



Production Line Process Improvement with Process Reengineering – A Case Study In Garment Factory

Yanin Palasri¹ and Somjai Boonsiri²

¹ Department of Mathematics and Computer Science, Faculty of Science, Chulalongkorn University, Bangkok, 10330; 6278008023@student.chula.ac.th

² Department of Mathematics and Computer Science, Faculty of Science, Chulalongkorn University; somjai.b@chula.ac.th

* Correspondence: E-mail: somjai.b@chula.ac.th

Citation: Palasri, Y.; Boonsiri, S. Production Line Process Improvement With Process Reengineering – A Case Study In Garment Factory. *ASEAN J. Sci. Tech. Report.* **2022**, 25,(1), 24-35. <https://doi.org/10.55164/ajstr.v25i1.244708>

Article history:
Received: July 27, 2021
Revised: December 13, 2021
Accepted: December 16, 2021
Available online: March 3, 2022

Publisher's Note:
This article is published and distributed under the terms of the Thaksin University.

Abstract: ABC is struggling to reach daily production objectives and has low productivity, which is one of the production line process problem. Business Process Reengineering (BPR) employs process redesign heuristics to enhance an existing production line process using an assessment technique and fit-gap analysis. The simulation tool is used to model the production line process redesign. After adopting the provided approach and conducting the simulation, the company's production productivity and service level increased by about 45%. The required simulation resulted in critical measurements such as manufacturing capacity and lead-time. This research demonstrates the redesign production line process that must be followed to archive this artefact.

Keywords: business process reengineering; fit-gap analysis; production line process; redesign heuristics

1. Introduction

Nowadays, the garment and textile industries are one of the important business sectors that drives Thailand's GDP and export revenue growth every year [1,2]. Many Computer Integrated Manufacturing Systems are widely distributed in the manufacturing industry. It aids in the standardisation of the production line process and increases efficiency to a certain extent. The existing management information systems face difficulties in keeping up with the fast-changing pace of the complex business models and the diversified customer needs [3]. With the emergence of new technologies such as Enterprise Resource Planning (ERP) software, it is widely used among medium to large businesses' scale. The various benefits have been provided to the organisation for the post-implementation, such as reducing the production cost, increasing service quality, and raising process efficiency in the long run [4].

In this research, the case of ABC garment manufacturing company is brought up to study about production line process. ABC garment manufacturing is a company whose subsidiaries manufacture men's and women's clothing for export to Europe, Canada, Japan, the U.S.A., and Russia. The company has factories in Thailand and Vietnam. The existing production line process and business operations of Thailand's manufacturing are overly reliant on reports and redundant procedures, resulting in missed daily output. It is expected that

Enterprise Resource Planning (ERP) software can facilitate the production process complexity and eliminate redundant tasks. The assessment approach and fit-gap analysis have been applied in this research. However, the ERP software implementation consumes longer time than expected with the analysis result. Plus, the standard functions of ERP software do not support the business requirements, and a customised program is required. Therefore, we have changed the approach to applying the Business Process Reengineering (BPR) as the proposed methodology based on our new analysis described in Section 4.

Following the suggested methodology and solution definition, the simulation tool is used to model the new redesign production process to determine its efficacy. To ensure efficiency, manufacturing capacity, lead time, and daily production target achievement are considered critical measurements of the expected outcome.

2. Current Issues

It is dedicated to manufacturing original equipment manufacturers or OEM for the top world brand name. In addition, garment manufacturing is a vast process. All operations are done in different departments in a garment factory. Also, the production line process is a sequential process starting from designing, sampling, laying, marking, cutting, stitching, checking, finishing, pressing, and packaging [5]. Therefore, the garment industry required adaptable and flexible technology to track and control the entire production line process. The QR code has been used for monitoring every production step, and the in-house program is developed as the core back-end system connected to the Oracle Database. On the other hand, this firm has suffered from low productivities, resulting in the inability to meet the daily output target. The problems were analysed using the cause-effect diagram, as shown in Figure 1.

