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Business processes analysis and re-engineering for radio manufacturing: A case study at Sat-Com (Pty)Ltd, Namibia

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Abstract

In today's highly competitive business environment for manufacturing of state of the art military equipment, companies like Sat-Com in Namibia, need to deliver quality products on time. These demands translate to low production time and high production output levels. This research focused on discussing the effects of implementing a new RADSEII(Recognition, Fundamental Analysis, Radical Re-Design, Simulation, Evaluation, Implementation, and Continuous Improvement) BPR (Business Process Reengineering) method for the current radio production system at Sat-Com, Namibia with the aim to maximised output levels, whilst using minimum resources.

Three possible design alternatives (1.shared database, 2.Automation and 3. the combination of the shared database and Automation) were proposed and tested, with the aim of improving the "As-Is" production process. Discrete-event simulation was used to compare the performance of the As-Is and the three alternatives. When compared to the As-Is process, the cycle time and throughput of the third alternative improved by 41% and 70%, respectively, while the failure rate reduced by 87%. Therefore, the third alternative was the best among all.

Problem statement

Current BPR approaches are ineffective because of poor evaluation methods. Poor evaluation methods may lead to an implementation of a process design proposal due to insufficient knowledge of its implementation outcomes, which may be too costly. It is crucial to include effective evaluation techniques, in order to generate adequate knowledge of the design proposal. A discrete simulation-based evaluation approach was incorporated into the process re-engineering methodology, with an application on the radio manufacturing process at Sat-Com, Namibia.

In order to improve the current Sat-Com production process, the researcher suggested an improved BPR method. The researcher analysed the whole radio production process for Sat-Com, and identified non-value added activities and found viable ways of eliminating them through BPR.

Research Objectives

The main objective was to develop a business process reengineering method for re-designing the radio production process at Sat-Com, Namibia.

Specific objectives:

- To analyse the effectiveness of the current production process in terms of cycle time, failure rate, throughput, and waiting time.
- To develop alternative designs for the production process.
- To develop a simulation model for evaluating the proposed design alternatives.

BPR Simulation Methodology

A new simulation based BPR methodology, called the RADSEII approach, was proposed, as shown in Figure 1. RADSEII is an acronym for its seven stages namely; Recognition, Fundamental Analysis, Radical redesign, Simulation, Evaluation, Implementation, and Continuous Improvement .

First, the Recognition and Fundamental Analysis stages aim to analyse the current production line at Sat-Com. Secondly, different alternative process design solutions are developed in the third radical redesign stage. A simulation model is then developed in the fourth stage. The simulated results are evaluated at the fifth stage of the RADSEII approach. Focus is then placed on the strengths and limitation of the proposed RADSEII BPR approach, as an improved approach to BPR. The RADSEII approach enables the decision analyst to evaluate the possible process design alternatives by means of a simulation, before the implementation stage.

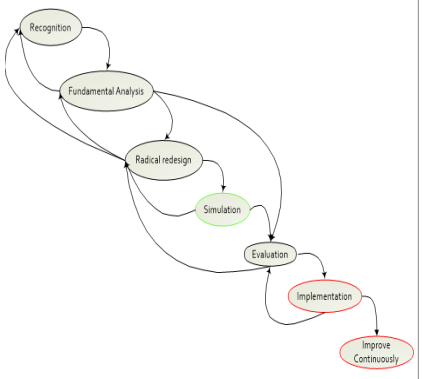

Fig 1: *The RADSEII approach*

Results

The transformation of the radio production process is shown below. Fig 2 shows the current production process and Fig 3 is the new improved production process. The possible design alternatives were modelled and simulated using ARENA process analyser. A comparative analysis was done to compare the simulation results between the As-Is and the three design alternatives, based on cycle time, failure rate and throughput. The third alternative had the best results with improvement rates of 41%, 87%, 70%, respectively (see in Table 1 and Table 2). In addition, the third alternative also had a better waiting time compared to all other alternatives and the As-Is process (see Fig 4).

