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A Development of Logical Design Flowchart for Computerized System of Problem Solving and Improvement Procedure

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ABSTRACT

Problem solving and improvement procedure is needed when improvement team to perform an improvement or a problem solving activity. The procedure is very significant to ensure the improvement activities are being conducted efficiently and effectively. From comprehensive literatures and references, this paper developed the integration procedure to conduct the problem solving and improvement activities that consist of 14 steps and 35 quality tools and techniques. This integration procedure can be used as an assessment tool for the improvement team to confirm all necessary steps are taken during the improvement activities. The aim of this study is to develop the assessment application system by transforming the integration procedure into computerized system or digital decision making. Therefore, based on the steps of integration procedure, this study proposes the logical design flowchart as a preliminary study to the development of assessment application system. The findings from this paper will be able to ease the improvement team in order to assess the steps performed is meeting the improvement process requirement.

Key words: Problem Solving Procedure, Logical Design Flowchart.

1. INTRODUCTION

In information system, the researcher and technologist develop and built Decision Support System (DSS) for almost 40 years since the computer being introduced to the world. DSS is a system that being computerized as a digital computer based software that being used to support the decision that being made by the organization. Through the DSS the organization is being able to make better decision in order to make the organization become a success. Organization and business utilize DSS when performing decision making activities. DSS will help decision makers to transform raw information such as data, documents, procedure and others as the input and change it into digital mode and make quality decisions at the end of it. DSS will transform the manual decision that organization did into digital decision making. There are many types of DSS and in this study, researchers focusing on knowledge driven DSS. Knowledge driven DSS can work as a medium to let deliver information and advice to organization in choosing product or services. Knowledge driven DSS also give suggestion to users about the action step that need to be taken. The problem-solving process can be done by using this type of DSS. The usual technology that can be used is a web or software that stands alone in the computer.

In this research attempted to transform the manual integration procedure into digital mode in order to ease the team to decide which step that need to be performed in order to solve problem and make improvement. Manual decision is the decision that has been made by decision makers manually. For example, by using experience that decision makers already have. Not all problems and decision can be solved by using past experience. Some of the problems are new to the world. So, in order to solve the new problem, decision makers need to know the step to solve the problem. The problem can be solved by guidance such as through the procedure. Decision makers also make decision by using the knowledge that gained from research study and expert opinion. Apart from that, decision making also normally is being performed by using teaching and learning style where decision makers learn how to solve the problems by using steps, procedure, information, data and analysis that being introduced.

Digital decision-making process is a computerized system

that let user to easily use it to perform the activities of solving problems. Digital decision making will be able to help the user to solve the problem with minimum supervision. Digital decision allow user to know the steps easily that need to be undergo in order to solve the problem that exist in organization.

2. INTEGRATION OF PROCEDURE

This study developed an application that provide user with an integration procedure for project deliverables from PDCA and DMAIC. The procedure assists and guide user by providing the necessary steps that user need to perform in order to make the improvement a success and able to solve problem that occurs. The procedure works by letting user evaluate and rate the improvement and problem solving process progress.

This procedure consists of 14 main steps that were developed from the integration of 17 references. About 35 quality tools and techniques were involved in the procedure that uses to assist the improvement team to conduct the improvement activities.

STEP 1: Forming team [1], [2].
- a) Select team members
  - Matrix Diagram
- b) Appoint team leader
  - Voting
- c) Develop organization chart
  - Organization Chart
- d) Develop Gantt Chart
  - Gantt Chart

STEP 2: Problem identification [3], [1]
- a) Identification of possible problems [1]
  - If involving general problems - Brainstorming, Cause and Effect Diagram, Affinity Diagram
  - If involving manufacturing process - Value Stream
- b) Mapping, Flowchart, Process Capability Evaluation, Control Chart, QFD
  - If involving customer, identify the problem by
- c) customer feedback, customer requirement and company mission – Voice of Customer (VOC)
- d) Select the most significant problem [4], [5]
  - Pareto Chart, Scatter Plot
- e) Develop problem statement
  - 5 W
- f) Identify what need to be improved (reason for improvement) [6].
  - Brainstorming, Affinity Diagram, CTQ, VOC, Pareto Chart, SIPOC Diagram, Scatter Plot, Check Sheet, Matrix Diagram

STEP 3: Establish project charter [2], [4], [7]
- a) Develop plan of action
  - Flowchart, Matrix Diagram, Histogram, Scatter Plot
- b) Define objectives of project [8], [9]
  - Brainstorming
- c) Define project benefits [2]
  - Six Thinking Hats