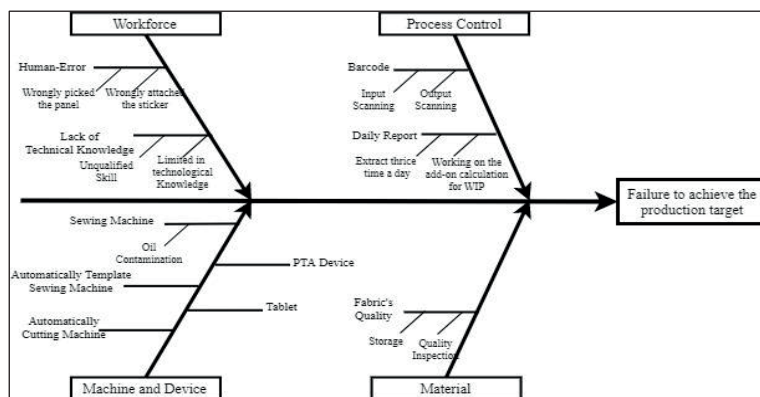


Figure 1. Cause-Effect Diagram

From Figure 1, many possible causes were identified as the root causes of the problem in the production line process, such as lack of worker's awareness, lack of technical knowledge, oil contamination from the sewing machine, and time-consuming manual calculation of the daily report. The officer and the foreman who mainly control the production line process have relied too heavily on the report.

3. Related Work

The main purpose of the literature review is to bring up the prominent point of each related work and discuss, based on the authors' perspective, that could support the core objective of this research. The authors have concluded the strong point and summarised it in the below section

A). Improvement of shirt making production through lean manufacturing – Identify the issues that occurred in the garment industry.

The most important aspect of this literature study is constructing a cause-effect diagram to identify prevalent difficulties in the garment business. The main factors that affect the garment industry are labour

rigidity, instability, political changes, regulations, informality, low productivity and low competitiveness [6]. This review has brought up the case study of a small company that manufactures the prima cotton polo shirts. It is found that this company suffers from the product's delivery to customers, and the problem was analysed using an Ishikawa diagram (Cause-Effect diagram).

B). The Dependency of the department in the garment industry – Identify the dependency of department and workstation in the garment industry

The activity diagrams have represented the business process of garment manufacturing. The problems become more evident when the researchers model the strategic dependencies between departments, the services they offer, and the constraint they impose on each other [3]. In such a case, the researchers have decomposed the business processes of garment manufacturers. They derive the dependencies among different departments by applying the i* modeling framework and a service-oriented approach.

The i* model has been specially developed based on the early requirements in this literature. There are two basic models in the i*framework: the strategic dependency (SD) model and the strategic rationale (SR) model. The strategic dependence illustrates the connection between different actors in achieving goals, performing tasks, and providing resources. Through understanding the dependencies between actors, the enhancements and weaknesses of goals and tasks could be analysed [3]. As a result of this literature research, the authors used the i* model to deconstruct the production line process and capture the diagram displayed in section 4, Figure 3.

C). Evaluation of Transportation Reservation Management Module Usage in ERP system at PT. XYZ – Apply fit-gap analysis & technology acceptance model to the research

This literature carried out the Fit gap analysis method to understand and compare installed systems (TRM) with existing requirements. Then, Technology Acceptance Methodology (TAM) model was applied. It is expected that TAM can identify the factors that can influence user behaviour in accepting and using the system TRM at PT.XYZ [7]. Fit Gap analysis has been conducted after receiving the input data from PT.XYZ company. Five columns have been identified: Business requirement, describe existing solution, priority, degree to fit, gap description and new capabilities. After performing Fit Gap Analysis, the TAM has been used to find out the user's acceptance towards the system TRM. The results of the TAM calculation will be compared with the hypothesis that the authors have previously determined [7].

In short, the fit-gap analysis and TAM model have carried out that the features of the TRM system are still not following the requirement or the system design request and many features need to be developed. Therefore, the authors have foreseen the practical use and advantage of the two methodologies; therefore, fit-gap analysis is selected to be applied as one of the research methodologies. In the TAM model and the authors' perspective, the tool is more involved in people behaviour than the process flow itself.

4. Research Methodology

The research methodology has been developed based on business process management (BPM). The BPM is the discipline of improving a business process from end to end by analysing it, modelling how it works in different scenarios, executing improvements, monitoring the improved process and continually optimising it [8]. Referring to the business process management textbook [9], the process consists of process discovery, analysis, process redesign, process implementation, process monitoring, and control.

A). Process Discovery

The As-Is production line process in ABC garment manufacturing is identified by the creation of the production process flow, as shown in Figure 2. After the planning process is done by the planning/IT/IE

department, the fabric will be issued out from the warehouse and directly sent to the 5LAS process, as displayed in Figure 2.

