The copyright © of this thesis belongs to its rightful author and/or other copyright owner. Copies can be accessed and downloaded for non-commercial or learning purposes without any charge and permission. The thesis cannot be reproduced or quoted as a whole without the permission from its rightful owner. No alteration or changes in format is allowed without permission from its rightful owner.

EMPLOYEES' INTENTION TO PARTICIPATE IN PREVENTIVE MAINTENANCE AMONG MANUFACTURING IN MALAYSIA

MAVITRA SETHURAMAN

Universiti Utara Malaysia

MASTER OF SCIENCE (MANAGEMENT)

UNIVERSITI UTARA MALAYSIA

AUGUST 2023

Pusat Pengajian Pengurusan Perniagaan
SCHOOL OF BUSINESS MANAGEMENT
Universiti Utara Malaysia

PERAKUAN KERJA KERTAS PENYELIDIKAN

(Certification of Research Paper)

Saya, mengaku bertandatangan, memperakukan bahawa

(I, the undersigned, certified that)

MAVITRA SETHURAMAN

Calon untuk Ijazah Sarjana

(Candidate for the degree of)

MASTER OF SCIENCE (MANAGEMENT)

telah mengemukakan kertas penyelidikan yang bertajuk

(has presented his/her research paper of the following title)

EMPLOYEE INTENTION TO PARTICIPATE IN PREVENTIVE MAINTENANCE AMONG MANUFACTURING IN MALAYSIA

Seperti yang tercatat di muka surat tajuk dan kulit kertas penyelidikan

(as it appears on the title page and front cover of the research paper)

Bahawa kertas penyelidikan tersebut boleh diterima dari segi bentuk serta kandungan dan meliputi bidang ilmu dengan memuaskan.

(that the research paper acceptable in the form and content and that a satisfactory knowledge of the field is covered by the research paper).

Nama Penyelia *(Name of Supervisor)*	:	**DR MUHAMAD ALI IMRAN BIN KAMARUDIN**
Tandatangan *(Signature)*	:	
Tarikh *(Date)*	:	**20 APRIL 2024**

Universiti Utara Malaysia

PERMISSION TO USE

(For PhD/D.Mgmt/Master By Research Candidate)

In presenting this thesis in fulfillment of the requirements for a Post Graduate degree from the Universiti Utara Malaysia (UUM), I agree that the Library of this university may make it freely available for inspection. I further agree that permission for copying this thesis in any manner, in whole or in part, for scholarly purposes may be granted by my supervisor(s) or in their absence, by the Director of Postgraduate Studies Unit, College of Business where I did my thesis. It is understood that any copying or publication or use of this thesis or parts of it for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the UUM in any scholarly use which may be made of any material in my thesis.

Universiti Utara Malaysia

Request for permission to copy or to make other use of materials in this thesis in whole or in part should be addressed to:

Director of Postgraduate Studies Unit, College of Business

Universiti Utara Malaysia

06010 UUM Sintok

Kedah Darul Aman

Abstract

The study aims to investigate how employees' intentions to participate in preventative maintenance activities are influenced by several factors, such as work-life balance, employee wellness, retention rates, turnover, job performance, and digital technology performance. The substantial influence of these factors on workers' readiness to participate in preventative maintenance tasks is addressed by the research questions. This study applies the idea of planned behaviour to assess Malaysian manufacturing employees' intention to engage in preventative maintenance procedures. Malaysia's manufacturing industry contributes significantly to the GDP of the nation, although it has difficulties being sustainable and competitive internationally. It has been determined that one way to increase output and prolong the life of manufacturing equipment is through preventive maintenance. The data gathered from remote-working personnel in Malaysian manufacturing through a cross-sectional survey is analysed using a descriptive study design. To ensure a robust statistical analysis, a sample size of at least 100 individuals is selected using simple random selection. The research aims are reflected in the questionnaire design, which focuses on demographic data and employee attitudes towards work-life balance, preventive maintenance, wellbeing, flexibility in the workplace, and aspirations about prevention activities. Cronbach's alpha is used to evaluate data reliability, guaranteeing the quality and internal consistency of the information gathered. To test hypotheses and come to relevant conclusions, data analysis techniques including regression analysis, correlation analysis, and descriptive statistics are performed using the Statistical Package for Social Sciences (SPSS) software.The study presents a detailed examination of factors influencing employees' intention to engage in preventive maintenance activities in Malaysian manufacturing settings.

Abstrak

Kajian ini bertujuan untuk menyiasat bagaimana niat pekerja untuk mengambil bahagian dalam aktiviti penyelenggaraan pencegahan dipengaruhi oleh beberapa faktor, seperti keseimbangan kehidupan kerja, kesejahteraan pekerja, kadar pengekalan, pusing ganti, prestasi kerja dan prestasi teknologi digital. Pengaruh besar faktor-faktor ini terhadap kesediaan pekerja untuk mengambil bahagian dalam tugas penyelenggaraan pencegahan ditangani oleh soalan kajian. Kajian ini menggunakan idea tingkah laku terancang untuk menilai niat pekerja pembuatan Malaysia untuk melibatkan diri dalam prosedur penyelenggaraan pencegahan. Industri pembuatan Malaysia menyumbang dengan ketara kepada KDNK negara, walaupun menghadapi kesukaran untuk mampan dan berdaya saing di peringkat antarabangsa. Telah ditentukan bahawa satu cara untuk meningkatkan output dan memanjangkan hayat peralatan pembuatan adalah melalui penyelenggaraan pencegahan. Data yang dikumpul daripada kakitangan yang bekerja jauh dalam pembuatan Malaysia melalui tinjauan keratan rentas dianalisis menggunakan reka bentuk kajian deskriptif. Untuk memastikan analisis statistik yang mantap, saiz sampel sekurang-kurangnya 100 individu dipilih menggunakan pemilihan rawak mudah. Matlamat penyelidikan dicerminkan dalam reka bentuk soal selidik, yang memfokuskan pada data demografi dan sikap pekerja terhadap keseimbangan kerja-kehidupan, penyelenggaraan pencegahan, kesejahteraan, fleksibiliti di tempat kerja, dan aspirasi tentang aktiviti pencegahan.

Alpha Cronbach digunakan untuk menilai kebolehpercayaan data, menjamin kualiti dan ketekalan dalaman maklumat yang dikumpul. Untuk menguji hipotesis dan membuat kesimpulan yang relevan, teknik analisis data termasuk analisis regresi, analisis korelasi, dan statistik deskriptif dilakukan menggunakan perisian Statistical Package for Social Sciences (SPSS). Kajian ini membentangkan pemeriksaan terperinci tentang faktor yang mempengaruhi niat pekerja untuk melibatkan diri dalam aktiviti penyelenggaraan pencegahan dalam tetapan pembuatan Malaysia.

Acknowledgement

Completing this master's thesis has been a journey filled with challenges, growth, and invaluable support from various individuals and institutions. I would like to express my sincere gratitude to all those who have contributed to the realization of this academic endeavour.

First and foremost, I extend my deepest appreciation to my supervisor, Dr Ali Imran bin Mohammad, for his unwavering guidance, expertise, and encouragement throughout the research process. His insightful feedback, patience, and mentorship have been instrumental in shaping the direction of this thesis and refining its content. I am also grateful to the faculty members of School of Business Management, whose advice, and constructive criticism have enriched my academic journey and helped me navigate through the complexities of research.

I would like to acknowledge the support of my family for their endless love, understanding, and encouragement. Their belief in my abilities and their sacrifices have been a constant source of strength and motivation. My heartfelt thanks go to my friends and colleagues for their support, encouragement, and stimulating discussions. Their camaraderie and companionship have made this academic pursuit a truly enriching experience.

Finally, I express my gratitude to all the participants and individuals who generously contributed their time, insights, and expertise to this study.To all those mentioned above and anyone else who has contributed in any way, I am deeply grateful for your support and encouragement. This thesis would not have been possible without your collective contributions.

Universiti Utara Malaysia

Table of Contents

CERTIFICATION OF THESIS WORK.....**Error! Bookmark not defined.**

PERMISSION TO USE v

Abstract vi

Abstrak vii

Acknowledgement viii

Table of Contents ix

List of Figures xii

List of Tables xiii

Chapter 1: INTRODUCTION 1

1.1. Introduction 1

1.2. Background of Study 2

1.3. Problem Statement.....3

1.4. Research Objectives 4

Research objectives 4

1.5. Research Questions 5

1.6. Scope of Research 5

1.7. Significance of Research 5

1.8. Definition of Key Terms.....6

1.10. Organisation of Thesis 6

Universiti Utara Malaysia

Chapter 2: LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT.....8
2.1. DV: Concept of Preventive Maintenance Practices and Employee Support.....8
2.2. Remote work adoption.....9
2.3 Employee wellbeing.....10
2.4. Work flexibility.....11
2.5. Hypotheses Development.....12
2.5.1 H1: Effect remote work adaptation on intention to participate in preventive maintenance.....13
2.5.2 H2: Effect employee well-being on intention to participate in preventive maintenance.....16
2.5.3 H3: Effect work flexibility on intention to participate in preventive maintenance.....17
2.6. Theoretical framework.....19
2.6.1 Underpinning Theory.....19
2.7. Chapter Summary.....20
Chapter 3: RESEARCH METHOD.....21
3.1. Introduction.....21
3.2. Research Framework and Research Hypotheses.....21
3.3. Research Design.....22
3.4. Population, sample and sampling technique.....23
3.5. Questionnaire Design.....24
3.6. Research Measurement.....24
3.7. Data Collection.....25
3.8. Data Analysis Technique.....26
3.9. Chapter Summary.....27
Chapter 4: Data analysis.....28
4.1. Introduction.....28