STEP 4: Understanding current situation
- a) Analyze current process problem [10], [6]
  - Scatter Plot, Check Sheet, Pareto Chart, Cause and Effect Diagram, Control Chart, Affinity Diagram, Flowchart, Histogram
- b) Measure current process [1]
  - Process Capability Evaluation, Control Chart

STEP 5: Setting target [1]
- a) Decide what to attack
  - QFD
- b) Define target and who involved
  - VOC
- c) Determine location of problem
  - Observation
- d) Determine when to collect the data
  - Brainstorming
- e) Determine how to collect the data
  - Check Sheet, Gage R & R, DOE, Taguchi, Lean

STEP 6: Data Collection Plan [2]
- a) Gather and collect data [11]
  - Check Sheet, Gage R & R, Affinity Diagram
- b) Analyze the data [3]
  - Inferential Statistics, Descriptive Statistics

STEP 7: Identify all possible causes [12], [5]
- If involve general and customer based process – Brainstorming, Cause and Effect Diagram, Affinity Diagram
- If involve manufacturing process - Value Stream Mapping

STEP 8: Verification and validation of possible causes [3]
- Histogram, FMEA, Pareto Chart

STEP 9: Determination of root causes
- Why-Why Analysis, Relation Diagram, Pareto Chart, Histogram

STEP 10: Identification of possible solutions [6], [2], [13]
- Cause and Effect Diagram, Check Sheet, Pareto Diagram, Control Chart, Scatter Plot, Affinity Diagram, PDPC Diagram, FMEA, Interrelationship Diagram, Matrix Diagram, QFD, Fault Tree Analysis, Process Capability Evaluation

STEP 11: Verification of solution by performing pilot testing [13], [6]
- Check Sheet, Pareto Diagram, Histogram, Scatter Plot, Control Chart, Matrix Data Analysis, FMEA, DOE, Taguchi, Process Capability Evaluation

STEP 12: Measure the effectiveness of solution [12], [2]
- Tangible impact and intangible impact [7]
- Inferential Statistics, Descriptive Statistics, Interrelationship Diagram, Process Capability

Evaluation, Control Chart.

STEP 13: Solution implementation

a) Adopt and adapt to real situation [9], [5]
- Training

b) Standardization of solution [12], [13]
- Matrix Diagram, Flowchart, Training

c) Keep improvement on-going (plan for future) [6], [5]
- Training, Inferential Statistics, Control Plan

3. METHODOLOGY

3.1 Development of Assessment Application System

Two main contents required in this application system which is the procedure that being integrate and the quality tools and techniques in each steps of the procedure. Prior to the development of the application, pre-design is required to sketch the layout of the interface, and Microsoft Office PowerPoint is one of the options that used in this study during pre-design stage. Subsequently, this study creates and design algorithm for the system and software development and Visual Basic is used to develop this assessment application system. Pilot testing is conducted to ensure the system is operating as per design in the logical design flowchart. Figure 1 shows the steps of this development.

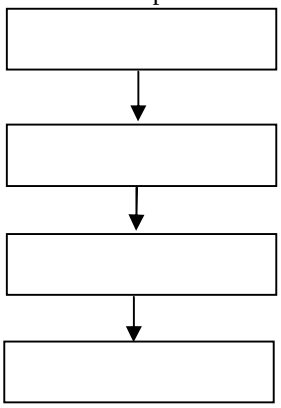

Figure 1: Steps for Development of Assessment Application System

3.2 Conceptual Model System

The system developed based on input-process-output (I-P-O) model as shown in Figure 2. This conceptual model show that the system need to identify the type of data or content needed, the logical design flowchart to guide the development of system' algorithm, and lastly the desire output for user application.

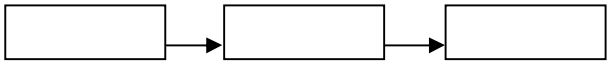

Figure 2: The conceptual model using I-P-O

Input - Data

a) Procedure
b) Quality tools and techniques

Process - System

a) Pre-designing by using Microsoft Office PowerPoint
b) Visual Basic Software Coding and logical design flowchart

Output- Software (Assessment Application System)

a) An assistance software that help user to assess and measure the improvement process's progress
b) Display score of each step
c) Display further recommendation that need to be undertake by user if the improvement step do not meet the specification

4. LOGICAL DESIGN FLOWCHART

Figure 3 (A)-(O) below shows the logical design flowchart that being used to develop the assessment application system by using Visual Basic Software.