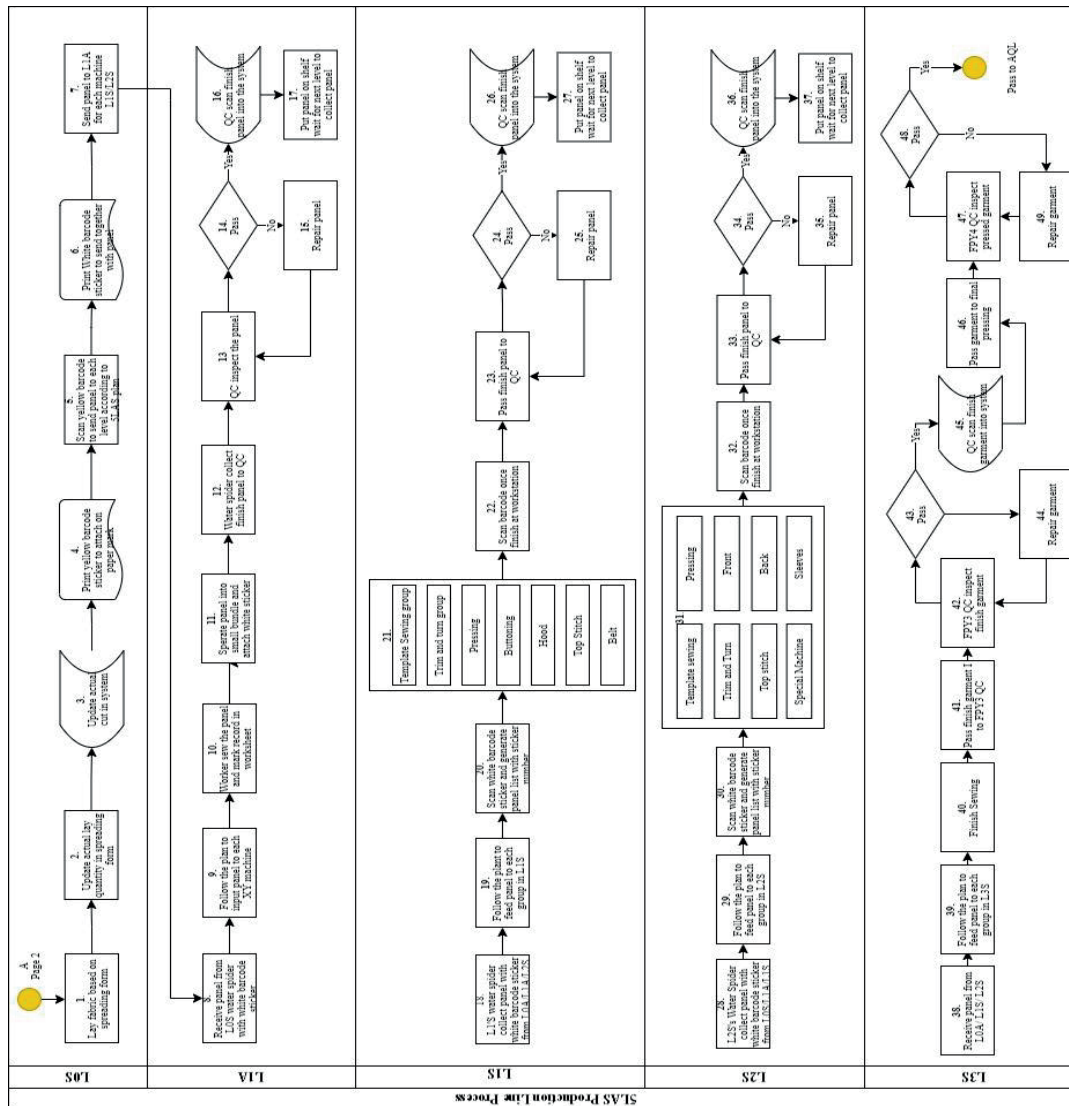


Figure 2. 5LAS Production Line Process

B). Process Analysis

In the process analysis, two tools have been applied: Cause-Effect diagram and Fit-gap analysis. The Cause-Effect diagram is used to identify the root causes of the existing production process problem as described in Figure 1. After the critical issues have been identified, the fit-gap analysis will address how well the system under consideration fits the proposed solution.

C). Process Redesign

Once the fit-gap analysis of each problem area is identified in Table 1, we will know the gap between the As-Is and To-Be production line processes. Two solutions are proposed:

- Develop a customised program to auto-generate the report, including the manual calculation which the officer currently does
- Redesign the production process based on the Business Process Reengineering (BPR) – Redesign heuristics

Firstly, the core production process in ABC garment manufacturing is the 5LAS process. The standard function of ERP software to generate the report automatically does not support the production process complexity. Therefore, the customised program has been proposed to develop the ERP software as the new capacity to reduce or eliminate these gaps. However, the customised program is required to create on ERP software, and the implementation takes a long time as a year based. Hence, we have shifted the plan of ERP software implementation to propose another solution.