Universiti Utara Malaysia

4.2. Demographic analysis....28
4.3. Descriptive analysis....33
4.4. Correlation analysis....39
4.5. Regression analysis....40
4.6. Reliability analysis....42
4.7. Normality test....42
4.8. Factor analysis....46
4.9. Summary....48
Chapter 5: Conclusion and Recommendation....49
5.1 Conclusion....49
5.2 Linking with objectives....50
5.3 Hypothesis testing....52
5.4 Recommendations....53
5.5 Research limitation....54
5.6 Future scope....55
References....56
Appendix 1: Questionnaire....67

Universiti Utara Malaysia

List of Figures

Figure 1.1: The average GDP from the Malaysian manufacturing sector within 2021-2023 2
Figure 1.2: Structure of the thesis 7
Figure 2.1: Hypothesis for each IV and DV 12
Figure 4.1: Frequency for Gender 29
Figure 4.2: Frequency for Age 30
Figure 4.4: Frequency of Educational qualification 31
Figure 4.4: Frequency of Profession 33
Figure 4.5: Q-Q plot 43
Figure 4.6: Q-Q plot 45
Figure 4.7: Q-Q plot 46

Universiti Utara Malaysia

List of Tables

Table 4.1: Frequency for Gender 28
Table 4.2: Frequency for Age 30
Table 4.3: Frequency of Educational qualification 31
Table 4.4: Frequency of Profession 32
Table 4.5: Descriptive analysis 36
Table 4.6: Correlation ..... **Error! Bookmark not defined.**
Table 4.7: Model Summary 40
Table 4.8: ANOVA 41
Table 4.9: Coefficients 41
Table 4.10: Reliability for remote work adaption ..... **Error! Bookmark not defined.**
Table 4.11: Reliability for employee wellbeing ..... **Error! Bookmark not defined.**
Table 4.12: Reliability for work flexibility ..... **Error! Bookmark not defined.**
Table 4.13: Reliability for intention to prevention 42
Table 4.11: Normality for Remote Work Adaptation and employee Well-being 43
Table 4.12: Normality for Remote work Adaptation and work Flexibility 44
Table 4.13: Normality for remote work adaptation and Intention to prevention 45
Table 4.14: Correlation matrix for factor analysis 47
Table 4.14: Component matrix for factor analysis 47

Universiti Utara Malaysia

Chapter 1: INTRODUCTION

1.1. Introduction

Preventive maintenance is a kind of vital as well as planned and systematic approach to realise the performance goal of a business firm. Preventive maintenance practices have become an inevitable strategy which includes the scheduled and planned regulation of the machines, equipment, and supporting facilities in recent times (Gan et al. 2022). On the other hand, Preventive maintenance practices in the manufacturing sector are capable of optimising and expanding the life cycle of the manufacturing machinery and equipment with its formal programs. Malaysia's manufacturing industry, which includes a wide range of industries like electronics, automotive, chemical, and food processing, significantly contributes to the national economy. The reliance on complex machinery and equipment in these industries highlights how important maintenance procedures are to maintaining efficiency and competitiveness.

Unlike reactive or corrective maintenance, preventive maintenance focuses on taking proactive steps to find and fix such problems before they worsen and cause expensive breakdowns. In addition to technical know-how, this strategy calls for proactive participation from staff members in all departments, including management, manufacturing workers, and maintenance teams. Preventive maintenance is essential to maintaining the ongoing and effective operation of machinery and equipment in the ever-changing manufacturing sector (Gan et al. 2022). It entails methodical maintenance, repairs, and inspections with the goal of reducing unscheduled downtime and increasing output. Nevertheless, despite its acknowledged significance, the active involvement and engagement of staff members at all organisational levels is frequently critical to the success of preventative maintenance programmes. The purpose of this study is to investigate the variables affecting workers' willingness to engage in preventative maintenance in Malaysian manufacturing companies. Comprehending these variables is imperative for establishments aiming to augment the efficacy of their maintenance approaches and, in turn, elevate overall operational efficiency. In the first chapter of the research work, the researcher intends to evaluate the intent of the workers to participate and contribute to preventive maintenance among manufacturing staff in Malaysia with an analysis using the theory of planned behaviour.

1.2. Background of Study

For manufacturing gear and equipment to operate effectively, dependably, and for a long time, preventive maintenance is essential. It contributes to decreased downtime, fewer unplanned malfunctions, and overall manufacturing process optimisation, which lowers costs and boosts output. The implementation of Industry 4.0 techniques, automation, and technological breakthroughs are causing profound changes in the global manufacturing sector. Manufacturing activity is concentrated in the Asia-Pacific area, where South Korea, China, Japan, and India are important players. A substantial portion of Malaysia's GDP comes from the country's expanding manufacturing sector, which is an emerging economy. The manufacturing sector of Malaysia is one of the biggest influencers in increasing the GDP (gross domestic product) of Malaysia after the service industry of Malaysia. As per the data of the Malaysian Department of Statistics, from 2010 to 2023, the average GDP from the Malaysian manufacturing sector was 68853.45 MYR Million (Trading Economics, 2023). At the same time, in the 3rd quarter of 2023, Malaysian GDP from its manufacturing sector was 92296 MYR Million which is an enormous upsurge than GDP of the 2nd quarter of 2023 (Trading Economics, 2023). However, from the research findings made by Svystunova et al. (2023), it can be pointed out that major large and small size manufacturing businesses in Malaysia are facing enormous challenges from their global opponents in the respective sector.

Universiti Utara Malaysia

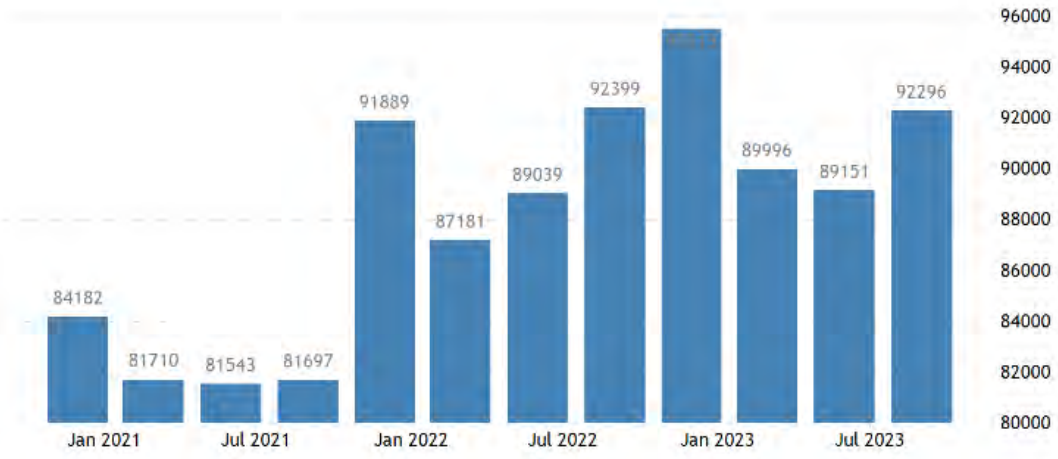

Figure 1.1: The average GDP from the Malaysian manufacturing sector within 2021-2023

(Source: Trading Economics, 2023)

At the same time, Hamasha et al. (2023) stated that preventive maintenance practices minimise unexpected breakdowns with respect to improving the overall productivity level of the manufacturing systems as well as extending the overall lifespan of their manufacturing equipment. In this aspect, it is possible to note that in terms of enhancing sustainability and improving the productivity levels of the manufacturing systems of the entire manufacturing sector of Malaysia, they can meet the higher level of international production standards. As a result, in order to design and enhance the productivity improvement system with the Malaysian manufacturing businesses preventive maintenance (PM) practices can be effectively implemented.

1.3. Problem Statement

In recent times, the manufacturing businesses in Malaysia have experienced a wide range of challenges in order to attain sustainability in their production process. It is to improve the productivity of the production systems to achieve a competitive edge globally over their opponent organisations (Svystunova et al. 2023). Maintaining operational efficiency and minimising downtime in Malaysia's manufacturing industry requires for making sure preventative maintenance programmes are efficient. Nonetheless, employee dedication and active participation are critical to the success of these initiatives. Although the value of preventative maintenance has been acknowledged, little is known about the factors influencing workers' intentions to take part in these programmes in Malaysian manufacturing environments. In this aspect, it can be stated that preventive maintenance practices are the capability of increasing manufacturing performance with respect to optimising and expanding the overall life cycle of manufacturing machinery and other supportive equipment (Cui et al. 2020). Since preventive maintenance practices ensure the smooth function and longevity of machinery through practical techniques in the manufacturing segments, it can readability and increase the productivity of the production systems of the Malaysian manufacturing sector. Employee satisfaction and well-being are positively correlated with their perception of a healthy work-life balance. Increased motivation, output, and dedication to company objectives may result from this. Long work hours, heavy workloads, and little time for personal interests are signs of a poor work-life balance, which can result in burnout, stress, and a decline in job satisfaction. Workers in this circumstance could be less inclined to engage in extra work-related activities, such preventive maintenance.

On the other hand, the theoretical context of planned behaviour demonstrates the individuals' behaviour due to intentions in which the behavioral characteristics are influenced by the individual behavioral attitudes and subjective norms as well as perceived behavioural control. As a result, in terms of evaluating the manufacturing employee intention levels to participate in preventive maintenance practices, the behaviour of individual staff must be determined to contribute to preventive maintenance practices to enhance the productivity levels of the manufacturing units of the organisations (Sasitharan et al. 2020). From this perspective, the attitude of the individual staff towards behavioural intention perceived behavioural control, and subjective norms must be evaluated with respect to integrating preventive maintenance practices to optimise and increase the performance of Malaysian manufacturing businesses. Hence, in terms of preventing further maintenance activities of the manufacturing units, predictive maintenance, condition-based maintenance, and Time-based maintenance must be incorporated with regard to the employees' intentions.