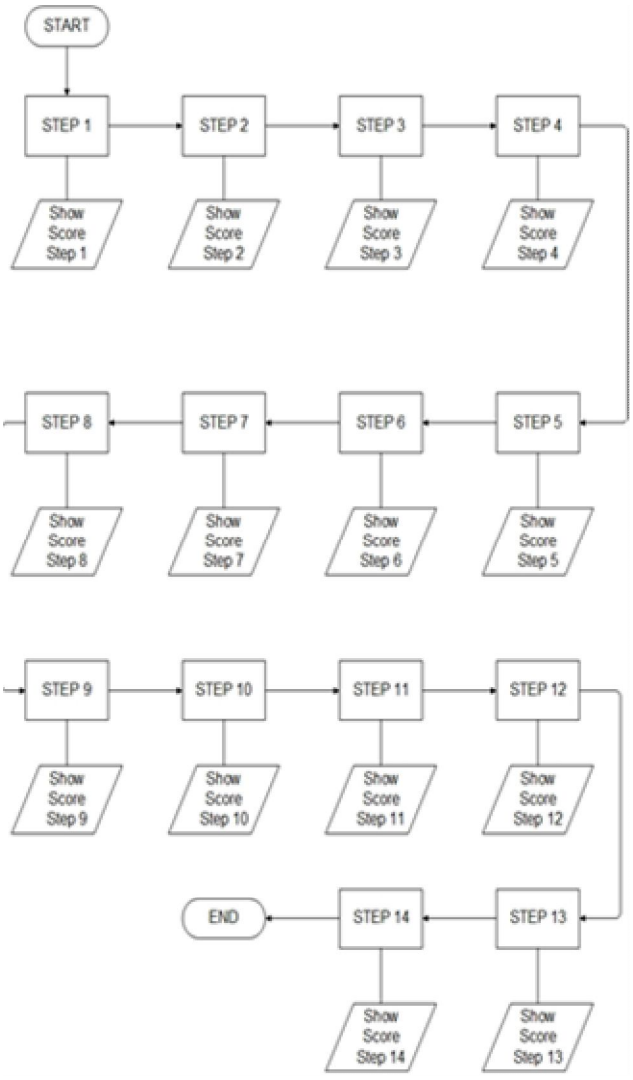

Figure 3 (A): Logical Design Flowchart - Overall

The improvement team or user will select the steps that has been performed and completed. If the organization does not complete the steps, the assessment apps will show the suggested further action that can be performed by the user. The further action consists of the quality tools and techniques that can be used when perform the steps.