Another proposed solution is to redesign the production process based on Business Process Reengineering (BPR). It is a process in which the enterprise can significantly improve some key aspects of the enterprise's performance, such as cost, quality, service, and speed [10]. We have redesigned the production process based on the redesign heuristics and adjusted some parameters from the enterprise's performance. The new production process is tested and simulated using [11]. The OXCLOSE clothing style's production process is brought up to be a case study of the production process and redesign in this research.

D). Process Implementation

The last step is to simulate the redesign production process of clothing styles H06_OXCLOSE, a made-to-order from ABC's customer, to ensure that the proposed solution improves the current production process. The simulation input consists of process flow, resources, and the initial value of decision parameters.

E). Process Monitoring and Controlling

After the simulation, the production capacity and lead time of each OXCLOSE's clothing part from the As-Is/To-Be production process are compared. We expect the production capacity to increase with the comparison and the production lead time decreases, respectively.

5. Experimental Details

A). Process Analysis and Fit Gap Analysis

Referring to the literature review, the concept of the dependency of the department in each garment company [3] has been applied to the production line process. Each clothing style has a different 5LAS production line process flow in which currently this process is managed and controlled by the officer. We have applied the model and analysis approaches covering a different perspective of the production process flow. However, each clothing style's 5LAS production line process is differently considered by the dependency among the workstations, goals, and dependency relationship modelling process. Therefore, we can't model the standardised 5LAS production line process template. Instead, a high-level of the overall production process has been constructed in Figure 3.

The dependency tasks of each department are represented in Figure 3. It consists of five departments: Planning/IT/IE (Industrial Engineering), MIM (Merchandising), planner maker, warehouse, OB/TPE and two core processes: L0A and 5LAS. The diagram starts with the MIM department receiving the order confirmation from the planning department. Then, the MIM department will create the SO (Sales Order) and BOM (Bill of Materials) in the system. This indicates the dependency among two departments that the MIM department must wait until it receives the order confirmation from the planning department. The dependence is well described by the symbol of the connector connected between two departments

After getting essential data for analysis, we have conducted the fit-gap analysis template shown in below table:

Table 1. Fit Gap Analysis of ERP Software Implementation

Problem Area	Existing Solution	ERP Software Implementation		Business Process Reengineering	
		Gap between existing & new	New Capacity needed to reduce or eliminate gap	Gap between existing & new	New Capacity needed to reduce or eliminate gap
Relied too heavily on the report. The operation can't start until the report is generated	Most of the officers and workers felt indifferent toward the number of current reports as they have continued doing the same operation.	The process of each clothing style is very complex to automate on the system, also the standard function of ERP software is not supporting such kind of process complexity.	The new customized program is required to develop on the ERP software to support the process variety and complexity.	To apply the automation - one of the re-design heuristics approach. Data sharing (Intranets, ERP) Similarly to the proposed solution of ERP implementation. The standard function of ERP may not support the clothing style complexity	The new customized program is required to develop on the ERP software to support the process variety and complexity.
Fail to achieve daily production target	The officer and foreman need to work closely to the workers. They have monitored and controlled the production process by QR code tracking and manually update the daily report to identify which process/ step is delayed which possibly causing the slowdown in entire production process	The external device such as QR code scanner and QR code reader needs to connect to ERP system. The cost of infrastructure's setting and maintenance may high. Also as mentioned in point no#1, the process of each clothing style is too complex to automatically generate from the system in which the manual calculation is the process after the report is generated.	The new customized program is required develop on the ERP software to support the process variety, complexity, and manual calculation.	Once the production process is re-designed based on the re-design heuristics approach. The new production process is required to test the effectiveness using the simulation model or tool.	Define the simulation approach (Simulation tool/model, expected result and result measurement) as it is required to prove the new production process efficiency
Low productivity	The management team has set up weekly meeting for the workers who work in the assembly process. The purposes are to brainstorm, share and gather the idea about the causes of the low productivity	N/A	N/A		

From Table 1, we have proposed two solutions: ERP software implementation and business process reengineering. In each solution, the gaps of the proposed solutions are identified in column "Gap between existing & new", and the new capacity has been suggested to eliminate the gap of the new solution. It can be seen from Table 1 that the ERP implementation solution is required a new customised program to support the process complexity. Moreover, the ERP implementation and custom program development takes a long time, like a year-base. Hence, we have dropped this proposed solution and focus more on the business process reengineering solution