1.4. Research Objectives

Research aim

The main aim of the research is to examine the behavioural intent of the manufacturing staff in Malaysia to contribute to preventive maintenance with an analysis using the theory of planned behaviour.

Research objectives

- RO1: To examine the effect of work life balance and employee wellbeing on participation intension to preventive maintenance measure among employees in manufacturing sector of Kuala Lumpur
- RO2: To examine the effect of employee retention rate and turnover on participation intension to preventive maintenance measure among employees in manufacturing sector of Kuala Lumpur
- RO3: To examine the effect of employee job performance on participation intension to preventive maintenance measure among employees in in manufacturing sector of Kuala Lumpur

- RO4: To examine the effect of employee performance on digital technology on participation intension to preventive maintenance measure among employees in manufacturing sector of Kuala Lumpur

1.5. Research Questions

- RQ1: What are the effect of work life balance and employee wellbeing on participation intension to preventive maintenance measure among employees in manufacturing sector of Kuala Lumpur?
- RQ2: What are the effect of employee retention rate and turnover on participation intension to preventive maintenance measure among employees in manufacturing sector of Kuala Lumpur?
- RQ3: What are the effect of employee job performance on participation intension to preventive maintenance measure among employees in in manufacturing sector of Kuala Lumpur?
- RQ4: What are the effect of employee performance on digital technology on participation intension to preventive maintenance measure among employees in manufacturing sector of Kuala Lumpur?

Universiti Utara Malaysia

1.6. Scope of Research

The scope of the research study specifically revolves around the Manufacturing sector of Malaysia examining the manufacturing workers' intentions to contribute to preventive maintenance in Malaysia with an analysis of the theory of planned behavior. Other than that, through the research investigation, the research will make a comprehensive assessment of the individual manufacturing workers' attitudes towards their behaviour, perceived behavioral control, and subjective norms in terms of management of preventive maintenance practices (Tanveer et al. 2021). The assessment will enhance work-life balance and employee well-being as well as retention rates and turnover of Malasian manufacturing employees. On the other hand, quantitative analysis of primary data sources will provide the researcher with a first-hand and practical assessment of the research data.

1.7. Significance of Research

The research is inevitably significant since it critically analyses the relationship between employee engagement, job satisfaction, as well as preventive maintenance practices in the Malaysian

manufacturing industry in a quantitative manner. On the other hand, individual behavioural intentions towards the evaluation of preventive maintenance practices will be evaluated with the theoretical interplay of the theory of planned behaviour (Sasitharan et al. 2020). At the same time, the impact of preventive maintenance on employee engagement and satisfaction as well as the integration of digital tools will be effective in supporting preventive maintenance practices for manufacturing workers in Malaysia.

1.8. Definition of Key Terms

DV: Preventive Maintenance Practices: Preventive maintenance is the organised and systematic technique to ensure and implement the performance objectives of a corporate organisation in regard to the effective management of the machines, equipment, and supporting tools involved in the organisation (Gholizadeh et al. 2021).

IV 1: Remote work adoption: The term "remote work adoption" describes the growing practice of companies and organisations enabling workers to work from non-traditional office spaces. These workers frequently use digital tools and technology to communicate and finish projects.

IV 2: Employee wellbeing: The general state of health, contentment, and satisfaction of employees at work is referred to as employee wellness.

IV 3: Work flexibility: The ability of workers to modify work schedules, locations, or arrangements to better meet their personal requirements while still carrying out their duties is referred to as work flexibility.

Work-life balance: It is defined as the balancing act between personal and professional livelihoods through reducing the stresses involved with work and enhancing a suitable healthy attitude.

Theory of planned behaviour: This theoretical concept provides the individual attitudes towards their behaviour, perceived behavioural control, and subjective norms that can be achieved through exercise to the overall process of support and retribution (Huang et al. 2023).

1.10. Organisation of Thesis

The first chapter of the thesis analyses the aim, objectives, research background, and problem statements contributing to preventive maintenance among Malaysian manufacturing staff using the theory of planned behaviour. This literature review chapter will explore previous studies on individual behavioural intentions toward preventive maintenance. The third research chapter will

analyse the research methods that will be taken throughout the research process. The fourth research chapter will offer valuable insights and analysis into preventive maintenance dynamics through the survey analysis. The last and final chapter will summarise the research findings and make recommendations as per the results.

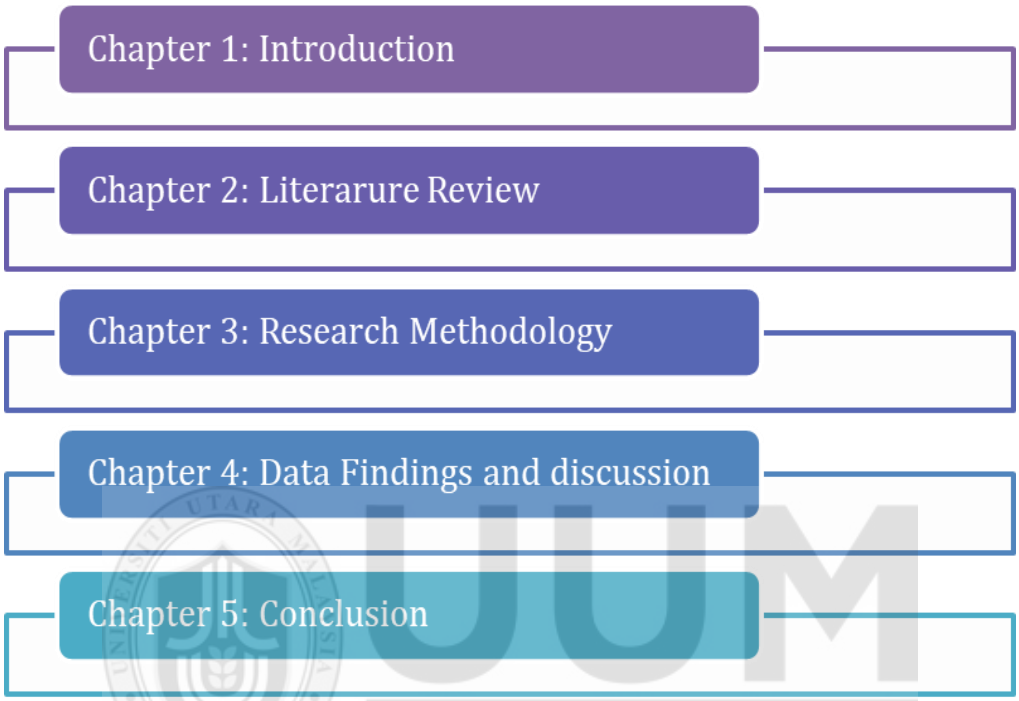

Figure 1.2: Structure of the thesis

(Source: self-developed)

Universiti Utara Malaysia

Chapter 2: LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1. DV: Concept of Preventive Maintenance Practices and Employee Support

The concept of preventive maintenance practices includes the scheduled and planned approach of the machinery, equipment, and supporting tools that can be suitable for achieving the performance objectives of a particular business firm in the respective industry. On the other hand, as stated by Foà et al. (2020), preventive maintenance practices are also able to optimise and develop the entire lifespan of the machinery and equipment within its formalised schedules.

At the same time, the preventive maintenance practices such as predictive maintenance, condition-based maintenance, and Time-based maintenance can help increase the efficiency of the workers and additionally improve the supportive measures for recovering the aspects of employee engagement. On the other hand, Satria et al. (2020) opined that maintenance practices including predictive maintenance, condition-based maintenance, and Time-based maintenance generally combine the aspects of prediction, surveillance as well as tracking the uncertain activities while repairing fundamental deficiencies of the machinery elements. These preventive maintenance practices are also able to reduce the overall cost of machinery manufacturing with regard to accomplishing the performance enhancement capacities of the workers (Satria et al. 2020).

As a result, through the proper implantation of preventive maintenance practices within the employment activities, the organisational management can develop a positive and supportive pattern for the staff and reduce their stress while increasing job engagement in a consistent manner. This literature review chapter will explore the intricate relationship between employee engagement, job satisfaction, and preventive maintenance practices in the manufacturing sector. It delves into the concepts of individual behavioural intentions towards maintenance, the impact of preventive maintenance on employee engagement and satisfaction, challenges faced by manufacturing staff, and the role of digital technology in supporting maintenance efforts.

Previous studies are reviewed to provide insights into these dynamics while underpinning theories such as Social Exchange Theory and Conservation of Resources (COR) theory. This chapter also seeks to elucidate the importance of fostering a conducive work environment and leveraging technology to optimize maintenance practices and enhance employment performance.

2.2. Remote work adoption

The process through which businesses and individuals accept and put into practice remote work policies is referred to as "remote work adoption." This adoption can take many different forms, such as allowing workers to work from home on occasion or completely switching to a hybrid or remote-first work style. The behaviour of individuals is specified through their intention to engage in work and it is supported by the theory of planned behaviour. The behavioral achievement interventions are with respect to the theory of planned behaviour and it is dependent on intentional motives and behaviour controlling abilities. As per the view of Yuriev et al. (2020), some kinds of behavioral aspects such as the attitudes of the individuals towards their behaviour, perceived behavioural management, as well as subjective standards, are the main intention of the individuals. All of the international aspects regarding individual behaviour are in line with the theory of planned behaviour. Through the implementation of the theory of planned behaviour, positive or negative behavioral elements of individuals can be judged while engaging in different programs.