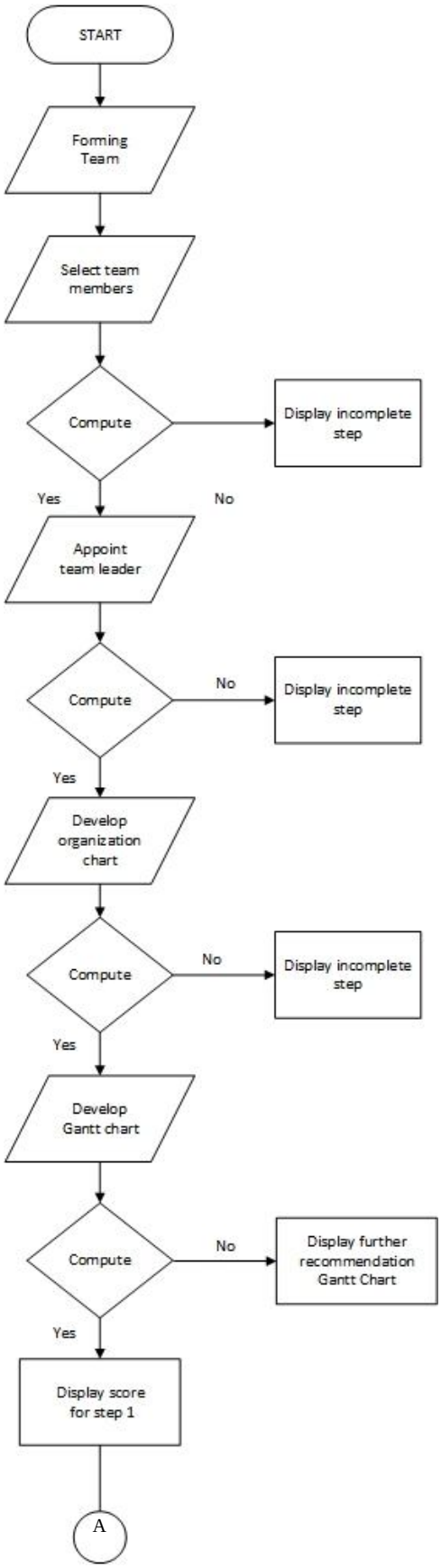

Figure 3 (B): Logical Design Flowchart for Step 1

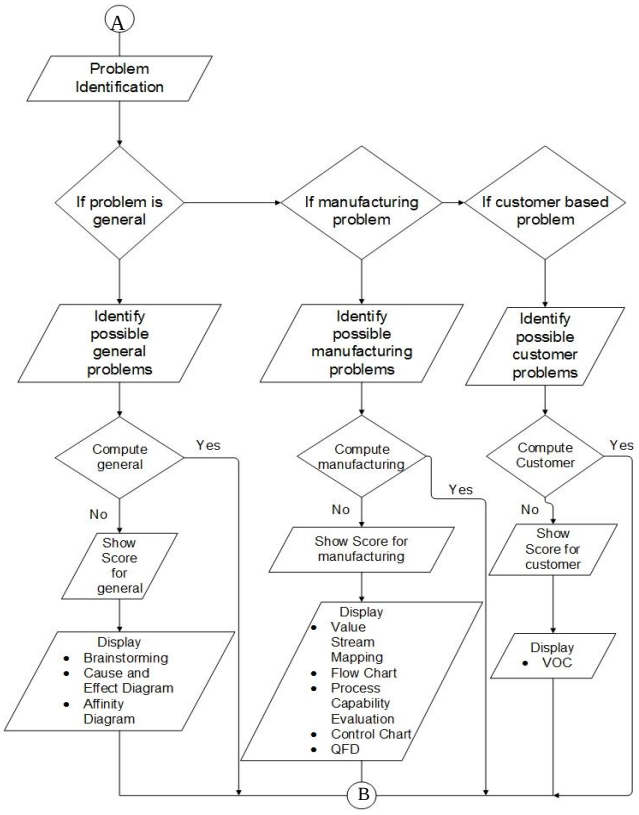

Figure 3 (C): Logical Design Flowchart for Step 2

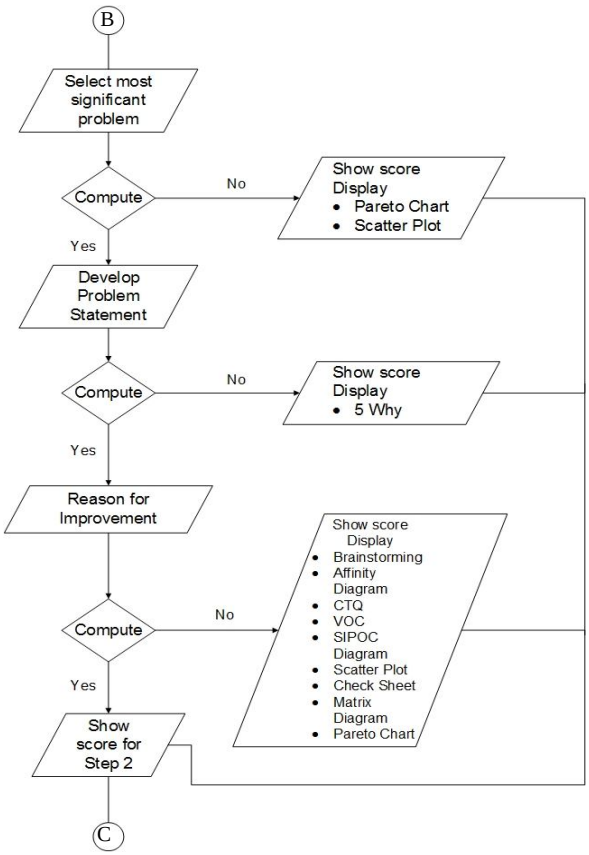

Figure 3 (D): Logical Design Flowchart for Step 3

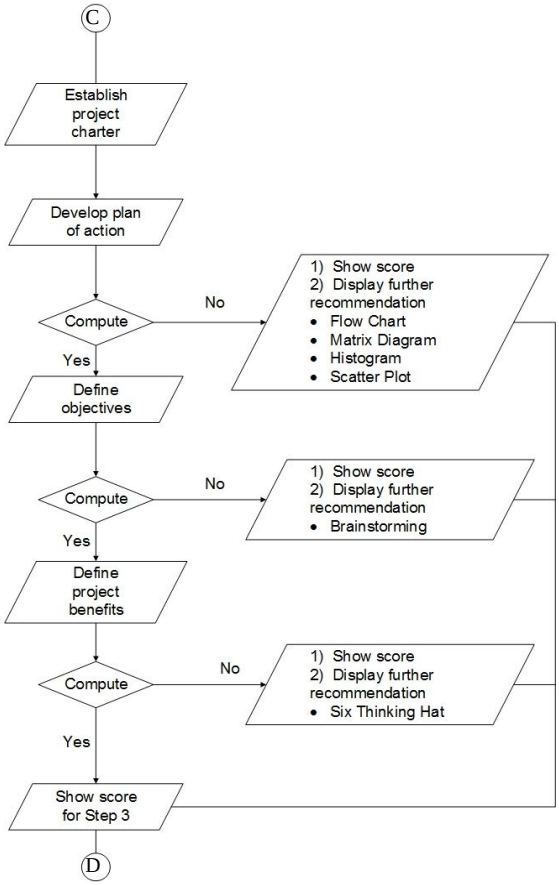

Figure 3 (E): Logical Design Flowchart for Step 4