B). Design the new process

The Business Process Reengineering (BPR) is selected as the new approach to solving the current problems in ABC Manufacturing's production process. OXCLOSE clothing style is made to order that contains production process complexity. The OXCLOSE consists of 11 clothing parts, and each part will be embodied at the end of the production process. As per process analysis, we detected some parameters that reduce production process efficiency. One of the OXCLOSE's clothing parts, the hat, consists of many dependency

work and sub-process. It is the relationship in which a task relies on one or more tasks to be performed in a certain order before it is marked complete. We have created a histogram in Figure 4 to describe each clothing part's production standard time's frequency. It can be that there are two clothing parts of Collar and Hat with standard time; 6.86 and 14.11 min respectively contained the most time-consuming production process. Hence, the collar and hat's clothing parts are the key process that require the BPR consideration.

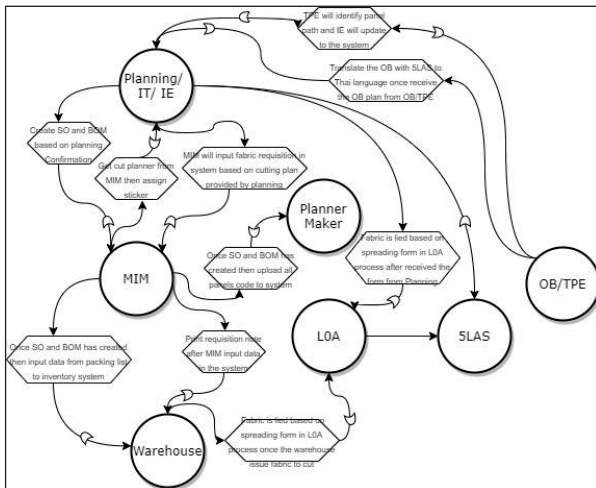


Figure 3. Dependency of departments in ABC garment manufacturing company

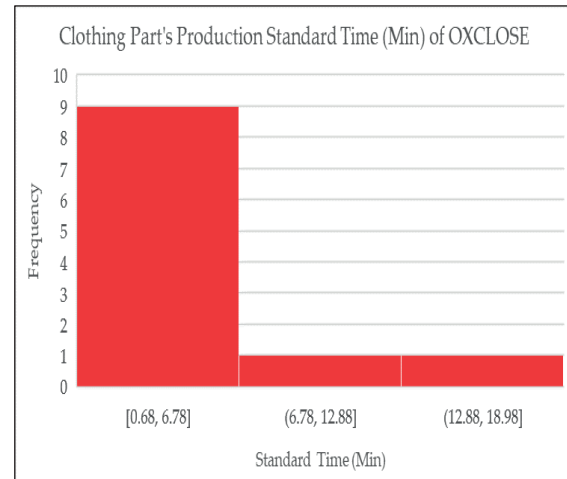


Figure 4. Clothing Part's Production Standard Time (Min) of OXCLOSE

Table 2. OXCLOSE_7 Subprocesses flow panel

Clothing Part	Step Sequences					
	1	2	3	4	5	6
Hoodie Piece 2 (CHO)	B12	B61	B31			
Hoodie Piece 1 (SHD)	B12	B61				
Hoodie Lining (174)	B12	B31	B61			
Collar (P1)	B12	B31	B41	B12	B51	
Bottom Collar (UCL)	B13	B31				
Flap Pocket (HIW)	B13	B21	B31	B41		
Sleeve Straps (P10)	B21	B31	B41			
Placket Piece (FAC)	B41					
Front Placket's Hoodie (HFF)	B12					
Placket Base (HFN)	B12	B31				
Hat (109) ²	B13	B21	B31	B61	B51	B71

Hat (109)² = SHD+CHO+HFN+HFF+174

The redesign heuristics [12] are applied with the current production process of the OXCLOSE clothing style. As per the investigation, 5LAS and sub-process in L1S are redesigned as below:

- Task Elimination – Collar base activity in the L1S process is eliminated. This activity is unnecessary for the operation and has no additional value in increasing processing speed [13] as it can be completed earlier.

- Resequencing the 7 sub processes in the L1S process, the tasks with lots of dependency work would have started first because the dependency work takes more time than others.
- Parallelism – The individual tasks that do not require a dependency process can proceed parallel with other workstations.