On the other hand, as Cui et al. (2020) pointed out the theory of planned behaviour is attained through the exercise of regular work practices which is extremely vital for enhancing employee performance and job engagement. With respect to analysing the aspects of work engagement through the behavioural intentions of individuals in a proactive manner, effective identification and rectification of the potential risks of the work systems can reduce the failure risks. From this perspective, the theory of planned behaviour is inevitably capable of protecting the workers for a certain period while ensuring strict adherence to proper protective measures. As this research topic relies on the intension of employees to participate in preventive maintenance program, the selection of employees as the research participant is justified.

2.3 Employee wellbeing

Preventive maintenance practices in the manufacturing unit are helpful for increasing operational efficiency and further improving the longevity of machinery. At the same time, it has a positive impact on employee engagement and job satisfaction levels among the manufacturing staff. As coined by Foà et al. (2020), it is evident that the manufacturing industry plays a significant role in the economy and is primarily driven by high-level employee engagement. Preventive maintenance helps to address all the potential issues minimise downtime and ensure all the key assets are available and running all the time inside the manufacturing facility. Apart from the financial consideration, preventive maintenance plays a vital role in enhancing the safety level among the working people. Proactively identifying and rectifying potential hazards including machinery breakdown can reduce the risks of accidents and it protects the employees to a certain extent while ensuring strict compliance with proper safety regulations.

This works as a shield for the organisation to get read from repercussions and safety-related reputational damages. As stated by Annarelli et al. (2020), there is a link between preventive maintenance and employee satisfaction, and one of the primary reasons is the unpredictability of emergency repairs. Most of the time, the unexpected breakdown disrupts the workflow and also increases the stress level among the employees. Preventive maintenance works as a barrier and strikes against all emergencies which eliminates the need of having high-pressure interventions and successfully cultivates a sense of control and stability among the employees. On the other hand, when machines break down and take longer hours to repair it increases the stress level among the employees. In the words of Basalamah and As'ad (2021), if the machinery operates reliably and consistently then the employees can successfully carry out their tasks which creates a positive working environment. A workplace that operates smoothly with effective preventive maintenance plans develops a culture of confidence and reduces stress levels as well as increases overall job satisfaction among the employees.

It also can be said that preventive maintenance contributes to the establishment of a predictable schedule for the employees. If the equipment is regularly maintained and the downtime is less, then the employees can consider more reliable and consistent working hours. As opined by Sugiarti

(2022), this predictability allows them to plan their personal life and spend more time with their family and friends while they can engage in more activities outside of work. At the same time with the help of preventive maintenance businesses can skill and provide training to the staff which can cause the growth of individual employees and the overall competence of the workforce. Therefore, it can be said that preventive maintenance practices have a high impact on employee engagement and job satisfaction among the manufacturing staff.

2.4. Work flexibility

Preventive maintenance planning is one of the proactive techniques to ensure the smooth operation and longevity of machinery and equipment inside any manufacturing unit. As coined by Geurtsen et al. (2023), maintaining a system is related to repairing and replacing, overall, servicing and measuring as well as detecting the falls to avoid any failure that could interrupt the overall production system. Performance measurement inside the measurement system is based on different factors and effective maintenance reduces the consequences of machine breakdown and explains the life of machineries. On the other hand, Sok et al. (2021) coined that the theory of planned behaviour explains the individual's behaviour as a result of intentions in which the terms are present and are influenced by the attitudes and subjective norms as well as perceived behavioural control. It is based on a specific idea that all behaviours can be acquired through conditioning through the process of reinforcement and punishment. The theory of plant behaviour provides a comprehensive framework in order to understand the individual's positive or negative aspects of engaging in preventive maintenance programs.

Most of the manufacturing staff have a different view of preventive maintenance as it minimises unexpected breakdown while improving the productivity level as well as extending the equipment's overall lifespan. At the same time, Wang et al. (2020) mentioned that the negative attitude perceived by the manufacturing staff is primarily due to the time-consuming manner of preventive maintenance and sometimes it creates disruption in the daily manufacturing operation operations. It also can be said that inside the workplace the organisational culture mostly influences the employees' attitudes and beliefs. Most of the time the supervisor primarily focuses on maintaining and servicing the manufacturing equipment and employees need to have a positive

attitude toward preventive maintenance practices. In this context, there are several factors that are associated such as technical skills and resource access as well as support from the management staff.

Most of the time employees who start to feel more competent to conduct the maintenance tasks have direct access to necessary tools and training and express strong intentions to participate in preventive maintenance activity. As said by Li et al. (2021), it also can be suggested that proper planning and attention are required by the manufacturing staff before conducting preventive maintenance and it is also needed to consider the state of systems and other important elements. Therefore, it can be said that having a proper understanding regarding the behavioural intentions of manufacturing staff towards PM is essential to promote the culture of practice equipment keeping and enhancing the overall efficiency of the manufacturing farm.

2.5. Hypotheses Development

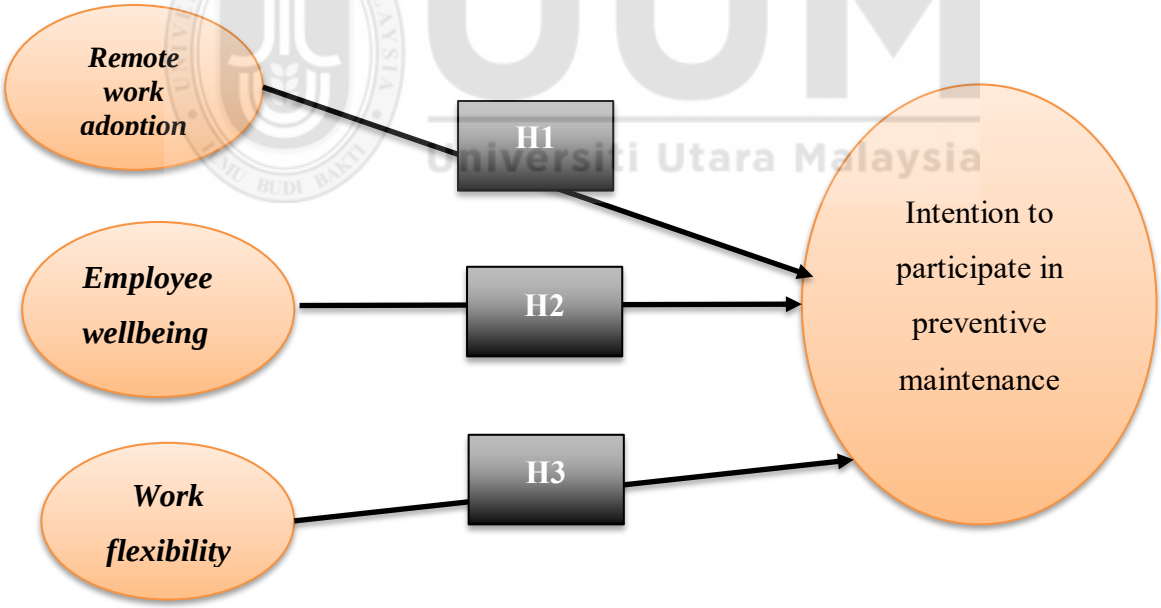

Figure 2.1: Hypothesis for each IV and DV

(Source: Self-developed)

2.5.1 H1: Effect remote work adaptation on intention to participate in preventive maintenance

The ability of people and organisations to successfully switch from traditional in-office work settings to remote or hybrid work setups is referred to as remote work adaption. The act of integrating and using digital tools, platforms, and systems to facilitate work processes, communication, teamwork, and productivity in remote or hybrid work contexts is known as technology adaption. Adopting technology effectively enables employees to adjust to working remotely by giving them the resources and infrastructure they need to complete their jobs effectively from any location. Employee performance regarding digital technology has significant relationship with the intention of employees to take part in preventive maintenance. Digital technology is becoming a vital tool and playing a pivotal role in supporting preventive maintenance practices inside the manufacturing industry. This advancement not only increases the maintenance process effectiveness but also has a profound effect on employment performances reduces downtime as well and enhances the job satisfaction level. As opined by Khan et al. (2020), in the case of preventive maintenance one of the most prominent technologies is the Internet of Things or IoT. The application of IOT-based software such as intelligent factory applications can help to understand how the machine is running and what potential hazards are present with the predicted timelines. At the same time, big data algorithms and AI have actionable insights that can find the patterns that can allow the machine to break chances in the upcoming timeline (De Oliveira Santos et al. 2020). The application of data analytics and machine learning as well as different sensors can successfully monitor the equipment condition in real time and predict the potential failure before they can take place.

As stated by Mohd Ghazali and Rahiman (2021), by analysing relevant data from the different sensors such as equipment vibration and temperature levels as well as the operating parameters, predictive maintenance systems can identify all the early warning signs and allow the maintenance team to take the interventions. This predictive approach successfully minimises unplanned downtime and extends the equipment lifespan as well as optimising the maintenance schedules. On the other hand, in most of the predictive maintenance, a good amount of resource and asset utilisation takes place. expensive maintenance and repairs incur several costs and lead to

production delays. As per the views of Maktoubian et al. (2021), the application of IoT-based predictive maintenance as it enables efficient utilisation of resources and this technology can analyse the external and internal threats which can cause machinery breakdown. Apart from this the application of digital technology also extends the equipment lifespan and allows manufacturing companies to properly monitor and maintain as well as optimise their machinery for more effective utilisation and availability as well as performance.

