

Determine Malfunctions on Samsung Digital Door Lock

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Introduction

Since users of Samsung digital door lock are increasing in recent years in Taiwan, engineers in customer service department play an important role in providing technology supports to clients. Digital door lock, an electronic product can lock the door automatically and be unlocked by owner's fingerprints or passwords, is consisted of numerous complex electronic components, so news engineers usually have been struggling when they are serving their customers for determining malfunctions. In other words, even if the engineers have possessed engineering backgrounds before they are recruited in the department, problem evaluating is an ability which needs to be accumulated by experiences. However, employer expects new hires can be on the track as soon as possible in order to make more profit for company; in this situation, training program will be very crucial. Thus, the purpose of this project is to use basic circuit theory to guide new engineers to infer the process of operating digital door lock in order to determine malfunctions quickly and accurately, so knowing the function of each main device and utilizing the basic circuit theory to simplify the numerous electronic components is a rapid way to achieve the ability of determining errors. Of course, experiences are still needed. New hires can be assigned several cases which are supporting clients whether at the scenes or on the phones. As a result, the principles of this project are electrical circuit foundation, modularize learning, and PBL application.

Electrical Circuit Foundation

Every electronic product is designed by electrical circuits; as an electrical engineer, being able to describe the functions of circuit is a fundamental knowledge. To put it differently, circuit

is as a language which presents the tasks of machine to readers. Of course, there are different kind of characters which are called electronic symbols need to be known in this language.

Furthermore, by using the concept of circuit, engineers can not only be assisted on evaluating problems of electronic products effectively but also develop their professional knowledge.

First of all, circuit is an overall description which tells engineers what functions should be accomplished during the operation; on the other hand, engineers can discover what functions does not be accomplished. According to Kollöffel and Jong (2013), “students’ conceptual understanding becomes deeper, the accuracy with which they can assess the causal relations between quantities in problem situations will increase.” In other words, learners who obtain better comprehension on electrical circuit can easily find out the causes of problems and the directions of solutions. For this reason, utilizing conceptual understanding to analyze electrical circuit can also determine where the errors are, and fix it.

Determining and fixing malfunctions is a professional task for engineers of customer service department. During the services, “engineers must exhibit more than first-rate technical and scientific skills.” (Keltikangas & Martinsuo, 2009) Namely, engineers have to do the process correctly and meaningfully when they are supporting clients. For example, if an engineer does not possess the foundation of electrical circuit and tests an equipment incorrectly, it may cause the malfunction gets worse; further, the trust between company and client will crash.

Modularize Learning

Big pictures of electronic components can be a rapid way of determining malfunctions. Inside a digital door lock, there may be more than hundreds of elements exist. It is impossible and unnecessary to figure out the function of every element and research the whole electrical circuit; also, the Samsung enterprise keeps the circuit of digital lock in secret since products may

be copied if these information are disclosed. However, engineers can still draw a circuit which is consisted of main components that are organized by tasks; for instance, if there are 50 elements are controlling a power supplement, then, these 50 elements can be considered in one main component. In the article, Teaching Calculus Using Module Based on Cooperative Learning Strategy, Arbin, Ghani and Hamzah (2014) claim that “the basic frame working constructing a teaching material is to divide the content into small items.” Basically, Arbin, Ghani and Hamzah are saying that cutting a complex subject into several easy pieces can benefit learners’ comprehensions and enhance their performances. Thus, to redraw a circuit of digital lock which only includes main components by own conceptual understanding can determine malfunctions easier than using complex circuit.

By testing malfunctions, logical thinking is another importance skill. According to the website, Engineering School, great engineers “understand how things work and how problems arise.” Basically, it is saying engineers have to know where the errors exactly are. In other words, sometimes there may be more than two malfunctions in one case, engineers must keep investigating the errors until every problems are fixed.

Since the big concept is enough to solve general clients’ problems, engineers do not have to apply whole circuit theory. Keltikangas and Wallen (2010) investigate the perspectives of connecting field and working life from engineers in their research, they mention that “field theory course does not have to be useful.” In making this comment, Keltikangas and Wallen argue that theory is a foundation of knowledge that people can develop in the future, but it does not mean the theory must be utilized thoroughly. Similarly, in this project, engineers will be guide to in big concept of digital circuit, rather than learning complex circuit.

PBL Application

Once new engineers have a big concept of digital door lock, they can be assigned some practices or cases for enhancing their abilities. Although circuit theory is an aid for providing technical supports, engineers still need experiences to improve their performances. According to Khan (2010), by using Problem-Based Learning, engineering students' "skills can be developed, including the ability to think critically, analyze and solve complex, real world problems." Actually, Khan is insisting that instead of just reading theories, engineering students' can be trained by given problems in order to develop various solutions for solving different problems. Hence, new engineers can solve clients' problems faster by practicing simulating malfunctions or encountering in real cases.

