KNOWLEDGE EXTRACTION AND VALIDATION METHODS FOR PROCESS OPTIMIZATION AND FAULT DETECTION IN AN AUGMENTED REALITY APPLICATION

By:

Christian Alison Maulion Piolo

1-1607-018

BACHELOR'S DEGREE
in

INDUSTRIAL ENGINEERING
FACULTY OF ENGINEERING AND INFORMATION TECHNOLOGY

SWISS GERMAN UNIVERSITY
The Prominence Tower
Jalan Jalur Sutera Barat No. 15, Alam Sutera
Tangerang, Banten 15143 - Indonesia

July 2020
Revision After Thesis Defense on 15 July 2020

STATEMENT BY AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.

Christian Alison M. Piolo

Student Date

Approved By:

Dr. Eng. Aditya T. Pratama

Thesis Advisor Date

Prof. Dr.-Ing. Andreas Schwung

Thesis Co-Advisor Date

Dr. Maulahikmah Galinium, S.Kom, M.Sc

Dean of Faculty of Engineering & IT Date

ABSTRACT

Knowledge Extraction and Validation Methods for Process Optimization and Fault detection in an Augmented Reality Application

By

Christian Alison M. Piolo

Dr. Eng. Aditya T. Pratama, Advisor

Prof. Dr.-Ing. Andreas Schwung, Co-Advisor

SWISS GERMAN UNIVERSITY

With the growing complexity of processes in factories, expert knowledge is considered a very valuable asset to have. However, expert knowledge is difficult to obtain and teach. This process requires time, practice and experience which the experts have obtained throughout their years of work. Fortunately, with the rapid technological advancements, there are many options that can help assist with this problem. One of the prominent technologies companies have tried implementing into their processes are augmented reality. Since this is still a new tool, there are many questions about its plausibility and effectiveness when used as a tool for learning and process optimization. In this thesis, it will aim to use augmented reality to assist in knowledge internalization, process optimization and fault detection and then formulating a solution developed in an augmented reality application. This paper discusses the proper ways to extract knowledge through the use of questionnaires, eFMEA and pFMEA and then implementing them into the HoloLens and testing the effectiveness of the implementation through time studies and tests.

Keywords: Knowledge Management, Augmented Reality, Expert Knowledge, FMEA

DEDICATION

I dedicate this thesis to my parents, teachers and myself.

To make the people who have guided me proud

and also, for me to see my full potential.

We did it bub!

ACKNOWLEDGEMENTS

First of all, I would like to express my gratitude to God who has given me the strength and wisdom to finish my thesis.

I am very thankful for my parents and my aunt, Linda Piolo, for their support throughout my bachelor's degree in Swiss German University. Their financial and emotional support is what gave me the perseverance to finish the thesis.

I also express my gratitude towards Prof. Dr.-Ing. Andreas Schwung, who has given me the opportunity to work on my thesis in Germany.

I am also grateful for Dr. Eng. Aditya T. Pratama for giving me the proper guidance throughout the process.

Also, thank you to Mohammad Tahasanul Ibrahim for his unwavering support in the backend scripting of the project.

I would also like to thank Dr. Eng. Tanika D. Sofianti and the faculty for giving me an opportunity to work on my thesis in Germany under an Erasmus grant.

Finally, I am especially grateful for Fernando Arévalo for relentlessly guiding me through the whole process of the thesis. Without his knowledge and guidance this thesis will not be accomplished.

TABLE OF CONTENTS

LIST OF FIGURES

Figure Page

LIST OF TABLES

Table Page