goods from the inventory manager. In Step 17, the inventory manager checks the stock and confirms if there are enough stock and in Step 18 the inventory manager informs the sales officer, who packages the goods in step 10. In Step 11 and 12, the sales officer prepares and writes the invoices/receipts and issues the invoices/receipts to the customer, together with the goods. Lastly in step 14, the sales officer records the sales in the sales book and if the user did not pay cash, the sales officer also records the sales in the credit book along with the name of the customer and the sales made to the customer.

The major shortcomings of this “as-is” process is that it is about 99.9% manual and as such is tedious, time consuming and is prone to error and fraud. It leads to the sales officer manipulating the stock books, the credit books and the sales books. Sometimes the books, invoices or receipts get missing, torn out and goods and money can easily be lost due to fraudulent records. In most cases, the manager finds it difficult to reconcile all the different records with the sales officer, and this leads to frequent changes in sales officers by the manager.

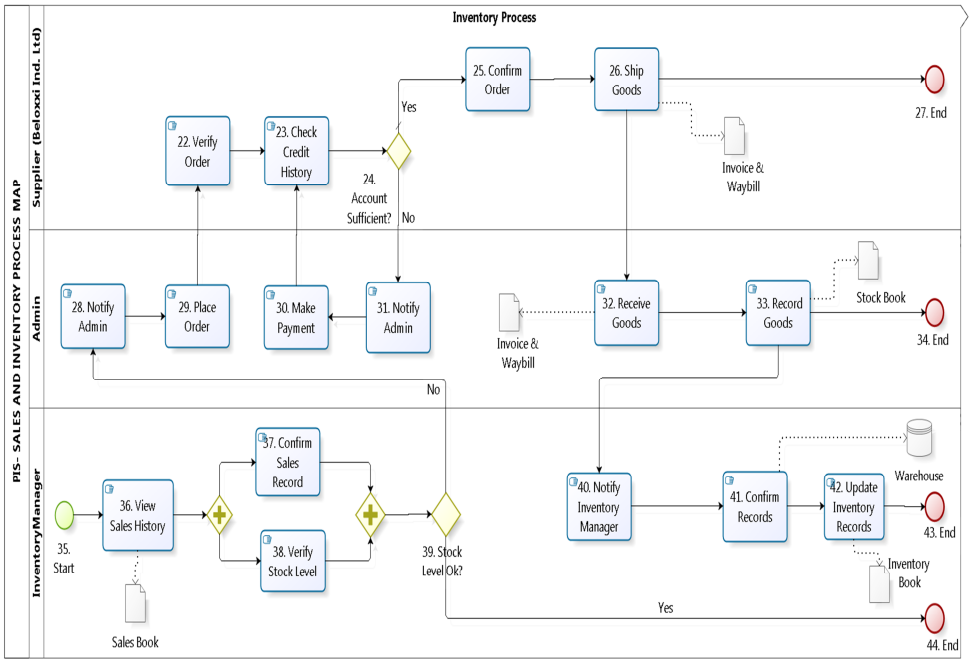

Figure 3: Inventory Process Flow map of the present System.

Figure 3 shows the Inventory manager process map of the present ”as-is” system. The process starts in Step 35, where the inventory manager checks the sales book for the daily sales; that is, the inventory manager examines the sales history and records from the sales books and in Step 38 checks the stock level from the stock book. If the stock level is low, the inventory manager informs the administrative officer in Step 28, then, the administrative officer goes ahead to place order for the stocking of the goods in Step 28. In Step 40, the inventory manager also confirms the received ordered goods and updates as appropriate in his books in step 40. In all, given the limitations of the existing manual and paper-based “as-is” process flow management system at Petrospan Integrated Services, there is need for an improved process flow management system that can address the challenges.

2.2 Process Maps of the Proposed New System.

The proposed Petrospan Integrated Services-Sales and Inventory Management System (PIS-SIMS), is a computerized method which is different from the present manual method being used by the company presently. It tries to address the weaknesses and lapses inherent in the current “as-is” sales and inventory management system being used in the company.

