CHAPTER III

RESEARCH METHODOLOGY

3.1   Research Object

The local Small and Medium Enterprises (SMEs) laundry services are selected as the subject of the research to be analyzed on the waste that happens within the company. The minimum number of population to fulfil the requirement for direct measurement research is 30 respondents (Sugiyono, 2012). The criteria of required respondent for this research are:

1.   SMEs are located in Yogyakarta.
2.   SMEs total asset are up to Rp. 200 million excluding land and building, with annual sales are not more than Rp. 1 billion, and owned by Indonesian citizen.
3.   Respondents are the expert of the laundry service SME.
4.   Respondents are fully understanding about the service process in the laundry service.
5.   Respondents are knowledgeable regarding to the topic of this study.

3.2   Data Collection Method

3.2.1   Type of Data

There are two types of data used in this study. The description for each type described below:

    a.   Primary

        Primary data is data obtained directly from the research subject which conducted in from of close-ended questionnaire and open-ended questionnaire. The close-ended questionnaire is conducted to find the type of waste that happens in the SMEs laundry service and the frequency of waste occurrences. The close-ended questionnaire is conducted to obtain a deeper and understanding on the causes of the waste that happens in the SMEs' laundry service that will be used to find the root of causes on waste.

    b.   Secondary

        Secondary data obtained from sources related to the researches that have been performed previously such as theoretical study that can support the research. Such as published journals/papers, laboratory data, books, and information obtained through the internet. Then, the secondary data on this study are researches or articles obtained from article, book, journal and any other internet-based sources.

3.2.2   Apparatus

In this research, some equipments were used as follows:

a. Questionnaires were developed to identify the type of waste and the causes of waste in the SMEs. A translated questionnaire was available to make sure respondents who use local language are involved without any problem.

b. Statistical Package for the Social Science (SPSS) software version 23 was used to analyze and run the statistical data.

c. Analysis tool in qualitative research software called Nvivo11 was used to perform the data processing for the data that obtained from open-ended questionnaire section.

d. Verification result questionnaires also developed to identify whether the findings of this research are considered applicable and approved by the respondents.

3.3   Data Processing and Analysis

3.3.1   Survey

Data that obtained will be processed in 2 different phase. The first phase will focus on the processing of quantitative data to find out the type of waste that happens and the frequency of waste that happens. The second phase will focus on the processing of qualitative data to find out the causes of each waste that will be used to find the root causes of the waste and later on will be used as a consideration in selecting the most suitable lean method to implemented to give recommendation to solve the problem. Below the general explanation of data processing:

A. Quantitative (Phase 1)

Likert five scale is used in the questionnaire for this phase. A Likert scale is a psychometric scale that has multiple categories from which respondents choose to

indicate their opinions, attitudes, or feelings about a particular issue (Beglar & Nemoto, 2014). The scale that used on the first section of questionnaire are 1 = never, 2 = rarely, 3 = sometimes, 4 = very often, and 5 = always. Descriptive analysis is conducted to describe the data obtained from the questionnaire. The analysis is done using a category based on the value of the frequency distribution. The frequency distribution values are performed using the following formula:

$$Interval = \frac{Max\ Value - Min\ Valuue}{Number\ of\ Classes} \qquad ...(3.1)$$

B. Qualitative (Phase 2)

Inductive analysis technique is used by Computer Assisted Qualitative Data Analysis Software (CAQDAS), namely NVivo 11 to perform the data process. NVivo is a software used for processing qualitative data in the form of text, audio data, video, and images. The researcher analyzed those data documents by doing coding, making matrix coding query, maps, and framework matrix.

Coding is the process of labelling of data using a code that symbolizes or summarizes the meaning of that data (Saunders, Lewis, & Thornhill, 2016). While according to Tracy (2013) coding refers to labelling and systematizing the data. Coding can be accomplished by using a variety of materials – paper and colored pencils, an Excel spreadsheet, or computer-aided qualitative data analysis software. Each approach has advantages and disadvantages and is personal to every researcher and project. The best approach for one person will not be right for another, and what works for one project may be clumsy for another. Bazeley and Jackson (2013) stated that coding in NVivo 11 is stored in nodes. In information systems the term 'node' is used to indicate either a terminal point or a point of connection in a branching network. Sociologists might be familiar with the idea of nodes in a social or a semantic network. Horticulturalists know the node as the point at which branching might occur in a plant. Similarly, in a fully

developed NVivo 11 coding system, nodes become points at which concepts potentially branch out into a network of sub concepts or dimensions.

In this research, the coding process using Nvivo 11 start from insert the source of data that obtained from the open-ended questionnaire. The function of coding process is to categorize topics/subject from data collected. The researcher then creates nodes to facilitate the coding process. Nodes serve to classify the results of data obtained. Then the data from the sources are grouped to the appropriate nodes.