Having a forecast on machine failure and identifying the specific parts that require replacement is beneficial for the manufacturing company. As coined by Patel et al. (2022), digital technologies such as asset monitoring tools enable workers to proactively monitor all manufacturing assets and their health. When the machinery breaks down the field crew can relocate to fix it on an ad hoc basis and it eliminates the requirement to hire extra personnel depending on the damage done. Predictive maintenance gives a 360° view of asset health and allows the businesses to plan for the field crew and it reduces the response time and overall maintenance duration. Additionally, Voinea et al. (2022) suggested that digital technologies like augmented reality and virtual reality transform the maintenance tasks performed, and the artificial intelligence and augmented reality included mobile devices can provide maintenance technicians with real-time access to relevant information like equipment manual and troubleshooting guides as well as field of view. These technologies successfully improve the effectiveness and efficiency of maintenance training and empower the employees to perform and execute all the tasks more confidently and accurately. Therefore, it can be said that digital technology plays a vital role in honouring preventive maintenance practices and having a positive effect on employees' performance levels. Hence, it can be identified that employee performance regarding digital technology have an important influence on the intention of employees to take part in preventive maintenance.

Work-life employee job performance has a strong relationship with the intention of employees to participate in preventive maintenance. There are several primary advantages that are helpful for manufacturing companies to increase their operational capabilities. There are several challenges present related to preventive maintenance having a negative impact on job performance. First of all, Huang et al. (2020) said that having a regular schedule is one of the most important things to conduct preventive maintenance. In order to do it perfectly the whole manufacturing facility

Universiti Utara Malaysia

needed to be shut down and this downtime could phase most of the pushback from the employees and managers who are not familiar with this process. As it causes shut down it sometimes increases the pressure of producing goods in the manufacturing facility especially if there are any specific deadlines present. Due to this reason some of the manufacturers still believe that if the machinery is not broken, therefore, it doesn't require any maintenance or services.

Although it is evident that preventive maintenance can make the workplace safer, determining what kind of preventive measures need to take place is one of the biggest challenges for manufacturers. In the words of Rojek et al. (2023), as there are several machinery operating in the manufacturing line, therefore the whole manufacturing line depends on each of the machines having different wear and tear. The second big challenge is to understand who the person will be responsible for the preventive maintenance and how this responsible person will perform the maintenance. For instance, if machinery is particularly operated by a group of staff, therefore, it will be challenging for them to keep it in working condition as they deal with tiring schedules and also don't have time to do any kind of maintenance work. As coined by Franciosi et al. (2021), this problem is particularly relevant in small and medium size manufacturing farms as big manufacturing facilities have their own technicians or have contracts with service centers with specialised commercial machinery repairs.

Universiti Utara Malaysia

In both cases, they need to have access to technicians with expertise enough to execute the preventive maintenance program. Furthermore, ensuring the parts are available is also necessary in the preventive maintenance program. As stated by Jwo et al. (2021), the sourcing of new replacement machinery becomes a major issue, and due to this most of the manufacturing companies are forced to keep existing machinery in service far beyond the scheduled replacement dates. Apart from this, the complexity of modern manufacturing equipment poses a significant challenge in order to implement preventive maintenance programs. Most of the manufacturing process relies on heavily sophisticated machinery and technologies which cannot be repaired or serviced through in-house technician teams and requires specialised knowledge and skills. As suggested by Yang et al. (2020), inadequate training and technical expertise among the manufacturing employees hinders their ability to identify and diagnose as well as maintenance issues which leads to suboptimal performance and increases the risks of equipment failures.

Therefore, it can be said that the application of preventive maintenance is beneficial inside the manufacturing facility but all of the challenges bring obstacles for the workers and businesses themselves to implement the preventive measurement strategies. Hence, it can be identified that employee job performance have significant impact on the intention of employees to participate in preventive maintenance.

2.5.2 H2: Effect employee well-being on intention to participate in preventive maintenance

Employee well-being have significant relationship with the intention of employees to take part in preventive maintenance. As coined by Yadav et al. (2020), for most of the developing and developed nations manufacturing industry plays a vital role in the economy, and also the core component of this manufacturing industry is its labour force. Preventive maintenance practice primarily reduces the machinery downtime and broken-down chances as well as emergency repair when the machinery has a regular maintenance period the employees aren't required to work overtime and do not need to address urgent maintenance issues. It can help them to make a better plan and enjoy their personal time with the family.

At the same time, Molęda et al. (2023) coined that the application of preventive maintenance practices contributes to a more predictable and stable working environment which can allow the employees to rely on consistent operation of machinery inside the manufacturing unit. It further eliminates the need for last-minute adjustments to the schedule to personal lives. This predictability successfully develops a sense of control over the working responsibilities and enables the employees to allocate their time and energy to developing new skills or completing any education curriculum as well as giving time to family and friends. As mentioned by Kikuchi et al. (2020), working overtime is one of the major stress factors and in this case, unexpected maintenance schedules cause high levels of workplace stress and burnout. Due to the fear of machinery breakdown employees work slowly and it causes delays while increasing the use of resources. Preventive maintenance eliminates all such things and organizations can also eliminate all the stress factors and create more supportive and less anxiety-inducing working environments.

On a similar note, employees can properly focus on their regular tasks without having to worry about unexpected machinery breaking down which improves their mental well-being and causes a high level of job satisfaction.

As suggested by Parvin et al. (2020), in the manufacturing industry different types of machinery are placed which brings additional safety hazards and health risks for the employees. Unexpected breakdown sometimes leads to workplace accidents and injuries and also the employees start to feel unsafe and unsupported. Preventive maintenance practices have a commitment to employee well-being and safety levels. All the well-maintained machinery increases the safety level and reduces the chances of workplace accidents and injuries. Apart from all of these things Martins et al. (2020) coined that, employees who participate in preventive maintenance get the opportunity to increase their skill level by knowing how to repair or service the machinery properly. This can help them in career advancement while empowering them to take ownership of equipment which enhances their technical expertise and job proficiency. Therefore, it can be said that preventive maintenance has a positive impact on the work-life balance and employee well-being particularly in the context of the manufacturing industry. Hence, it can be identified that work-life balance and employee well-being have significant impact on the intention of employees to take part in preventive maintenance.

Universiti Utara Malaysia

2.5.3 H3: Effect work flexibility on intention to participate in preventive maintenance

The capacity for employees to choose when, where, and how they work is referred to as work flexibility. Numerous options exist for achieving this flexibility, such as job sharing, telecommuting, shortened workweeks, flexible work schedules, and more (Shi et al. 2020). Contrarily, work-life balance describes the harmony or balance between obligations related to one's job and personal obligations, such as self-care, hobbies, social interactions, and family time. A person's capacity to establish and preserve a good work-life balance is strongly influenced by their level of job flexibility, which is why there is a strong correlation between the two. Work-life balance is particularly important to employees because it establishes a balance between work-related obligations and personal hobbies. Work-life employee retention and turnover have relationship with the intention of employees to participate in preventive maintenance process. Preventive maintenance practice has a positive impact on employee retention rates and employee

turnover. As stated by Ran et al. (2020), currently occupational health and safety is one of the major factors and considers the overall well-being of employees while promoting a safe and productive workplace. In order to protect the workforce, preventive maintenance focuses on periodic inspection and repair of manufacturing machinery and it includes the training and development of the employees in order to respond effectively in case of any emergency breakdown. Preventive maintenance leads to equipment safety and ensures that all the concerns related to equipment safety have been taken seriously. In the words of Shi et al. (2020), inspection and maintenance are the core components of preventive maintenance and it also works as a target approach which allows the manufacturers to understand when and how they need to purchase new equipment and update the newest safety practices with the machinery. At the same time while operating the machinery manufacturers provide all the import equipment necessary such as PPE kits and auxiliary safety equipment.

It also has been identified that preventive maintenance engages the employees in regular conversations about workplace and employee safety as well as scheduling maintenance tasks. If all the employees have proper awareness regarding the measurements taken to ensure workplace safety they start to feel more comfortable and safer while working with different missionaries. On the other hand, Wellsandt et al. (2022) opined that preventive maintenance practice contributes to the development of a job security sense among employees. When the employees start to know that the equipment, they are working with is regularly maintained and does not have any chances of sudden breakdown they start to develop a sense of stability and predictability. This stability assures that employees develop a sense of longevity in their position in the organisation which reduces the turnover and increases the employee retention rates. Additionally, preventive maintenance practices empower the employees to take charge of maintenance activities and it fosters a sense of more value in the workplace.

As stated by Rodríguez-Sánchez et al. (2020), when an employee starts to feel valued for their contributions in the workplace while having the proper opportunities in terms of skill development and growth, they are more likely to be satisfied with their job roles and reduce the chances of the employee leaving. It also leads to financial implications for the organisation in terms of recruitment and training costs. When an employee leaves the organisation, the business needs to go through

all the stages of human resource recruitment practices, which leads to additional costs. As preventive maintenance prioritises employee retention therefore organisations can save more money on recruitment and training expenses which further leads to cost savings in the long run. Finally, it can be said that preventive maintenance practice leads to a positive work environment creation, job security enhancement as well as employee satisfaction and job satisfaction promotion. Therefore, it is important for all manufacturing organisations to incorporate preventive maintenance which will significantly contribute to the stability and success of the workforce and lead to improved organisational performances and competitiveness. Hence, it can be identified that employee retention and turnover have significant impact on the intention of employees to take part in preventive maintenance.

2.6. Theoretical framework

2.6.1 Underpinning Theory

Social Exchange Theory

Social exchange theory suggests that individuals engage in behaviours based on the expectation of reciprocity and mutual benefit. In the context of preventive maintenance practices in manufacturing, employees may be more inclined to participate in such activities if they perceive that their efforts will be recognized, rewarded, or reciprocated by the organization. At the same time, organisations that demonstrate appreciation for employees' contributions to maintenance efforts are likely to foster greater employee engagement and commitment to preventive maintenance practices, thus enhancing overall job performance and organizational effectiveness.

