

## Designing The Simulation Model to Increase Production Using Flexsim Software

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**Abstract.** XYZ is a Small and Medium Enterprise (SME) that manufactures dolls from rasfur and velboa fabrics. XYZ uses a flowshop with a make-to-stock production system. The problem that occurs in XYZ is that they have not been able to achieve production targets so they cannot complete customer demands. This study aims to simulate the production system so that it can be analyzed problems and taking the best solution. The method used in this study is modeling and simulation using flexsim 6.0 software. After modeled on Flexsim, it can be seen that significant problems exist in the flow from cutting to the sewing machine and the sewing process time is too long. Therefore, the researcher tries to add a sewing machine as an investment so that there are no lost opportunities. After the addition, it turned out that XYZ was able to produce an average of 80 dolls per day by adding 2 sewing machines as a future investment.

**Keywords:** Flexsim, Simulation, System

### 1. Introduction

A company is closely related to the system. The system is an order consists of a number of functional components (with specific tasks / functions) which are interconnected collectively aims to fulfill a certain process / job [1]. One of the real systems in the company is the production system. The production system has a groove different production processes for each company depending on company goals. Some companies use a make-to-order system and some use a make-to-stock system. The purpose of the manufacturing process is to produce a product with high quality and efficiency, and pay attention to minimum supervision and can take care consumer needs. The relationship between demand efficiently is increasingly the amount of demand, a more efficient manufacturing process is needed [2]. Many companies or Micro, Small and Medium Enterprises (MSMEs) have emerged which are engaged in convection field. In its development, companies compete with each other to produce similar products. The rapid changes in business require them to be more capable adapt and make changes very quickly. Competition in the world makes companies must improve the quality of both the product and the production process. Companies must can manage existing resources so that goals can be achieved.

One form process namely flowshop production. Flow Shop is a continuous movement of units through a series of work stations organized by product. On flowshop, allocated resources will be skipped each job has a route or sequence of stages the same workmanship[3]. The arrangement of a flow type

production process is applicable appropriately for products with stable designs and volumes products, so that investment with a special purpose can be reinstated [4]. XYZ collection is one of the business fields that is engaged in the field doll production with flowshop production sistem. The type of doll produced is a doll in the form of a cartoon character. In this research, the production goods that will be used as the research object are dolls made of rasfur and dolls made of velboa. In the production process, there are problems that often occur, namely SMEs cannot meet consumer demand due to low production output. Therefore, the researcher will create a simulation model using Flexsim 6 software to solve it problem that happened.

## 2. Methodology

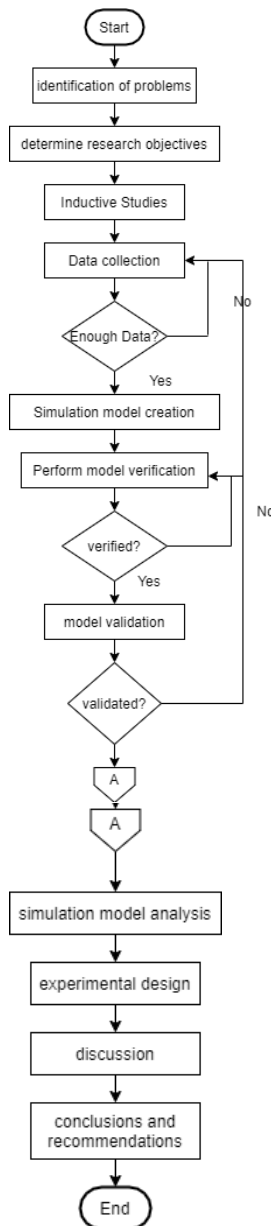
The method used in this research is simulation method. A simulation is an approximate imitation of the operation of a process or system; that represents its operation over time. Simulation is used in many contexts, such as simulation of technology for performance tuning or optimizing, safety engineering, testing, training, education, and video games.

### 2.1 Data Collection Method

Data collection methods are techniques or methods used by researchers to collecting data. Data collection is carried out to obtain information needed in order to achieve research objectives. In this study the data were taken from the results interviews with the owners and direct observation. Data according to the source, there are 2 types, namely primer data and secondary data. Primary data is data that is collected, processed and published by the organization who use it [5]. In accordance with the meaning of the secondary word which means second-not directly from the source-secondary data can be defined as data that has been collected by other parties, not by the researchers themselves, for another purpose [6]. In this study, the secondary data used were data and information from journal as literature.