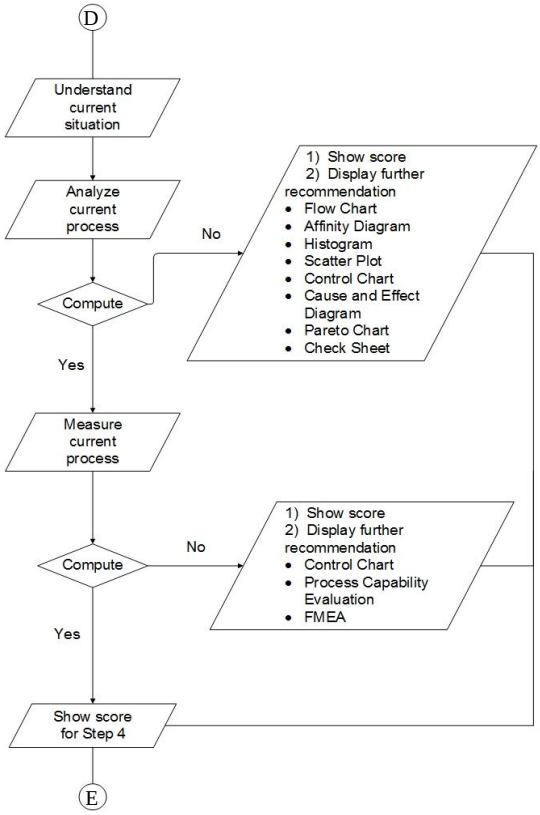

Figure 3 (F): Logical Design Flowchart for Step 5

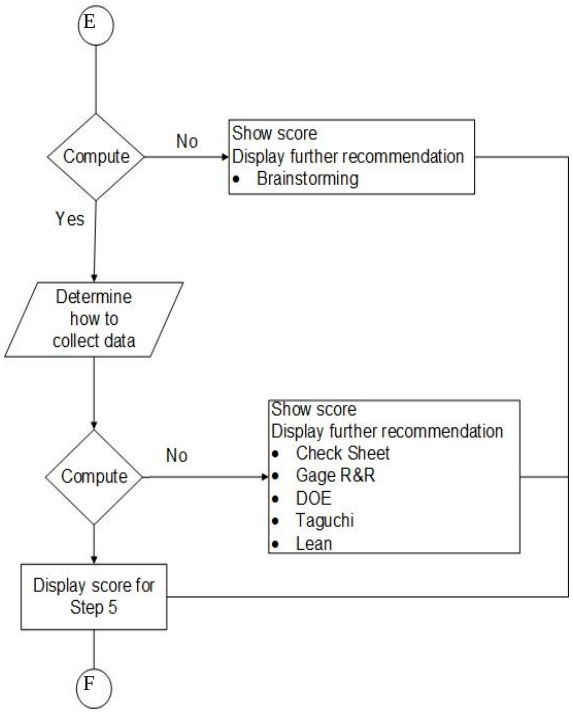

Figure 3 (G): Logical Design Flowchart for Step 6

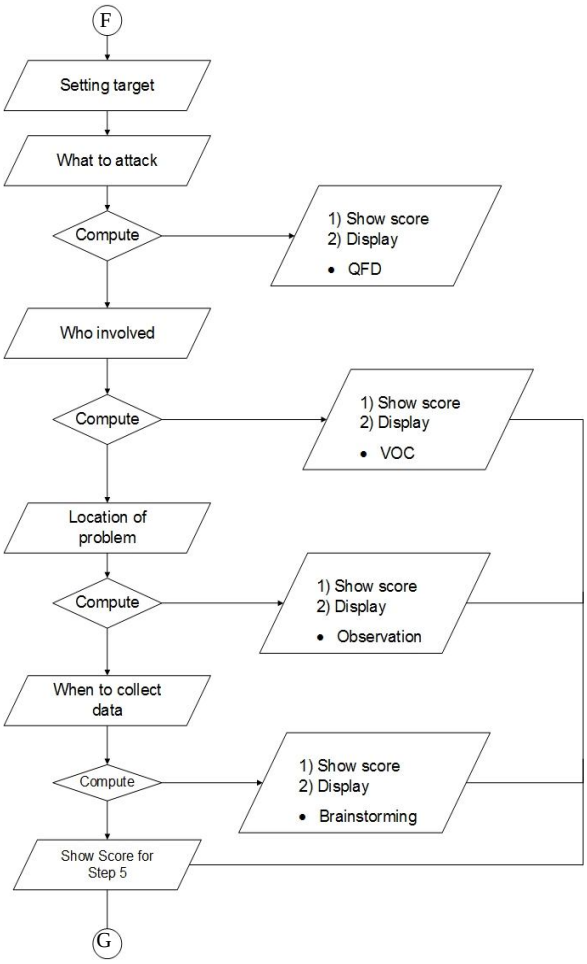

Figure 3 (H): Logical Design Flowchart for Step 7

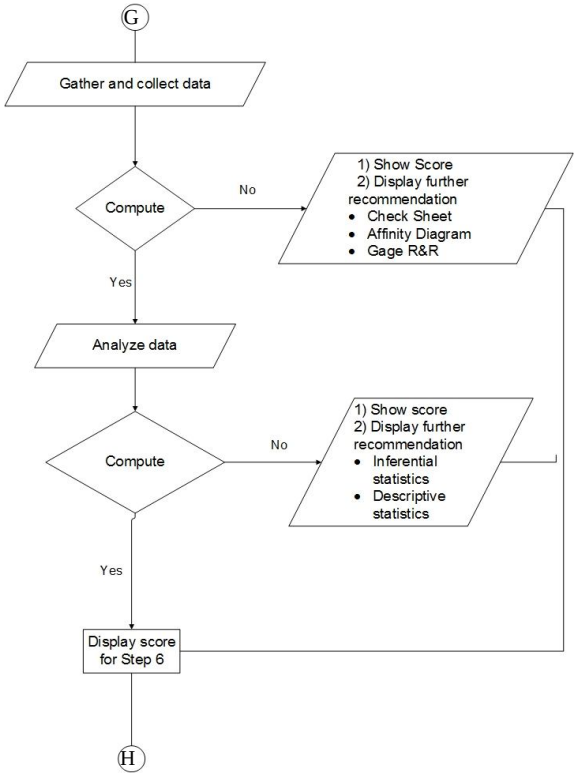

Figure 3 (I): Logical Design Flowchart for Step 8

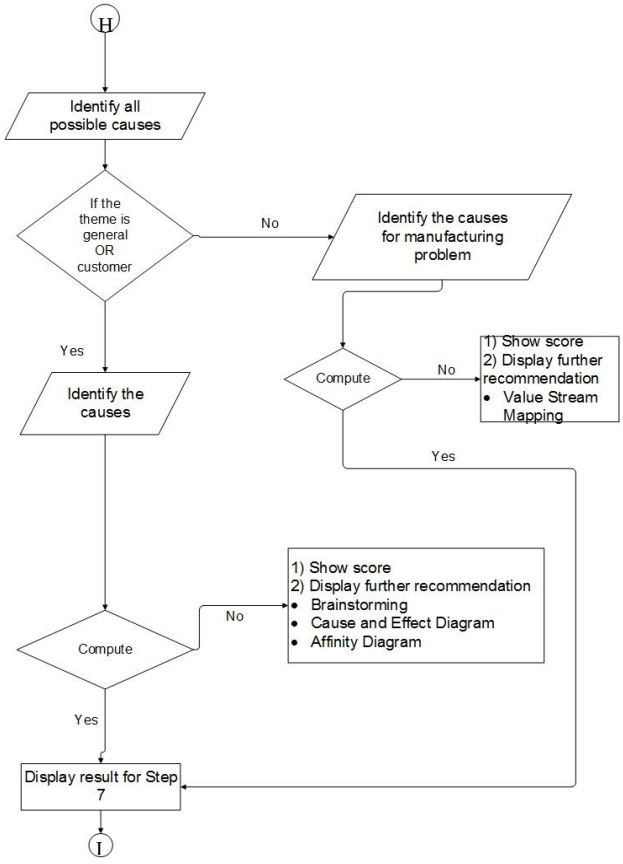