Conservation of Resources (COR) Theory

The Conservation of Resources (COR) theory can be applied to the topic of digital technology in preventive maintenance by emphasizing the importance of preserving and replenishing employees' resources. It has been identified that digital tools aid in conserving time and energy by automating tasks, reducing stress from equipment failures, and enhancing skill development through training simulations. By supporting employees with these resources, such as time, energy, and skills, digital

technology fosters a positive work environment, improves job satisfaction, and ultimately enhances employment performance in preventive maintenance practices.

2.7. Chapter Summary

This literature review chapter delves into the crucial concepts of employee engagement, job satisfaction, and preventive maintenance practices within the manufacturing sector, emphasizing their interplay and significance. It reviews previous studies, highlighting individual behavioural intentions towards preventive maintenance, its impact on employee engagement and job satisfaction, challenges faced by manufacturing staff, and the role of digital technology in supporting preventive maintenance practices. At the same time, underpinning theories such as Social Exchange Theory and Conservation of Resources (COR) theory provide valuable frameworks for understanding these dynamics. Overall, the chapter underscores the importance of fostering a positive work environment and leveraging technology to optimize preventive maintenance practices and enhance employment performance.

Universiti Utara Malaysia

Chapter 3: RESEARCH METHOD

3.1. Introduction

Chapter 3 significantly reflected on the usage of different methods within this research process of recognising the intention of the employees in regard to preventing maintenance through the theory of planned behaviour. Within this chapter, the researcher will demonstrate the research framework and hypothesis for the research. Along with this an explanation of considered research design will be given. Therefore, certain clarification of sampling size, sampling techniques, survey questionnaires, and target population also will be demonstrated further.

3.2. Research Framework and Research Hypotheses

As stated by Sandberg et al. (2022) research framework refers to the steps that will be taken throughout the whole research process. The researchers considered the research framework as a guide which allows them to be more focused in the research scope. As the research topic is highly based on the Theory of planned behaviour it suggests that the behaviour of individuals has been determined through their intention. At the same time, the intention of the individuals is influenced by some factors which include the attitude of the individuals towards behaviour, perceived behavioural control, and subjective norms. In this context attitude towards perceived maintenance can be considered as a negative and positive evaluation of the individuals while preventing different maintenance activities. Along with this subjective norm refer to the influence of social pressure including the influence of management in the manufacturing industry. Owing to this, the researcher has decided to first specify the research questions and generate themes for the literature review, collect data sets from the population and analyse these data through SPSS software. In this scenario, Islam & Aldaihani (2022) highlighted that the key purpose of analysing data in research is to reach the ultimate conclusion. Thus, the ultimate conclusion of the research will be drawn by analysing the datasets through SPSS software which includes correlation and regression analysis and evaluation of mean, median, and mode.

On the other hand, in the words of Jeyaraj (2023), a research hypothesis refers to a statement which introduces a specific research question in terms of proposing expected results. Some of the research hypotheses has been developed based on the research framework

Hypothesis 1: The attitude of individuals toward perceived maintenance positively influences the intention of employees while participating in preventive maintenance in the Malaysian manufacturing sector.

Hypothesis 2: Subjective norms significantly influenced the intention of individuals to participate in preventive maintenance initiatives.

Hypothesis 3: The support of the organisation for preventive maintenance initiatives helps to moderate the relationship between different variables.

3.3. Research Design

As per the words of Riaz (2023), research design can be considered as a strategy that is used by the researchers in order to answer the research questions. Developing a research design is significant for the overall research process because it allows the researchers to make decisions about research approaches and research objectives. There are four types of research design that are commonly used by researchers which include correlational, descriptive, diagnostic, and experimental. As the collected data has been analysed through SPSS thus employing a cross-sectional survey in order to collect essential datasets can be appropriate. Relying on this it has been recognised that consideration of descriptive research design would be appropriate. In this context, Riaz (2023) suggested that with the help of descriptive research design, it can be possible for the researchers to determine the key characteristics of the populations. On the other hand, using these specific research designs also allows the researchers to recognise the patterns in the key characteristic of the populations. Along with this, this research design has proven effective for the researcher in terms of measuring the data trends in determining the intention of the employees in the manufacturing industry of Malaysia for preventive maintenance activities.

Moreover, Mohajan (2020) demonstrated that statistical analysis in research refers to investigating different patterns and trends as well as finding relationships by using quantitative data. In this research, the researcher summarises the different demographic characteristics for key variables of interest. In this way, considering the descriptive research design has proven beneficial for the researcher in terms of recognising the structural relationship between different variables. Therefore, using this research design for this research also allows the researcher to identify the

significance of perceived maintenance and job satisfaction and other variables in this study.

3.4. Population, sample and sampling technique

Population sample (needs to specify where we get the participate, how we get the 100 participate, why we focused remote worker, how remote workers relates to this thesis

Population: According to Luijendijk et al. (2020), the target population in research refers to the entire group or population that the researcher is interested in analysing or evaluating. With the help of taking the opinion of the target population, it can be possible for the researcher to draw a significant conclusion at the last stage of the study. As this research aims to identify the intention of the employees in regard to preventive maintenance in the Malaysian manufacturing sector thus, the target population for this specific research is those employees who work remotely in the manufacturing industry of Malaysia. As the transition in the remote working process affects the performance of the employees significantly, talking about the opinions of the employees can be helpful for recognising the key issues and flaws.

Universiti Utara Malaysia

Sample: Aristeidou & Aristidou (2023) highlighted that by considering effective sampling it can be possible for the researchers to estimate the characteristics of a specific population through overdriving a portion of the population. The important datasets have been collected from the remote workers in the manufacturing units of Malaysia which helps the researcher to identify the planned behaviour of the employees in regards to preventive maintenance. Pertaining to this, the researchers have decided to collect data from at least 100 participants who are remote-working employees in the Malaysian manufacturing industry. The sample size has been determined by the researcher by discovering the complexity of statistical analysis, the desired level of confidence of the participants, and the margin of error. Considering such a large sample size allows the researcher to perform more complex statistical analysis and generate complex and accurate results which have proven effective in terms of understating the intonation and planned behaviour of the employees in the Malaysian manufacturing sector.

Sampling technique: As opined by Noor et al. (2022), simple random sampling can be considered as a type of probability sampling through which the researcher is able to select participants randomly from a specific population. With reference to this, the researcher has considered simple random sampling for this research and selected participants randomly from the remote working employees. Although consideration cluster sampling can prove effective in terms of collecting data from different manufacturing organisations in the different regions of Malaysia.

3.5. Questionnaire Design

[Refer to appendix 1]

3.6. Research Measurement

Research measurements as assigning numerical datasets to relevant things according to explicit rules. In this way, research measurement can be considered as a process of recording and observing the collected data as an integral part of the research effort. Owing to this, in the first stage, the reliability of the collected data has been measured. In order to recognise the reliability of the collected datasets the calculation of Cronbach's alpha has been done. Bell, Chalmers & Flora (2024) highlighted that in order to calculate Cronbach's alpha it is essential to input the responses of each item in different scales into the SPSS software. In this scenario, some of the value of Cronbach's alpha is determined between 0 to 1; this showcases a higher internal consistency between datasets (Kien et al. 2021). In this way, the researcher has decided to analyse the reliability of the collected data based on the value of Cronbach's alpha. At the same time, some of the data resulted in a lower Cronbach's alpha value which is lower than 0.70. These datasets are considered as less reliable data because they exhibit a lower internal consistency. Moreover, the researcher has designed the questionnaire based on research objectives which allows the researcher to collect from the target population.

As the data has been collected by taking into account the research objectives thus, it can be stated that the collected data and the design of the questionnaire are appropriate. Along with this, as this study is highly based on the theory of planned behaviour thus, the integration of appropriate theory in order to underpin the study has been done by the researcher which showcases a higher validity of this research and it will also prove helpful for other researchers in this field in terms of accepting

this research widely. Therefore, as per the views of Fan et al. (2021), quantitative research delivers a wide range of numerical measurement approaches in research. Thus, by considering this research it can be possible for the readers to understand the landscape of behaviour and intention of the employees who work remotely in the manufacturing sector in Malaysia.

3.7. Data Collection

According to Pandey & Pandey (2021), data collection can be considered as a process in order to gather and measure the information in the area of interest of the researchers. In order to perform an appropriate data analysis process it is essential to collect significant datasets in the area of research. Without collecting effective data it can not be possible to evaluate the data and reach the ultimate conclusion for the research which exhibits the fact that collecting effective datasets is very crucial for research. The researchers mainly collected qualitative and quantitative data for the research purpose by considering surveys, interviews, and secondary sources. In this research, the researcher has considered a survey process in order to collect data from the employees in the Malaysian manufacturing industry. The reason behind consideration of the process in order to collect data has been justified below,

Universiti Utara Malaysia

Justification

As per the views of Barzilay et al. (2020), with the help of a survey process, it can be possible to collect data from a large population. Hence, consideration of this process of collecting data allows the researcher to collect a wide range of data from the remote workers which has been proven effective for analysing the diverse perspectives of the employees in preventive measurement in regard to remote working. As in this process, the data has been collected directly from the participants thus, misinterpretation of the data is not possible in this context which highlighted that by considering this process genuine and accurate data has been collected by the researcher which helps to generate more accurate results and understand the issue of the employees in the context of preventing maintenance. On the other hand, Hui et al. (2020) demonstrated that the secondary datasets may lead to methodological rigor due to outdated phases. In this way, high reliance on the secondary data can lead to inaccurate results which decreases the reliability and validity of the

research process due to lower and outdated quality of the datasets. Based on the drawbacks of secondary data and the benefits of using quantitative data, researcher have considered the survey process for collecting data.