Needs analysis

Background of the problem

A proxy company of Samsung digital door lock in Taiwan has recruited two new engineers in customer service department. In the department, engineers provide technical supports to clients by phone, and make schedules to repair digital door locks which are installed at clients' locations. Since engineers should evaluate problems by customers' descriptions through phone calls first, they must have a clear concept of digital door lock to explain the problems to customers; for example, informing components which might be broken and need to be replaced. Then, testing the digital lock at the scene in order to determine malfunctions. In this department, every engineer needs to support at least 5 customers every day, so the time of serving each customer has to be limited. Thus, engineers must possess solid ability of determining malfunctions for dealing with multiple problems from clients.

Problem statement

Interviews which interviewees were in higher positions (manager and director) and surveys which respondents were new hires were conducted in this analysis report. Through the interviews and surveys, new engineers did not have an effective training and support. Yet, manager and director hoped that engineers could do self-instruction.

In the interviews, the manager and director expected that new engineers could perform better on their works. The manager asserted that company provided video training material which could assist new engineers effectively. However, the director who worked with new hires as a mentor had opposite opinion, he mentioned that the video was only introducing how to use digital door lock which people could get on illustrations, rather than teaching problem solving. Further, new hires still had many confusions after they watched the video; also, the director mentioned that he did not have too much time for providing training since he had his own works to do. In the surveys, both of two engineers responded that the training video was not effective and it was only focusing on introduction of the digital lock. Furthermore, there were three findings of responses form new engineers; first, they did not know how to determine malfunctions at the beginning; second, they did not have visual aids to assist them on working; third, they cost too much time on solving problems on each customer.

Rationale for the need for instruction

Based on the manager's respond, the training video that he provided to new engineers was effective, and he asserted that learner should obtain experiences from clients' cases; in brief, manager expected new engineers did self-instruction. However, the director and new hires believed that the services would be worse if engineers did not have clear basic concept of the lock in training. Therefore, the gap between the position of management and implementation was significant. Engineers claimed that Samsung digital lock was a new product for them, so they

needed a direction to guide them for researching this new technology in order to solve problems quickly for clients. Hence, to bridge the gap, this project utilizes engineering knowledge to connect digital lock for enhancing learners' skill strongly. Also, the material is allowed to be read on computer or smartphone, etc. Thus, engineers can do the self-instruction which the manager expected.

Available resources

Since the designer of this training material was an engineer in this company, he obtained many experiences from co-workers and himself. To interview and discuss with ex-collogues can help the designer to clarify the need of new engineers. In addition, ex-collogues agree that they can provide document which are regarded to Samsung digital door lock and client's problem records; that helps designer to make this material more specific.

Goal statement

The goal statement of this instructional material is "new engineers are able to determine the malfunctions on Samsung digital door lock by applying electrical circuit." In this goal, learners are new engineers in customer service department. Further, they will learn how to determine errors on Samsung digital door lock in faster way by using electrical circuit concept which is simplified from complex circuit. Eventually, the engineers can solve clients' problems in shorter time.

Learner analysis

Entry behaviors

Learners should know how to use electrical meter and hardware tools. First of all, since the way to assess the power of electronic device is to measure voltage, learner must know how to

operate electrical meter. Second, during the process of determining malfunction, replacing and testing components are necessary, so learners need to use hardware tools to twist or loose screws.

Prior knowledge

Learners should be able to read electrical circuit. In this project, the functions of digital door lock are going to be presented by electrical circuit in order to infer errors. Thus, learners have to possess the basic concept of electrical circuit.

Education

Both of two learners are male. One learner graduated from university last year without any working experience, and his major was electrical engineering. Another learner also graduated from university without working experience, and his major was electronic engineering. Although they studied in different specific majors, they have engineering backgrounds.

Ability levels

Through the survey, both of two engineers responded that they already know how to use electrical meter and hardware tools since they had practicum class in their universities. Also, they understand electrical circuit and believe electrical circuit concept can help them obtain better understanding digital lock. Besides, one learner are able to list 5 main components of Samsung digital door lock while another learner only can list the 2 main components. In addition, they have good performances on installing each component on the digital door lock, but the ability of determining errors needs to be improved.

Motivation

The two learners present high motivation for be trained by this topic. So far, they have struggled in identifying malfunctions since they are lack of training and experiencing. In this

situation, their works have been accumulated because it could not be solved on time. Hence, this project can become an aid of initial training program and assisting material.