### 2.2 Research Flow

The software used is Flexsim 6.0, the use of the software is to do experimenter on the model to be made. Before making the model, the required data include human resources, raw materials, processing time, rest time, capacity machining, scheduling and flow of processed materials. The data will be used as input modeling so it is expected to represent the real system.



**Fig. 1.** Research flow

Based on the research flow above, the first step in research is to determine the problem and research objectives, after that conduct secondary data in the form of previous research. Literature studies can be searched through journals, books, proceedings, and other sources. Before making the model, required company production data which includes data on processing time, production process flow, machine capacity, number of machines, number of operators, working time. Furthermore, determine the distribution. The data is used for modeling input so that the model can represent the real system. Model making was assisted by Flexsim 6 software. During the manufacturing process is carried out by the process of verifying the model to suit the modeler's wishes. After the model is formed then run and validation using the test. The statistics include the two-mean test, the two-variance test and finally the chi square test. Model said valid at least if the chi square test is accepted or otherwise both are accepted. The next step is to analyze the model and conduct an experimental design to determine policies in accordance with company issues. Alternatives to any experimental design will be selected

by performing a statistical test again, namely the Anova test and the Bonferroni test. The last stage is the implementation of proposals by providing suggestions to XYZ SME.

### 3. Result and Discussion

#### 3.1 Early Model

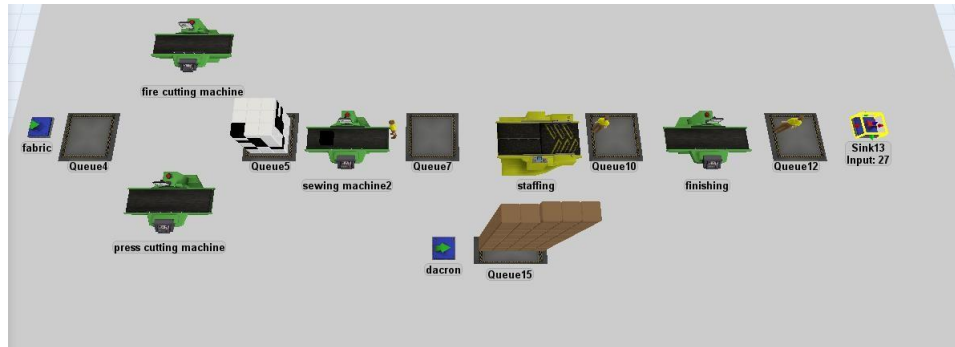


Fig. 2. Early Model on Flexsim

The process of making dolls begins with the arrival of raw materials for rasfur and velboa fabrics. The raw materials are then stored in the fabric warehouse. From the fabric warehouse the first process is cutting. Rasfur fabrics are cut using a fire cutting machine and velboa fabrics are cut using a press cutting machine. The fabrics has been cut then sewn and filled with dacron. The last process is finishing, which is to clean the doll from the remaining threads. Work time starts at 08.00 - 17.00 WIB with a break for 1 hour. The processing time for each machine is as follows :

Table 1. Processing Time and Input

	Machine name	Processing time
1	Fire cutting machine	johnsonbounded( 279.206931, 356.145604, 1.323231, 0.903163, 0)
2	Press cutting machine	johnsonbounded( 315.574128, 415.607937, 1.192905, 1.289555, 0)
3	Sewing machine	weibull( 525.920627, 388.106856, 14.622143, 0)
4	Staffing	johnsonbounded( 194.325503, 281.661727, -0.302820, 0.704538, 0)
5	Finishing	johnsonbounded( 7.636421, 18.443725, 0.503121, 0.637951, 0)

#### 3.2 Verification and Validation

In making a model, researchers must ensure that the model that has been made is in accordance with the real system. The way to be sure is to do a validation and verification test. Verification process checks model translation conceptual simulation (flowcharts and assumptions) into the programming language correctly [7]. Validation is a step to ensure that the model built as represented all important aspects and behave like the real system [8]. The following are the results of the validation tests that have been carried out :