3.8. Data Analysis Technique

In the opinion of Xu & Zammit (2020), data analysis can be considered a systemic process in which data has been collected, transformed, and interpreted effectively. In this way, along with data collection analysis of the data is crucial while performing any research. There are several techniques that have been considered by the researcher in order to analyse the collected data which include thematic analysis, axial coding, and statistical analysis. In this research, the researcher has considered statistical analysis and the reason behind for choosing this technique has been demonstrated in the below section,

Justification

As suggested by Mertler et al. (2021), statistical analysis can be considered as a method of collecting large volumes of data and evaluating the data by using statistics. As in this research, a large amount of data has been collected by considering the survey process thus, choosing satisfaction analysis for evaluating data is appropriate. In order to perform statistical analysis the researcher has considered SPSS software. In this regard, as per the opinion of Denis (2021), SPSS (Statistical Package for Social Sciences) is a modeling software in order to recognise the relationship between complex data and test different theories. Relying on this, as in this study analysis of the employee's intention towards preventive maintenance has been done by considering the planned behaviour theory, thus in order to test the theory in the context of remote working trend in Malaysia taking into account the SPSS is appropriate. With the help of SPSS, the researcher is able to prepare and analyse the data effortlessly by using the easy-to-use interface of IBM SPSS software without having any code. Based on this, it can be inferred that consideration of the SPSS data analysis process has allowed the researcher to evaluate a large and complex dataset with less effort which is a key reason for choosing this method in this study.

3.9. Chapter Summary

A detailed discussion about different research methods has been done by the researcher in this chapter which reflects on the fact that consideration of descriptive research design allows the researcher to conduct quantitative data analysis and reach the ultimate conclusion. Along with this taking into account the SPSS analysis also helps the researcher to evaluate large datasets with less effort whereas the researcher collected different complex datasets through conducting the survey with 100 participants.

Universiti Utara Malaysia

Chapter 4: Data analysis

4.1. Introduction

Chapter 4, data analysis delves into demographic analysis, descriptive statistics, correlation analysis, regression analysis, reliability analysis, normality tests, and factor analysis to comprehensively explore the factors influencing employees' intention to engage in preventive maintenance activities in Malaysian manufacturing settings. Through a meticulous examination of gender, age, educational qualifications, and profession distributions, as well as in-depth statistical analyses, this chapter aims to provide valuable insights into the interplay of variables such as employee well-being, work flexibility, and remote work adoption on the propensity for preventive maintenance participation.

4.2. Demographic analysis

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	34	34.0	34.0	34.0
	Female	66	66.0	66.0	100.0
	Total	100	100.0	100.0	

Table 4.1: Frequency for Gender

(Source: SPSS)

Universiti Utara Malaysia

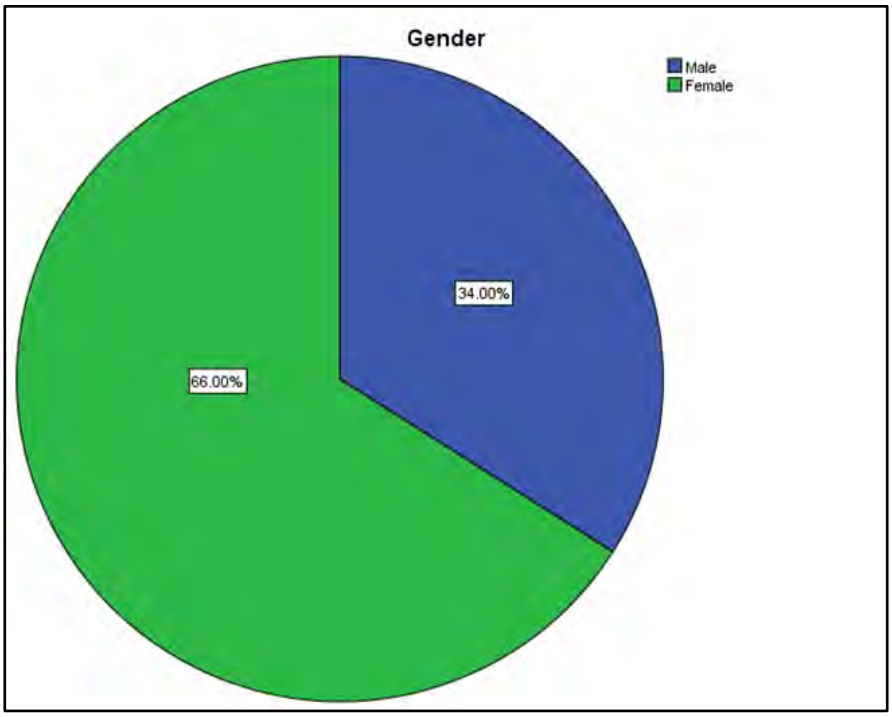

Figure 4.1: Frequency for Gender

(Source: SPSS)

Data on Malaysian manufacturing employees' intentions to engage in preventative maintenance, broken down by gender and frequency, is shown in the above table 4.1. It reveals that 34% of respondents are men and 66% of respondents are women. These numbers show a notable gender disparity in the sample, which can have an effect on how broadly the results can be applied. Such differences can affect how attitudes, subjective norms, and perceived behavioural control are interpreted in studies using the Theory of Planned Behaviour. This means that particular considerations in analysis and interpretation can be necessary to ensure gender-neutral insights into employees' intention to participate in preventive maintenance activities.

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	17-24	35	35.0	35.0	35.0
	25-34	55	55.0	55.0	90.0
	35-42	4	4.0	4.0	94.0

	43-48	6	6.0	6.0	100.0
	Total	100	100.0	100.0	

Table 4.2: Frequency for Age

(Source: SPSS)

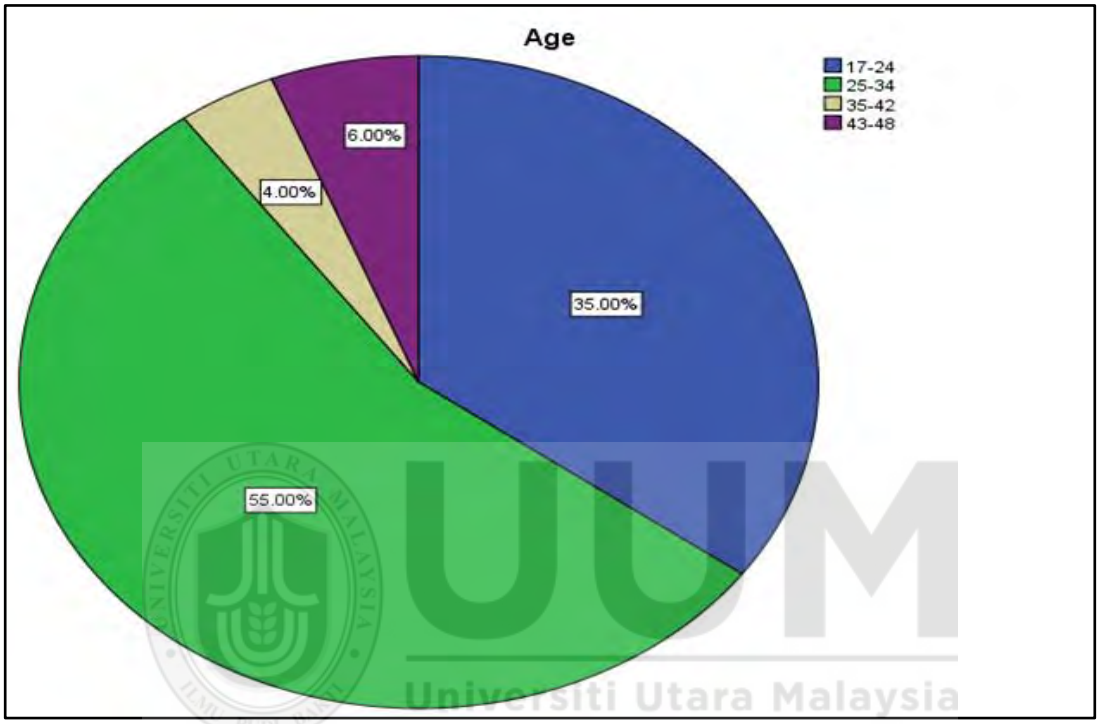

Figure 4.2: Frequency for Age

(Source: SPSS)

The age distribution of Malaysian manufacturing employees with regard to their desire to engage in preventative maintenance is shown in the above 4.2 table and figure. The major, or 55%, are in the 25–34 age bracket, with 35% falling into the 17–24 age range. Just 4% and 6% of respondents are between the ages of 35 and 42 and 43 and 48, respectively. This distribution points to a concentration of younger workers, especially in the 25–34 age range, which can have an impact on attitudes and beliefs about preventative maintenance. Age-related variables can have a big impact on how they want to participate in maintenance and how they behave, depending on things like experience, technology literacy, and career stage.