Figure 3 (J): Logical Design Flowchart for Step 9

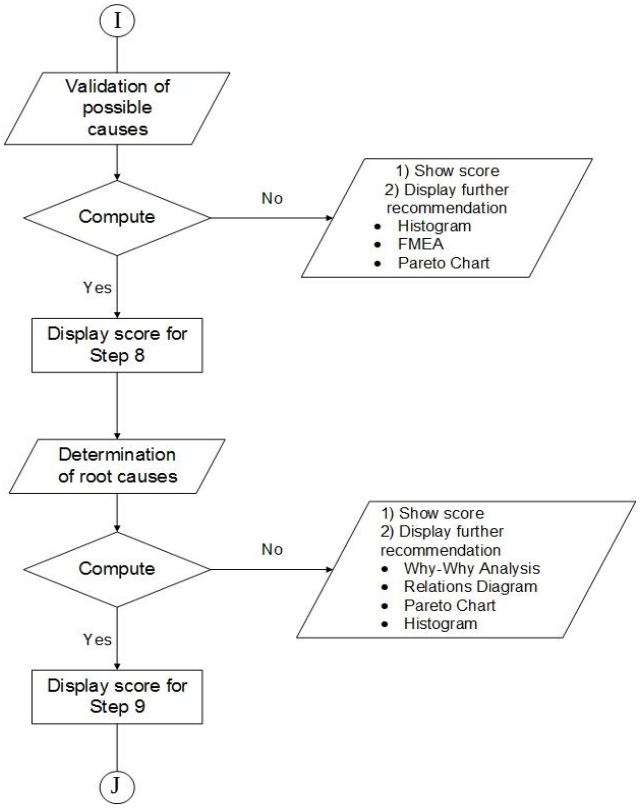

Figure 3 (K): Logical Design Flowchart for Step 10

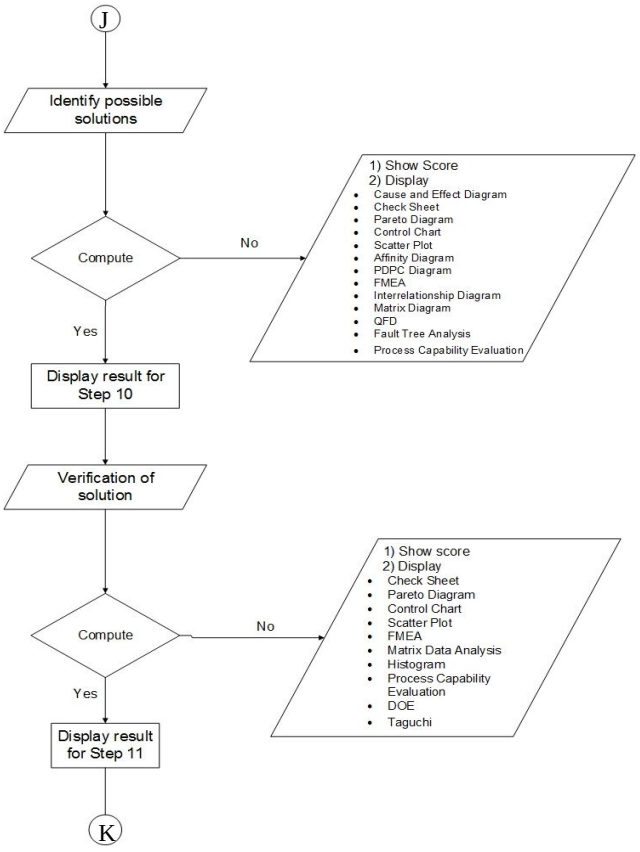

Figure 3 (L): Logical Design Flowchart for Step 11

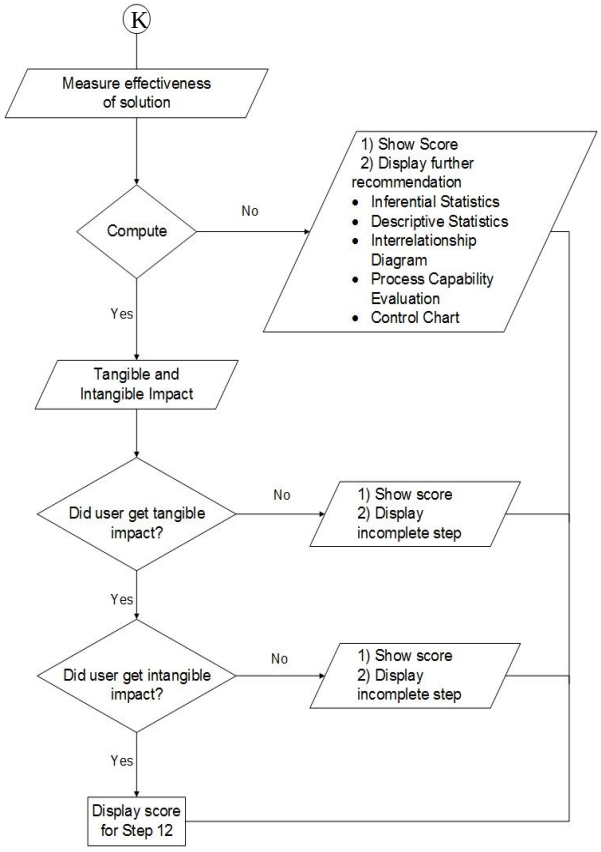

Figure 3 (M): Logical Design Flowchart for Step 12

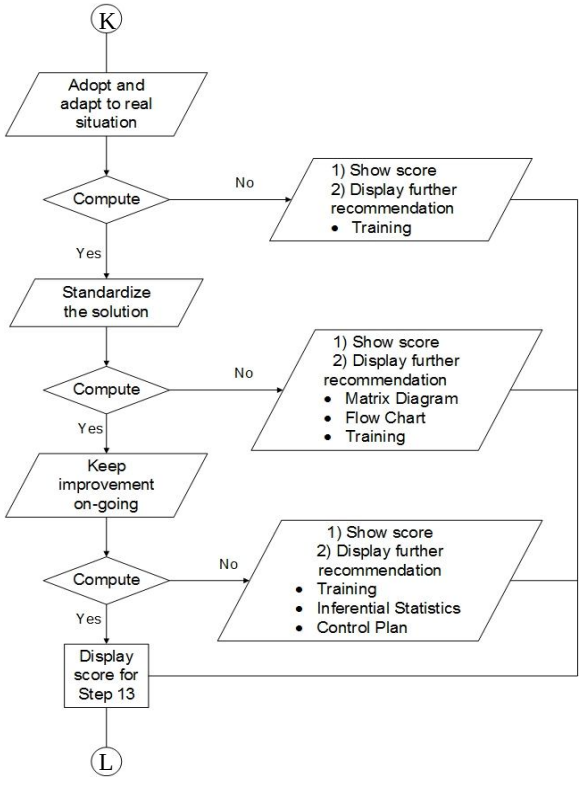