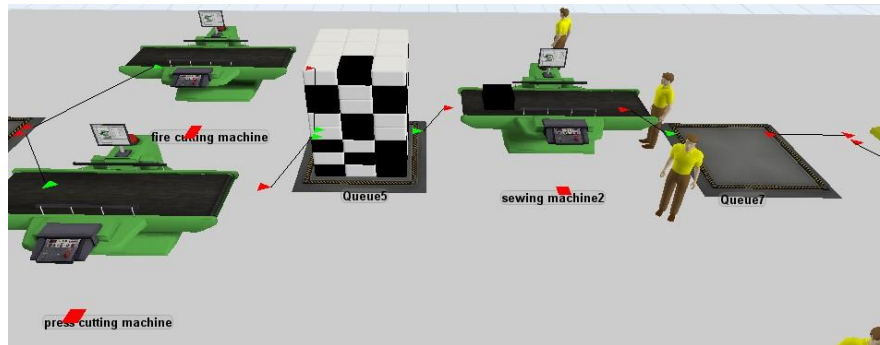
Table 2. Result of Validation Test

No	Validation Test	Decision
1	T-Test	Accepted
2	ANOVA	Rejected
3	Chi-Square	Accepted

From the table above, it can be concluded that the historical data and the simulation data meet the two mean similarity test and the chi-square test. Therefore the simulation model is considered valid and can represent the real system.

### 3.3 Analysis Early Model

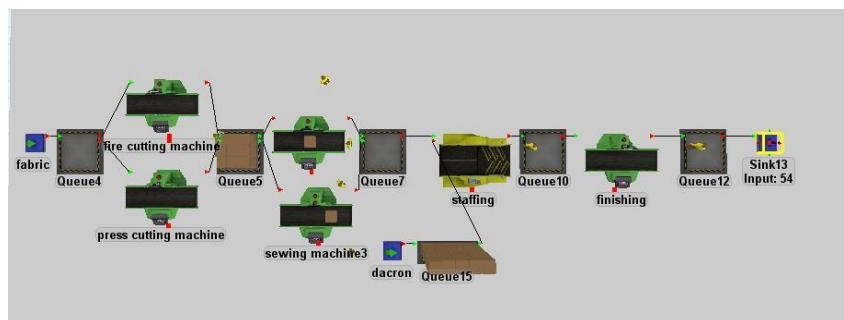
After the validation test is declared valid, a problem analysis can be carried out through the model. In the initial simulation, it was found that XYZ could only produce very limited quantities because the business was still relatively small. However, over time, XYZ always improves the quality of its doll products so that the demand increases every day.



**Fig. 3.** Problem on Production

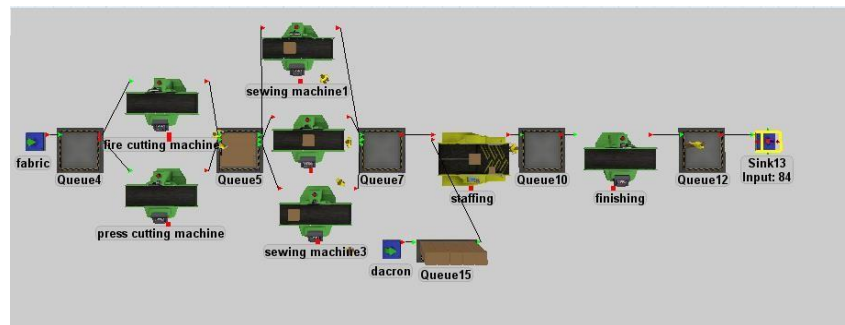
Based on the results of model analysis, it is known that accumulation occurs in the warehouse after cutting. This is because the sewing machine takes a long time to make one doll. This problem makes XYZ unable to fulfill all requests and XYZ will experience lost opportunities. The average incoming demand reaches about 80 pcs per day, but XYZ's production capability is only about 25 pcs per day so a solution is needed to increase XYZ's profit. To get the right solution, it is necessary to do experiments.

### 3.4 Analysis and Experiment Design



**Fig. 4.** Proposed Model First Scenario on Flexsim

In the simulation by adding one sewing machine, the results showed that there were an additional 30 pcs to 50-60 pcs per day. This amount has not been able to meet the average customer demand.



**Fig. 5.** Proposed Model Second Scenario on Flexsim

In the simulation by adding two sewing machines, the results showed that there were an additional 60 pcs to 80 pcs per day. This amount is in accordance with the average customer demand so that scenario 2 is chosen to be implemented as an investment.

#### 4. Conclusion

After the simulation is carried out, it can be seen that a significant problem that occurs in XYZ is that it is unable to continuously fulfill customer demands which will cause lost opportunities. XYZ can only produce 20-30 dolls per day while the average demand reaches 70-100 dolls per day. The length of production time is dominated by the sewing machine process, so there is a bottleneck between the cutting machine and the sewing machine. Therefore, the researcher tries to add a sewing machine as an investment so that there are no lost opportunities. After the addition, it turned out that XYZ was able to produce an average of 80 dolls per day by adding 2 sewing machines as a future investment.

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