The next step is making a query. According to Bazeley and Jackson (2013) queries might be about the occurrence of a word or words, about patterns of coding, comparison of groups, or some combination of these elements. They can be created and run once, or stored to use again with more data, or with a variation. In making matrix coding query, Bazeley and Jackson (2013) explained that the purpose is to find when the same data were coded at both of two nodes, such as when an emotion or experience was associated with a particular person or setting or time.

After coding and make matrix coding query, the data is displayed is made with NVivo 11 in an analytical map form to illustrate the relationship between the nodes with the data source for making an easy understanding and ease at the discussion stage. Within NVivo 11, there are three options to make maps, namely: mind map, project map, and concept map. Each map has its own function. In this research, project map is used. The results of coding data are presented in the form of framework matrix. Framework matrix is the result of coding to show the pattern of data that allows to be observed in the form of matrix table or in other word, its function is to show the entire result of coding in table form. In this research, the framework matrix is created from the source data that obtained from open-ended section of the questionnaire.

The result of analytical will be used as an input to conducting Current Reality Tree technique (CRT). A CRT is the first of a series of thinking processes proposed by Goldratt (1999). It allows you to identify the root cause(s) of problems from a list of Undesirable Effects (UDEs), or irritants. The CRT is one of the Thinking Processes logical tools. As the name tells, it depicts the current reality in a series of dependent logical cause-and-effect relationships, starting from Undesirable Effects down to one or a few critical root causes. The CRT is, in essence, a causal flowchart of the current system state as described by the facts of the case. The CRT is constructed by first identifying the Undesirable Effects (UDEs) noted in the case and posting them near the top of the diagram. Next, those facts of the case that appear to immediately cause the UDEs are posted to the diagram and connected to the appropriate UDEs with arrows, thereby illustrating the causal relationship. Next, those causes are looked upon as effects, and then their causes are extracted from the facts of the cases and subsequently diagrammed. This process is repeated until the CRT converges upon a root cause that, once identified, can be further acted upon by the decision-makers (Polito et al., 2006). By using this tool, the root causes of waste can be identified and thus can be solved.

3.3.2   Result Verification

An additional survey is conducted to ensure the result of this findings is considered applicable to the service laundry SMEs. The survey is conducted in form of survey given to the expert in this case the SMEs' laundry service manager's or owner. Likert five scale is used in the questionnaire for this survey. A Likert scale is a psychometric scale that has multiple categories from which respondents choose to indicate their opinions, attitudes, or feelings about a particular issue (Beglar & Nemoto, 2014). The scale that used on the first section of questionnaire are SD = strongly disagree, D = disagree, NAD = neither agree or disagree, A = agree often, and SA = strongly agree. Descriptive analysis is conducted to describe the data obtained from the questionnaire. The analysis is done using a category based on the value of the frequency distribution.

3.3.3 Validity and Reliability Test for Quantitative Data

3.3.3.1 Validity Test

Joppe (2000) stated that validity test determines whether the research truly measures that which it was intended to measure or how truthful the research results are. Researchers generally determine validity by asking a series of questions, and will often look for the answers in the research of others. The steps in validity test are explained below:

a. Determining the hypothesis

$H_0 = r_{count} \geq r_{table}$, the data obtained is valid

$H_1 = r_{count} \leq r_{table}$, the data obtained is not valid

b. Specifying the value of r_{table}

With the significance level of 5% and the degrees of freedom (df) = n-2, or in this research df = 30 − 2 = 28, then the value of r_{table} can be determined based on r table namely: df = 28, r_{table} 0.361.

c. Determining the value of r_{count}

The value of r_{count} can be obtained after doing the data processing using SPSS 23.0. The value of r_{count} can be seen in the output of SPSS 23.0 on Corrected Item – Total Correlation. As for the manual calculation can be seen on the attachment page by using the following formula (Sugiyono, 2010):

$$r_{xy} = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{[(N \sum X^2 - (\sum X)^2)(N \sum Y^2 - (\sum Y)^2]}} \qquad ...(3.2)$$

Where:

r_{xy} : correlation of coefficient between X variable and Y variable

X   : item score

Y   : total question score

N   : number of respondent

ΣX : sum of item score

ΣY : sum of total question score

ΣX^2 : sum of squared item score

ΣY^2 : sum of squared total item score

ΣXY : sum of the X and Y multiplication

d. Compare the value of r_{table} and r_{count}

    1. If r_{count} is positive and $r_{count} \geq r_{table}$, then *H*$_0$ is accepted

    2. If r_{count} is positive and $r_{count} < r_{table}$, then *H*$_0$ is rejected

If one item is rejected, then an iteration should be done until the valid item is found. To obtain an accurate result, valid calculation, and for time savings purpose, then the validity test is done by using SPSS 23.0. The procedure of validity test by using SPSS 23.0 is written as follow:

1. Turn on *Variable View* and define each column
2. Click *Data View* and fill in the data tabulation of questionnaire
3. Click *Analyze → Correlate → Bivariate*
4. Enter the entire X variable item into *Items*
5. Make sure to select *Pearson* in Correlation Coefficient category, *Two-tailed* in Test of Significant category, and tick the *Flag significant correlation*
6. Click OK

3.3.3.2 Reliability Test

Joppe (2000) defined reliability as the extent to which results are consistent over time and accurate representation of the total population under study is referred to as reliability and if the results of a study can be reproduced under a similar methodology, then the research instrument is reliable.

In academic publications, the most commonly used reliability coefficient is Cronbach's alpha, which is a generalized measure of a uni-dimensional, multi-item scale's internal consistency (Cronbach, 1951; Peterson, 1994). This criterion is defined as:

$$a = \frac{k}{k-1}\left(1 - \frac{\sum a_b{}^2}{\sigma 1^2}\right) \qquad \qquad ...(3.3)$$

Where:

α   : alpha reliability coefficient

k : number of question

$\Sigma \sigma_b{}^2$: number of variance items

$\sigma 1^2$: total of variance

A total assumption is that the average covariance among indicators must be positive. Therefore, one can easily see that Cronbach's alpha varies between 0 and 1. An issue in assessing Cronbach's alpha is that correlations among indicators and scale length are critical, influencing alpha. In addition, sample size has significant effect on the precision of the estimation of alpha. A common threshold for sufficient values of Cronbach's alpha is 0.6 (Hair et al., 2006).

In this research, reliability items are tested by using *SPSS version 23 for Windows.* The Cronbach's alpha value will be considered for overall reliability items in a single variable. The procedure of reliability test using SPSS are written as follow:

1. Turn on *Variable View* and define each column
2. Click *Data View* and fill in the data tabulation of questionnaire
3. Click *Analyze → Correlate → Reliability Analysis*
4. Enter the entire X variable item into *Items*
5. Make sure to select *Alpha* in Model category
6. Click OK

3.3.4 Trustworthiness Test for Qualitative Data

In qualitative research, according to Lincoln and Guba (1985) as cited in Leavy (2014), testing the validity data includes the testing of credibility, transferability, dependability, and confirmability.

a. Test of Credibility (In preference to internal validity).

According to Emzir (2010), credibility criteria involves the determination of qualitative research which is credible or trustworthy from the perspective of participants in the research. According to Lincoln and Guba (1985) as cited in Leavy (2014), credibility is the elements that allow others to recognize the experiences contained within the study through the interpretation of participants' experiences; checking for the representativeness of the data as a whole; member checking involving returning to the participants to ensure that the interpretations of the researcher are accurate representations of participants' experiences; peer debriefing; prolonged engagement.

b. Test of Transferability (In preference to external validity).

According to Emzir (2010), the transferability criteria refers to the level of ability of qualitative research results that can be generalized or transferred to other contexts or settings. While according to Lincoln and Guba (1985) as cited in Leavy (2014) transferability is the ability to transfer research findings from one group to another; thick description used to provide the reader with detailed contextual information; transfer of understanding is believed to occur if both contexts are similar.

c. Test of Dependability (In preference to reliability).

Dependability according to quantitative research relates to reliability. According to Emzir (2010), traditional quantitative views of reliability are based on the assumption of replicability or repeatability. Essentially, it relates to whether we will get the same result if we make the same observations for the second time. Lincoln and Guba (1985) as cited in Leavy (2014) stated that dependability is when other research follows the decision trail used by the researcher; having peers participate in the analysis process.

d. Test of Confirmability (In preference to objectivity).

According to Emzir (2010), qualitative research tends to assume that every researcher brings a unique perspective into the research. The criteria of confirmability or objectivity refers to the level of ability the researcher's results can be confirmed by others. Besides that, according to Lincoln and Guba (1985) as cited in Leavy (2014) testing conformability means self-critical attitude on the part of the researcher about how one's own preconceptions affect the research.