Figure 3 (N): Logical Design Flowchart for Step 13

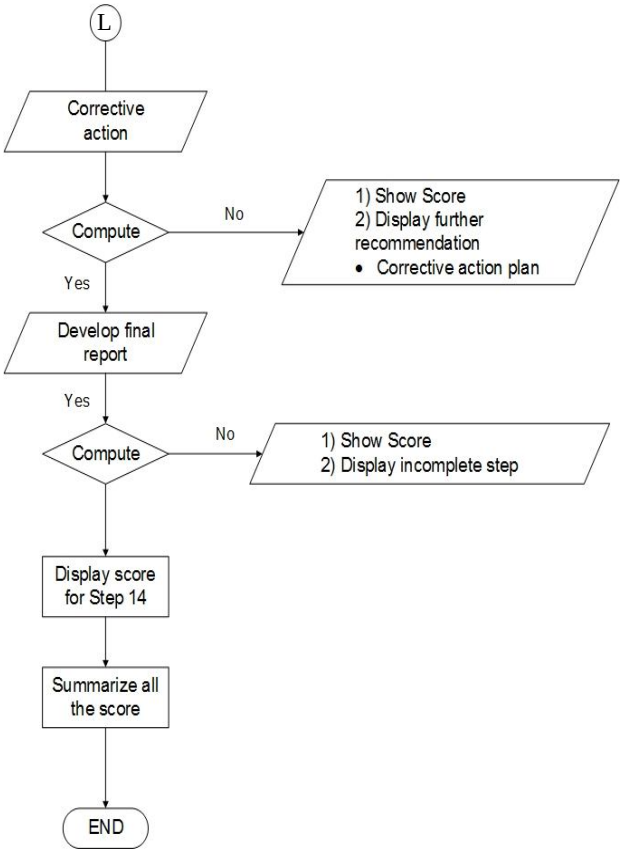

Figure 3 (O): Logical Design Flowchart for Step 14

5. CONCLUSION

The logical design flowchart is expected to become guidance in developing the assessment application system by suing Visual Basic Software.

The assessment application system is expected to ease the user or the team that conduct the problem solving and improvement activities, and can use the system to evaluate and assess the status of the activities.
The assessment application system also expected to display suitable quality tools and techniques in each steps of procedure that can be utilized by user or improvement team during improvement activities.

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