Resource Optimisation – The number of resources is allocated based on the number of dependency tasks of the clothing parts. Resource sharing is applied for the clothing parts that contain fewer processes

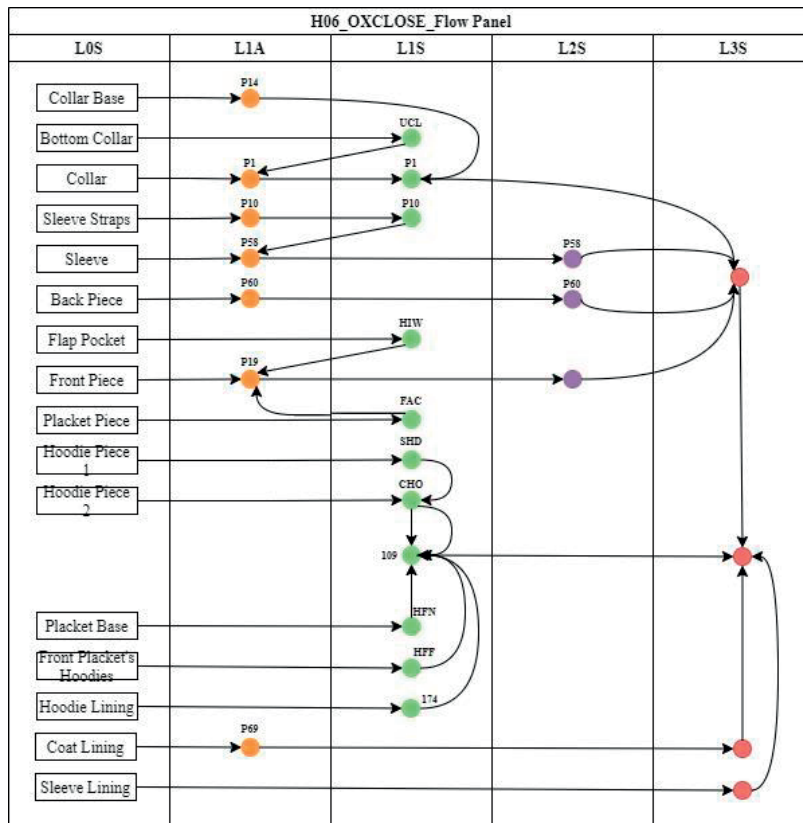


Figure 5. OXCLOSE_5LAS flow panel

The L1S process consists of 7 sub-processes: B1X, B21, B31, B41, B51, B61, and B71, which Table 2 represents the redesign work sequence of OXCLOSE clothing style. The clothing parts highlighted in yellow can be proceeded in parallel. Also, the clothing part of the collar (P1) and flap pocket (HIW) could have started first. Since both processes contain multiple dependency work in sub-process.

C). Test with New Process

Two production line processes are mainly redesigned: the 5LAS process and 7 sub-processes in the L1S process (One of the 5LAS processes). We have first tested the redesign of 7 sub-processes and then followed by the overview of the 5LAS process. The assumption is that if the redesign of the sub-process gives a good result, the production lead time of the entire 5LAS product should be decreased.

6. Result and Discussion

Table 4 shows the new production capacity of each clothing part and the production lead time of each workstation in the redesign L1S process. Table 3 depicts the current standard time calculation and production capacity for OXCLOSE's L1S clothing part process.

Table 3. Current production capacity of each clothing part and the standard time calculation

Clothing Part	Std. Time (Min)/ Piece	No. of Piece/ Hour
Hoodie Piece 2 (CHO)	3.97	15
Hoodie Piece 1 (CHO)	2.15	27
Hoodie Lining (174)	4.1	14
Collar (P1)	6.86	8
Bottom Collar (UCL)	0.68	87
Flap Pocket (HIW)	2.68	22
Sleeve Straps (P10)	2.67	22
Placket Piece (FAC)	2.53	23
Front Placket's Hoodie (HFF)	0.82	72
Placket Base (HFN)	0.79	75
Hat (109)	14.11	4
Total standard time and total pieces produced in 1 hr	<u>41.36</u> (Min)	<u>369</u>

Table 4. New production capacity of each clothing part and the

Clothing Part	Std. Time (Min)/ Piece	No. of Piece/ Hour
Hoodie Piece 2 (CHO)*	3.58	29
Hoodie Piece 1 (CHO)*	2.09	33
Hoodie Lining (174)*	4.06	27
Collar (P1)***	6.51	17
Bottom Collar (UCL)**	0.92	63
Flap Pocket (HIW)*	2.39	24
Sleeve Straps (P10)**	2.02	47
Placket Piece (FAC)	2.53	23
Front Placket's Hoodie (HFF)*	1.21	66
Placket Base (HFN)**	1.39	62
Hat (109)***	14.05	8
Total standard time and total pieces produced in 1 hr	<u>40.75</u> (Min)	<u>399</u>

Redesigned heuristics [12] on clothing parts has led to increased production capacity and a shorter manufacturing lead time. From Table 3 and Table 4, the average production capacity of each clothing part is increased by 45%. After applying the redesign process, the current output subtracts the number of new outputs to get the differentiated amount. Then, add up the group of differentiated amounts together and divide by each clothing part's count.