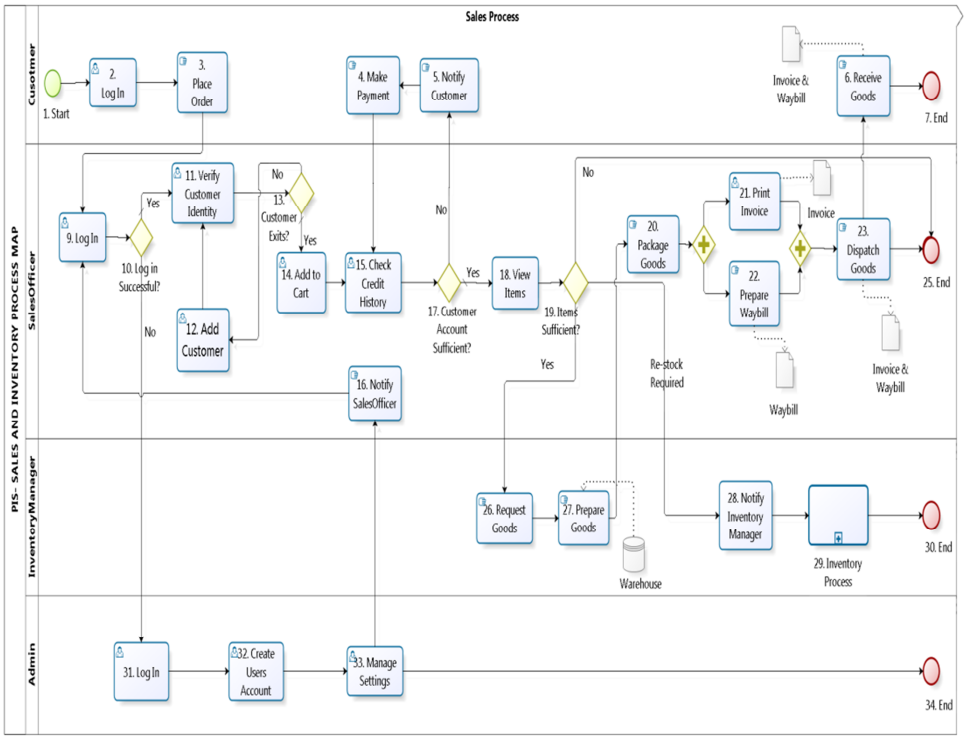

Figure 4: Sales Process map of the PIS-SIMS

Figure 4 shows the sales process map for the proposed “to-be” PIS-SIMS. It starts with Step 1, where the customer logs in to place order from the company’s website, if the customer is already a registered customer, else the customer will be required to register at the company’s website. There is also provision for walk-in customers to be registered by the sales officer in Step 12. The sales officer logs in to the system with sales officer’s “user id” and password in Step 9; if successful in Step 10 the sales officer verifies customer’s identity and places order in 12, else he contacts the administrative officer about the unsuccessful login in Step 31. The customer makes payment in Step 4 and the sales officer checks the system for the credit history of the customer in Step15 and confirms account sufficient check for the order placed in Step 12. If customer’s account is sufficient for placing order, the sales officer sends and alert or mail to (or chat with) the inventory manager in Step 26 requesting for the goods ordered by the customer. The inventory manager prepares the waybill and sends the waybill to the sales office in Step 27. The inventory manager enters also the waybill information into the database. The sales officer views the prepared waybill in Step 20, packages the goods and prints out the invoice for the customer in Step 21. All these steps are automated and captured in the audit trail log for accountability. The invoice generated by the system has “invoice id” for tracking of goods or items as well.

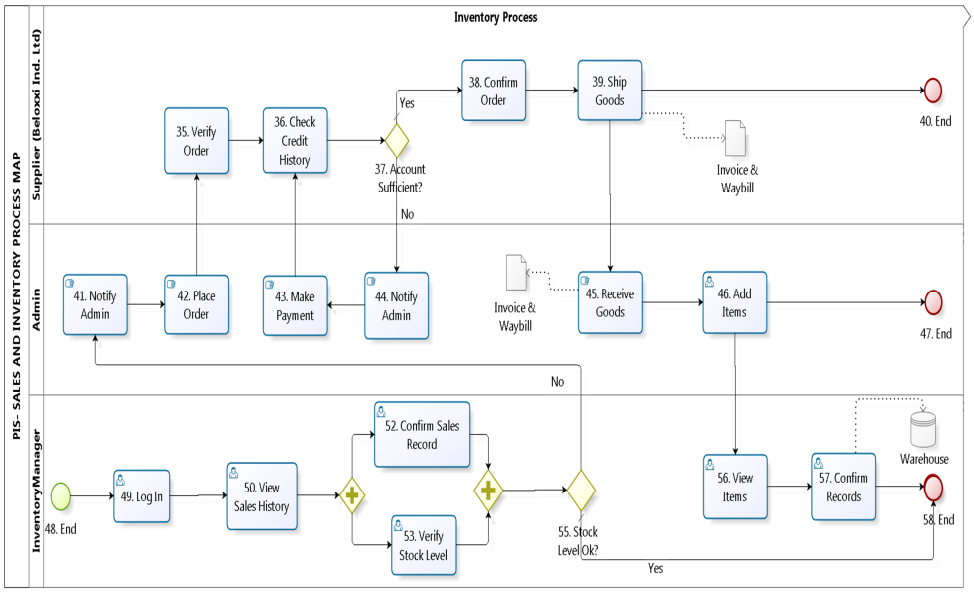

Figure 5: Inventory Process map of the PIS-SIMS.