General learning preferences

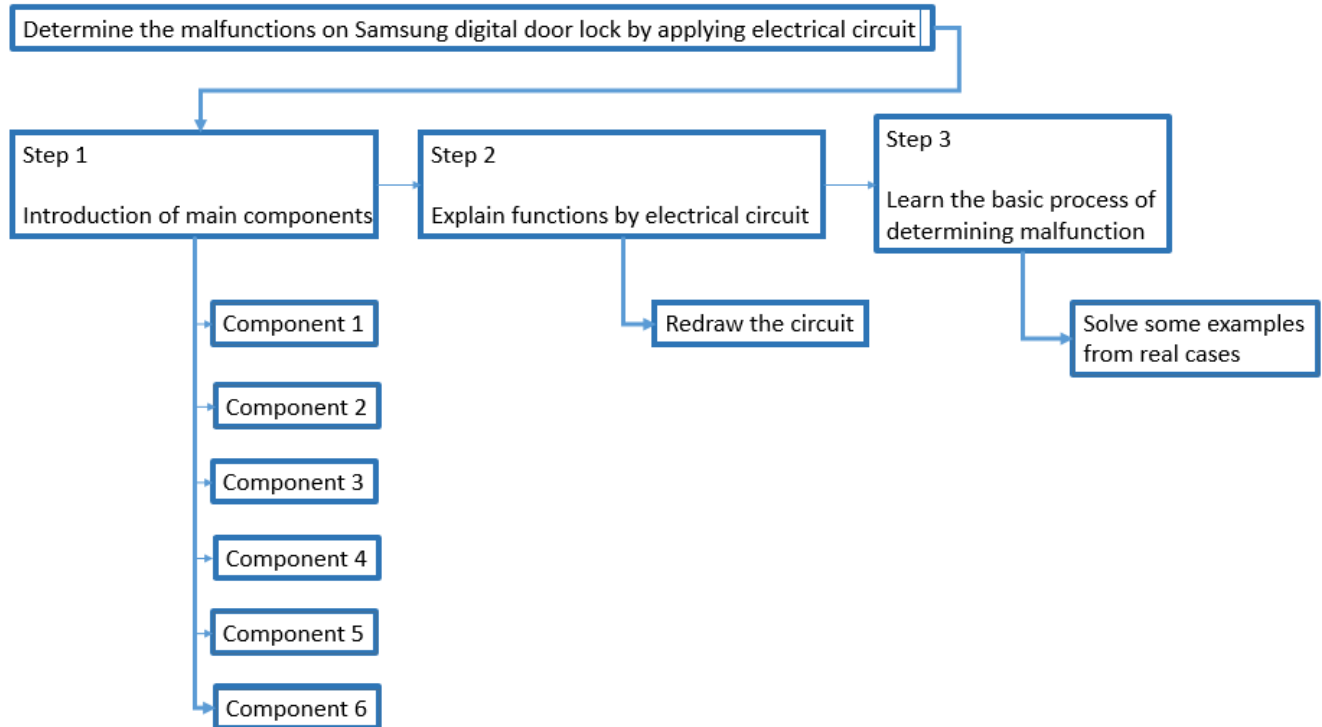
Through responses of the survey, learning preferences for respondents are visual material and practicum. First, the visual material is allowed to be read when they are off-duty, so that contents can be reread at home for enhancing the knowledge. Second, practicum provides real situation of solving problems for customers. Thus, it can improve engineers' skill and help engineers to solve problems faster.

Instructional analysis

According to the interviews and surveys. The need of manger, director, and new hires is to promoting the ability of determining malfunctions on Samsung digital door lock for new engineers in order to improve their performances on works. Therefore, the contents of this project will be organized in three sections:

1. Introduction of main components: List all main components and describe the task of each component.
2. Electrical circuit of functions: Present the functions of digital door lock by simplified circuit and explain the operation of the lock.
3. Malfunction determining: Illustrate basic process of identifying errors and use real cases for practicing.

Flowchart



Summary

This training material is focusing on combining knowledge and practicum. The original training of the company was only introduce each type of Samsung digital lock, and it is not helpful for engineers to evaluate malfunctions. Thus, this project guides learners to use the knowledge that they learned and apply it on works; in this way, learners can understand digital lock easier and deeper. Also, through PBL method, the performance of problem solving can be enhanced.

Since learners prefer to use visual material, using power point file and website can be considered. The reason is that these two delivery options can be opened on smartphone, so engineers can review it even at home. Also, it can be a visual aid when engineers are solving customers' problems at the scene or on the phones. Yet, there is an issue of using website which is Internet signal. Because engineers cannot make sure the locations that they work have Internet signal, website may not be linked on smartphone.

At the end of this project, designer will put some questions which are the real cases from service records. Further, the questions will be opened-ended questions in order to measure that do learners actually absorb the knowledge and apply it on their works.

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