3.4 Research Flowchart

After describing overall method and the way to collecting the data, here we construct the flowchart from the beginning until the end of research. Flowchart of research in this study shown in Figure 3.1 as follows:
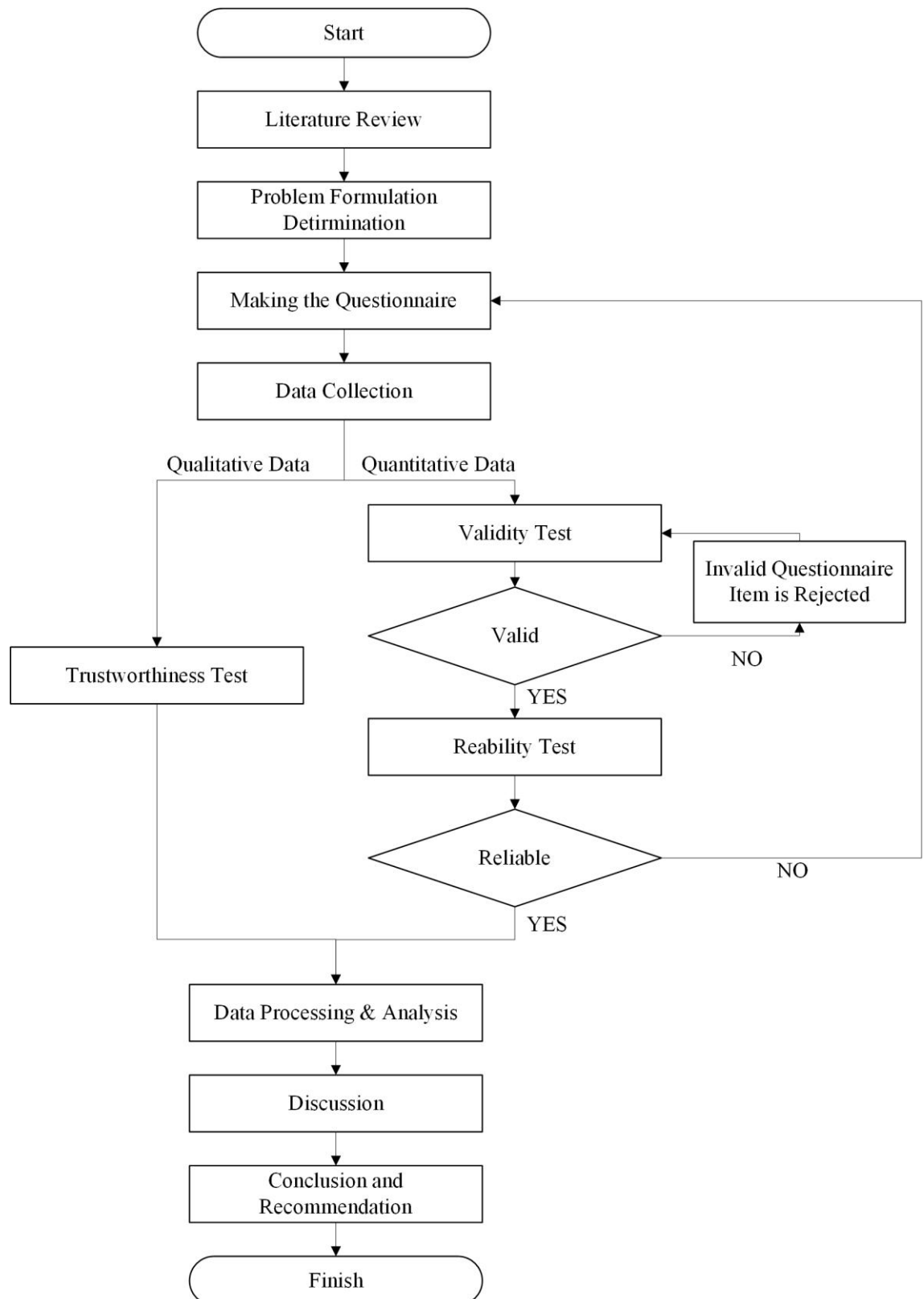
Figure 3.1 Flowchart of Research

Figure 3.1 above shows the research flowchart on this study. It can be seen that the research conducted has several steps. It was started by reviewing literature including journals, and books to earn an insight about research in lean concept applicability in SMEs. Next the problem formulation was conducted which become a reference in making the questionnaire. After that, data collection is conducted by distributing the questionnaire to the respondents which are local SME laundry services. After summarizing the collected data, for a quantitative data a validity test was conducted. After the data was categorized as valid, the reliability test was conducted. If the collected data is not reliable, researcher must recreate the questionnaire. For qualitative data a trustworthiness test was conducted. After all data was categorized as valid, reliable, and trustworthy the data that gathered can be processed and analyzed.

Then, researcher will analyze the collected data and will process the data to find out the type of waste that happens in the laundry service, the frequency of waste happens, and what is the causes of the waste that happens and finally finding the root causes of the waste. According to the root causes of the waste that happens, researcher can analyze and choose the most suitable lean methodology to be implemented in the service laundry SME to overcome the problem.