Figure 5 shows the inventory process map for the proposed "to-be" PIS-SIMS. The inventory process starts with Step 49, where the inventory manager logs on to the system, with inventory manager's user name and password to access the system. The inventory manager has the privilege of viewing all the transactions that have taken place in the system in Step 50. He confirms the sales record in Step 52 from the system unlike the old method he needs to consult the sales books for that. The inventory manager can also verify the stock level from the system in Step 53 because the new system is automated such that as goods are being sold and entered into the system, the system deducts it automatically and gives the stock level at any point rather than confirming from the sales books and the stock books. The inventory manager in Step 55 notifies the administrative officer about the stock level in Step 41, then, the administrative officer goes ahead and places order with the biscuit company. In Step 56 and 57, the inventory manager can view the items in the audit trail and logs. The log captures the entire successful and unsuccessful logon attempts to the system. It also captures all the activities being carried out by any user that logs on to the system, both delete, modify, edit etc. With this audit trail, past events can be reconstructed and proper auditing can be done. The invoices being printed are also generated with automatic numbers for future references.

3. Conclusion and Recommendation for Further Studies

3.1 Conclusion

In this paper, the "as-is and the "to-be" workflow process models for sales and inventory Workflow Management Information System (WFMIS) was developed for Petrospan Integrated Services-Sales Eket. The "to-be" workflow process model is design to address the challenges identified with the existing "as-is" workflow process model at Petrospan Integrated Services-Sales Eket. In all, the proposed workflow process is meant to facilitate the development and deployment of automated sales and inventory management workflow management system at Petrospan Integrated Services-Sales Eket.

3.2 Recommendation for Further Studies

In this paper, the “as-is and the “to-be” workflow process models are developed for sales and inventory Workflow Management Information System (WFMIS) for Petrospan Integrated Services-Sales Eket. However, development of the software for the automated sales and inventory management workflow management system at Petrospan Integrated Services-Sales Eket is not discussed in this paper. As such, further work is required for the development of such software both as web application and mobile application.

References

[1] Ellis, C. A. (1999). Workflow technology. *Computer Supported Cooperative Work, Trends in Software Series*, *7*, 29-54.

[2] Bull Corporation, (1992) Flow Path Functional Specification. Bull S. A., Paris, France, September 1992

[3] Saran, A., Suri, S., Balakrishnan, P., & Kamath, S. (2002). *U.S. Patent Application 10/216,544*.

[4] Santos, I. H., Göbel, M., Raposo, A. B., & Gattass, M. (2004, June). A multimedia workflow-based collaborative engineering environment for oil & gas industry. In *Proceedings of the 2004 ACM SIGGRAPH international conference on Virtual Reality continuum and its applications in industry* (pp. 112-119). ACM.

[5] Casadesus-Masanell, R., & Ricart, J. E. (2010). From strategy to business models and onto tactics. *Long range planning*, *43*(2), 195-215.

[6] Chapman, R. L., Soosay, C., & Kandampully, J. (2003). Innovation in logistic services and the new business model: a conceptual framework. *International Journal of Physical Distribution & Logistics Management*, *33*(7), 630-650.

[7] Chapman, C., & Chua, W. F. (2003). Technology-Driven Integration, Automation, and Standardization of Business Processes. In A. Bhimani (Ed.), *Management accounting in the digital economy*, 74-94. Oxford: Oxford University Press.

[8] Hoogervorst, J. A., Koopman, P. L., & Flier, H. V. D. (2002). Human resource strategy for the new ICT-driven business context. *International Journal of Human Resource Management*, *13*(8), 1245-1265.

[9] Harrington, H. J. (1991). *Business process improvement: The breakthrough strategy for total quality, productivity, and competitiveness* (Vol. 1). New York, NY: McGraw-Hill.

[10] Davenport, T. H., & Short, J. E. (2003). Information technology and business process redesign. *Operations management: critical perspectives on business and management*, *1*, 97.

[11] Davenport, T. H. (2013). *Process innovation: reengineering work through information technology*. Harvard Business Press.

[12] Anupindi, R., Deshmukh, S. D., Van Mieghem, J. A., & Zemel, E. (1999). MANAGING BUSINESS PROCESS FLOWS.

[13] Sharp, A., & McDermott, P. (2009). *Workflow modeling: tools for process improvement and applications development*. Artech House.

[14] Pande, P. S., Holpp, L., & Pande, P. (2002). *What is six sigma?* (Vol.1). New York, NY: McGraw-Hill.

[15] Damelio, R. (2011). *The basics of process mapping*. CRC Press.

[16] Eriksson, H. E., & Penker, M. (2000). Business modeling with UML. *Business Patterns at Work, John Wiley & Sons, New York, USA.*

[17] White, S. A. (2004). Introduction to BPMN. *IBM Corporation*.

[18] Zur Muehlen, M., & Recker, J. (2008, January). How much language is enough? Theoretical and practical use of the business process modeling notation. In *Advanced information systems engineering* (pp. 465-479). Springer Berlin Heidelberg.

[19] Wohed, P., van der Aalst, W. M., Dumas, M., ter Hofstede, A. H., & Russell, N. (2006). *On the suitability of BPMN for business process modelling* (pp. 161-176). Springer Berlin Heidelberg.

[20] Davis, R. (2001). *Business process modelling with ARIS: a practical guide*. Springer Science & Business Media.