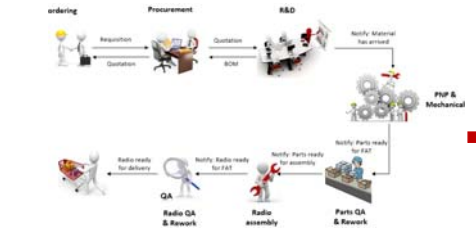

Fig 2: *The current production process*

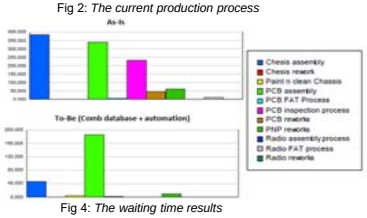

Fig 4: *The waiting time results*

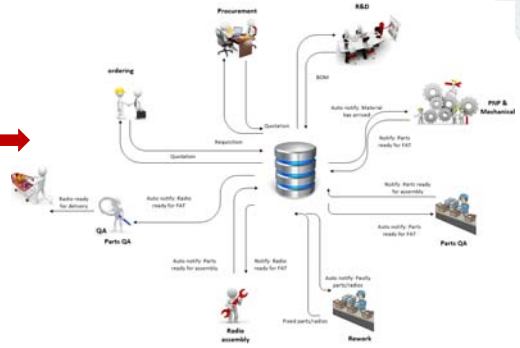

Fig 3: Third alternative Shared data base +Automation

Table 1: *The cycle time and failure rate results*

	S	Name	Program File	Reps	Scenario Properties: PCB Processing time factor	Controls: Radio FAT Processing time factor	Controls: PCB FAT Processing time factor	Controls: Transfer Factor	Responses: Derivered radio	Responses: Cheetah Radio.TotalTime	Responses: Radio failure rate
1		As Is	7 : current_prod	1	1.0	1.0	1.0	1.0	24.000	10.452	29.032
2		database	7 : current_prod	1	1.0	1.0	1.0	0.4	24.000	7.105	12.500
3		Automation	27 : Alternative2	1	0.6	0.6	0.6	1.0	24.000	7.993	14.815
4		Comb database + Automation	27 : Alternative2	1	0.6	0.6	0.6	0.4	24.000	6.205	3.704

Table 2: *The throughput results*

	S	Name	Program File	Reps	Scenario Properties: PCB Processing time factor	Controls: Radio FAT Processing time factor	Controls: PCB FAT Processing time factor	Controls: Transfer Factor	Responses: Derivered radio	Responses: Cheetah Radio.TotalTime	Responses: Radio failure rate
1		As Is	10 : current_pro	1	1.0	1.0	1.0	1.0	4	4.979	0.000
2		database	9 : current_prod	1	1.0	1.0	1.0	0.4	8	3.983	27.273
3		Automation	28 : Alternative2	1	0.6	0.6	0.6	1.0	5	4.859	16.667
4		Comb database + Automation	28 : Alternative2	1	0.6	0.6	0.6	0.4	11	4.204	7.692

Research contribution

This research introduced an improved approach to Business Process Reengineering. The improved approach enables the decision analyst to evaluate the possible process design alternatives before the implementation stage, by means of simulation to provide useful feedback to the process designer. The proposed approach avoids the risks and costs associated with experimenting with the actual system. The approach also utilises the IT enabling technologies and the lean tools such as single-minute exchange of die (SMED) and Autonomation.

Conclusion and Recommendations

The study developed an effective BPR evaluation process to redesign and evaluate the process before its implementation. The new BPR approach - RADSEEI - was used on Sat-Com case study. With this simulation based approach, all alternatives were evaluated before implementation stage. The third alternative was the best among all. The discrete event simulation provided useful feedback to the process designer. The proposed approach avoids the risks and costs associated with experimenting with the actual system. The approach will be useful for improving the production process at Sat-Com, enabling the company to deliver its products to the customer on time. As a recommendation, the company should implement the third process design alternative.

References

Ali, B 2012, Techniques, Advantages and Problems of Agent Based Modeling for Traffic Simulation. *IJCSI International Journal of Computer Science Issues*, vol. 9, no. 1, ISSN (Online): 1694-0814.

Chung, C., & Stepphen , C 1997, Business process re-engineering: evocation, elucidation and exploration. *Business Process Management Journal*, vol. 39, no. 1, pp.39–63. Doi: 1355-2503.

George, K 1992, *INTRODUCTION TO WORK STUDY*. Geneva: International Labour Office.

Gunasekaran, A., & Kobu B 2002, Modelling and analysis of business process reengineering. *International Journal of Production Research*, vol. *40*, no. 11, pp. 2521-2546. Doi: 10.1080/00207540210132733.

Hammer, M. & Champy, J 1993, *Re-engineering the Corporation – A Manifesto for Business Revolution*. Nicholas Brealey.

Ma, L. Xie, H. & Zhang, J 2009, Assembly Process Reengineering Applied To Production Line Balancing. *International Conference on Electronic Commerce and Business Intelligence*. Doi: 10.1109/ECBI.2009.94.

VLATKA, H., GERT-JAN, V. & ALESSANDRA, O n.d., *MODELLING AND SIMULATION TECHNIQUES FOR BUSINESS PROCESS ANALYSIS AND RE-ENGINEERING*. Vol. 7 no. 4-5, pp.1473-8031. Available at: http://ijsst.info/Vol-07/No-4-5/Paper1.pdf [Accessed 6 Dec. 2017].

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