Benchmarking

To see the advantage of the new process, standard time and production capacity's comparison are made between the existing and unique production process. These two variables are the important keys to disclose the new process efficiency. According to Soontorn (2016), the business process reengineering (BPR) of unnecessary process elimination and modification is applied to the computer service centre. Based on Soontorn's finding, the cycle time for service processes (day/working time) is reduced from 2.57 to 1.36 day/working time. The new process reduced 6 unnecessary steps, and these approaches decreased cycle time and waiting time as per expectation. Immawan (2018) claims that key performance indicator (KPI) is one of the measurement tools to assist the comparison between the old and new business processes. He also included production capacity as the main variable in KPI measurement.

The asterisk (*) in each clothing part means this clothing part applied the redesign process where (*) Parallel Tasks, (**) Resource Optimisation, (***) Resequencing Task.

In parallel tasks (*), we have set each L1S's sub process in the simulation tool to run the clothing part parallelly. In other words, Hoodie lining, Hoodie piece 1, Hoodie piece 2 and Flap pocket are simultaneously run. The standard time of some clothing part has slightly decreased because the dependency among each sub-process is removed.

In resource optimisation (**), we have re-allocated the worker in each sub-process with the centralisation to avoid overloading one group and another group waiting for work [14]. For example, the clothing part of the front placket's hoodie and placket base, B12's sub-process, is the first workstation of both clothing parts, containing a few processes. Hence, shared resources between these clothing parts are applied to the B12 workstation. As a result, the production capacity decreases, and the standard time increases, respectively. However, it doesn't impact the entire production process much.

For the case of the bottom collar and sleeve straps, B31's sub-process is the second workstation of both clothing parts. Regarding resource optimisation, we intend to increase the production capacity of the sleeve straps because OXCLOSE clothing style requires 2 pieces of sleeve straps per clothing. Therefore, we have set the shared resources and the allocation rule in the B31's sub-process of the simulation tools. As a result, the sleeve straps production capacity increases, whereas the bottom cars decrease.

Lastly, since collar and hat contain more sub-processes than others and require input from other processes such as L1A and within L1S itself, they should have started the tasks immediately once all components are ready at the workstation. Plus, these two clothing parts are considered the top priority to start the process. The production capacity of both clothing parts is increased according to the increase in other components such as hoodie pieces 1, 2 and hoodie lining, etc.

Best Practices

To guide the process improvement action continuously, we suggest the new production process of OXCLOSE clothing style to the factory's manager since the new process provides the improvement of standard time and production capacity. It can substitute the current production process in the long run. In addition, we did some more studies about continuous process improvement. Plan-Do-Check-Act (PDCA) cycle is one of the most popular tools [17]. It is a four-step model of carrying out change as the cycle should be repeated again and again for continuous improvement. However, in the scope of this research, we focus only on the business process reengineering (BPR) as one of the methodologies to solve the core problems. It provided us with the expected quantitative results. In future work, we will continue to study how to improve the process continuously by using the PDCA tool

Author Contributions: The authors conceived and designed the new production line process by applying the re-designed heuristics guideline. In addition, the simulation tool (BPSimulator) has been used to simulate the new production process in order to prove its efficiency. After the simulation, the expected results are given with an increase in production capacity and decrease in production lead time. With the quantitative results, it is proved that Business Process Reengineering (BPR) and the selected re-designed heuristics are the most appropriated approach to improve the current production line process. The ABC garment manufacturing company can follow this approach and apply to ABC garment manufacturing's current LIS process.

Findings

Process discovery and process analysis are the main principles of this research. Process discovery is an initial step that provides a baseline for process improvements and identifies key problem areas by business process reengineering (BPR). The garment manufacturing process is very complex and lots of dependency tasks are required, especially from the production process of fabric to the finished product. It is crucial to break down the process into a detailed level. Besides, the process analysis tool also enables you to understand the health of different operations within a business to improve process efficiency, identify the detrimental elements in operation, and overcome obstacles. Without a proper analysis, it will be a waste of time and effort to solve the wrong problems or switch from one software to another. Hence, the researcher should consider these two processes as the highest priority at the beginning of the research.

Conflicts of Interest: The authors declare no conflict of interest.

7. Conclusions

This paper focuses on the 5LAS process improvement by using the cause and effect diagram to identify the core problems in the production process. After that, the fit-gap analysis is performed to discover the best fit solution. The redesign heuristics to the existing production line process is the conclusion and the concept is applied. The new process is being constructed using the simulation tool to model the new production process. The simulation result shows the increasing production capacity and slightly decreased production lead time of the clothing style OXCLOSE, which meets the objective of this research paper. In future work, we have planned to study the ERP software implementation to overcome the low productivity problems such as the behavior of relying too heavily on the report and manual work caused by the report. Due to the current circumstance of the Covid-19 pandemic, ABC Manufacturing has brought up a new protocol to create a hygienic workplace. All workers must be fully vaccinated and tested for Covid-19 every week. With this protocol, it has been reported that no workers are infected with the disease for 3-4 months. However, a contingency plan is still required during this pandemic. Per suggestion, to compensate for infected workers during the pandemic, the manufacturing workers should be trained in multitasking to pay for the lack of workers in some clothing's tasks activity.

References

1. How to Calculate Efficiency. (n.d.). Accessed July 07, 2021, from <https://best-excel-tutorial.com/59-tips-and-tricks/313-efficiency>.
2. Investment, T. B. (2016). Thailand: Textile Industry. Accessed July 07, 2021, from https://www.boi.go.th/index.php?page=business_opportunities_detail&topic_id=117531.
3. Z. Xu, H. Zhao, S. L. Tan.; L. Liu, "Service-Driven Migrating of Enterprise Information Systems: A Case Study," 2012 19th Asia-Pacific Software Engineering Conference, 2012, pp. 127-136, doi: 10.1109/APSEC.2012.123.
4. Costello, L. (2018, February 21). Advantages and Benefits of ERP Software Solutions. Accessed July 07, 2021, from <https://terillium.com/benefits-of-erp/>.
5. Textileblog. (2020, August 17). Garment Manufacturing Process: Step by Step Section Wise. Accessed July 07, 2021, from <https://www.textileblog.com/garment-manufacturing-process-step-by-step/>.
6. K. Bautista-Calderon, D. Padilla-Reyes, F. Maradiegue-Tuesta and J. Alvarez-Merino, "Improvement of shirt making production through lean manufacturing," 2019 IEEE Sciences and Humanities International Research Conference (SHIRCON), 2019, pp. 1-4, doi: 10.1109/SHIRCON48091.2019.9024864.

7. F. Jingga, S. Cornelius, Alfin.; N. Limantara, "Evaluation of Transportation Reservation Management Module Usage in ERP System at PT. XYZ (a case study approach using Fit Gap Analysis and Technology Acceptance Model)," 2019 International Conference on Information Management and Technology (ICIMTech), 2019, pp. 266-271, doi: 10.1109/ICIMTech.2019.8843776.
8. K.Pratt, M. (2020, September). Business Process Management (BPM). Accessed July 07,2021, from <https://searchcio.techtarget.com/definition/business-process-management>.
9. Weske, M. (2007). Business process management: concepts, languages, architectures. Springer.
10. Y. -j. Miao, "How Does the Enterprise Implement Business Process Reengineering Management," 2010 International Conference on E-Business and E-Government, 2010, pp. 4100-4102, doi: 10.1109/ICEE.2010.1029.
11. The simulation tools. [Online]. Accessed June 2021, from <https://www.bpsimulator.com>.
12. Mansar, Selma.; Reijers, H.. (2007). Best practices in business process redesign: use and impact. Business Process Management Journal. 13. 193-213. 10.1108/14637150710740455.
13. Somphanpae, Salinthip & Boonsiri, Somjai. (2016). Business Process Improvement Using Adjustable Parameters on Simulation–A Case Study in Restaurant Business. Journal of Advances in Information Technology. 232-238. 10.12720/jait.7.4.232-238.
14. Dumas,M. [Marlon Dumas].(2014, April 14).Business Process Management – Lecture 7: Process Redesign [Video]. Youtube. https://www.youtube.com/watch?v=mIJLneu8_go.
15. Phiphopsuthipaiboon, Soontorn & Boonsiri, Somjai. (2016). Business Process Reengineering–A Case Study on Computer Center Service. MATEC Web of Conferences. 81. 06006. 10.1051/mateconf/20168106006.
16. Immawan, Taufiq & Asmarawati, Citra & Cahyo, Winda. (2018). Business Process Reengineering in a Sago Production Process. 1-5. 10.1109/ICSTC.2018.8528602.
17. What is Continuous Process Improvement. (2020, June 24). Accessed December 06, 2021, from <https://www.solvexia.com/blog/what-is-continuous-process-improvement>.