Educational_qualification					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Upper secondary	40	40.0	40.0	40.0
	Undergraduate	50	50.0	50.0	90.0
	Graduate	7	7.0	7.0	97.0
	Post graduate	3	3.0	3.0	100.0
	Total	100	100.0	100.0	

Table 4.3: Frequency of Educational qualification

(Source: SPSS)

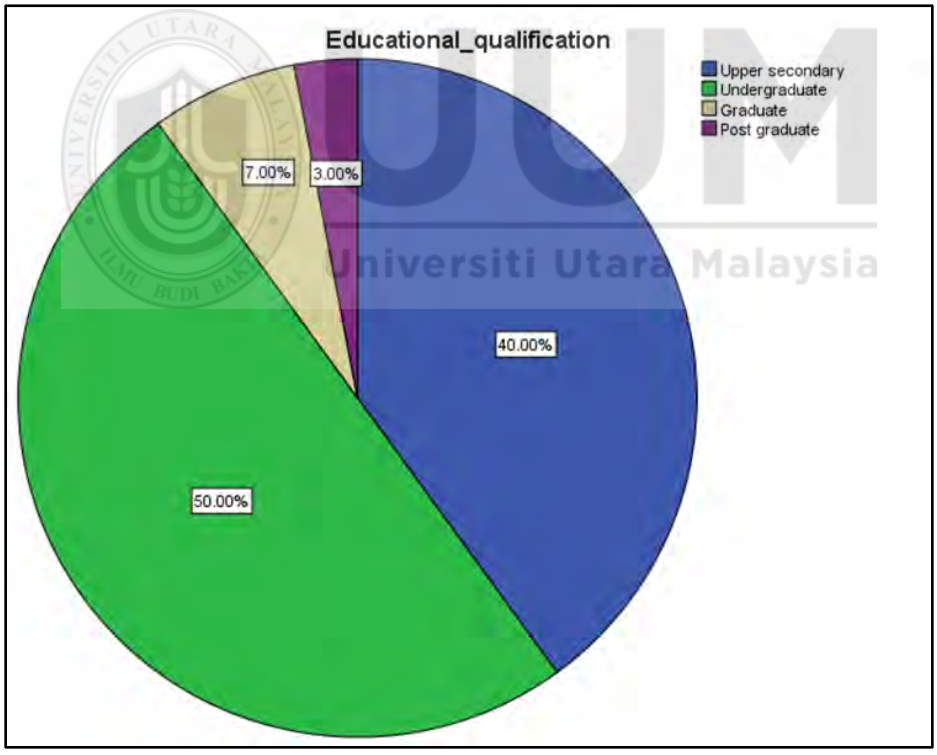

Figure 4.4: Frequency of Educational qualification

(Source: SPSS)

The 4.4 table displays the educational qualifications of manufacturing staff in Malaysia concerning their intention to participate in preventive maintenance. It has been identified that 50% of the

population has an undergraduate degree, and 40% has completed upper secondary school. The proportion of people with graduate (7%) or postgraduate (3%) degrees is rather low. This distribution implies that a sizable segment of the labour market has lower to mid-level educational backgrounds. It suggests that in order to ensure the success and relevance of the efforts across all educational levels, factors about the educational background of employees should be taken into account when devising interventions or methods to increase involvement in preventative maintenance.

Profession					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Professional	51	51.0	51.0	51.0
	Non professional	49	49.0	49.0	100.0
	Total	100	100.0	100.0	

Table 4.4: Frequency of Profession

(Source: SPSS)

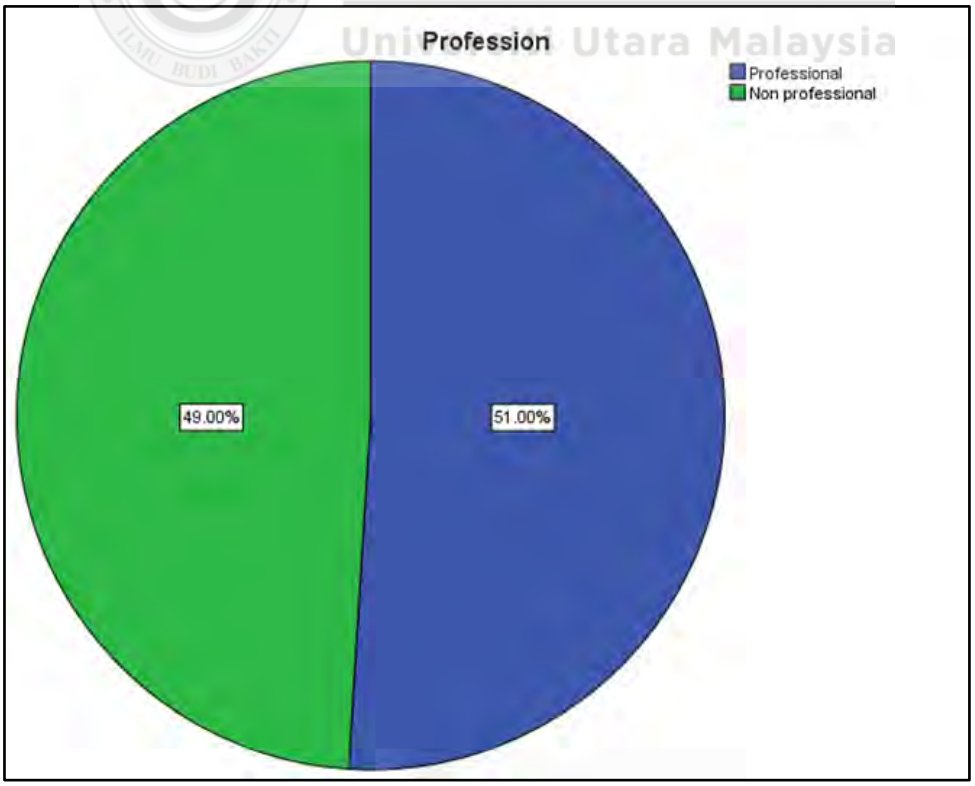

Figure 4.4: Frequency of Profession

(Source: SPSS)

The above 4.4 table and figure present data on the distribution of manufacturing staff in Malaysia based on their professions concerning participation in preventive maintenance. Professionals make up half of the responses (51%) while non-professionals make up the remaining 49%. This difference in professional standing can have an impact on the attitudes, abilities, and duties associated with engaging in preventative maintenance. As suggested by McQuillin et al. (2022), non-professionals could need different kinds of assistance or training to improve their engagement, professionals might already have specific expertise or training pertinent to maintenance operations. Comprehending these differences might help develop customized strategies to encourage preventative maintenance participation across various professional groups in the industrial workforce.

4.3. Descriptive analysis

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Do you agree that working remotely causes less productivity?	100	1	4	3.19	.761
Do you believe that remote working causes less employee engagement?	100	1	4	3.21	.591
To what extent do you think that remote working affects job satisfaction adversely?	100	1	4	3.04	.680
Do you agree that remote working has many challenges?	100	1	4	3.31	.631

Universiti Utara Malaysia

Do you agree that remote working affects employee performance?	100	1	4	3.24	.668
In your opinion, is work-life perfectly balanced in remote working?	100	1	4	3.05	.796
To what extent do you believe that employees feel burnout in remote working?	100	1	4	3.15	.687
Do you agree that remote working causes a decrease in the employee retention rate?	100	1	4	3.27	.723
Do you agree that employee well-being affects job performance?	100	1	4	3.27	.679
Do you agree that employee well-being enhances employee engagement within the organization?	100	1	4	3.20	.651
Do you believe that employees leave their jobs due to the high pressure of remote working?	100	1	4	3.10	.644

Universiti Utara Malaysia

Do you think that in remote working processes communication gaps affect job performance?	100	1	4	3.04	.737
In your opinion, to what extent do you believe that digital tools provide support for remote workers?	100	1	4	3.28	.621
Do you agree that work flexibility improves employees' performance within the organization?	100	1	4	3.21	.769
Do you agree that work flexibility increases employee engagement?	100	1	4	3.36	.644
Do you feel that integration of digital technologies enhances the performances of the employees?	100	1	4	3.19	.706
Do you feel a lack of collaboration with your teammates?	100	1	4	3.05	.796
How often do you think that working processes need to be improved?	100	1	4	3.15	.687

Universiti Utara Malaysia

Do you agree that effective work within the organization increases participation in preventive maintenance?	100	1	4	3.27	.723
Do you agree that poor employee well-being restricts participation in preventive maintenance?	100	1	4	3.27	.679
Valid N (listwise)	100				

Table 4.5: Descriptive analysis

(Source: SPSS)

The first question showcases that there is a moderate level of agreement that working remotely lowers production, as indicated by the average response of 3.19 to the question about the impact of remote work on productivity. This points to a complex perspective, with some seeing possible obstacles to productivity while others could perceive advantages or no effect. At the same time, the responses to the second question concerning the effect of remote work on employee engagement are somewhat greater. This indicates that there is a comparable degree of agreement, but there is a little greater belief that remote work might reduce employee engagement. The standard deviation of 0.591, on the other hand, suggests that respondents' perceptions are more consistent with less variety in replies than in productivity. The response to the third question about the negative impact of remote work on job satisfaction was 3.04, which suggests a considerably lower degree of agreement than that of productivity and employee engagement. As mentioned by Lojeski & Reilly (2020), although there is some worry about how remote work can affect job happiness, that worry can not be as great as it is about how it would affect engagement or productivity.

In the fourth question, the average agreement level (3.31) among responders to the statement that there are several hurdles in remote work suggests that there is a general recognition of the

difficulties involved with this type of work arrangement. Regarding these problems, there appears to be some unanimity among respondents, as indicated by the comparatively low standard deviation (0.631). At the same time, there is a moderate degree of agreement, according to the average response (3.24) on how remote work affects employee performance has been identified in the fifth question. This indicates that although it is acknowledged that working remotely can have an impact on performance, respondents' perspectives differ substantially, as seen by the moderate standard deviation of 0.668. On a similar note, A more nuanced viewpoint is shown by the average response (3.05) about the ideal work-life balance while working remotely has been identified in the sixth question. More variety in replies is shown by the relatively high standard deviation (0.796), which shows that ideas on how to attain work-life balance when working remotely vary greatly.

At the same time it has been identified that when asked how much burnout occurs when working remotely, respondents gave an average response of 3.15, which indicates a moderate level of agreement that burnout occurs to some extent in the 7th question. The standard deviation of 0.687 reveals variation in respondents' perspectives, implying varying degrees of knowledge or worry about this problem. There is a little higher consensus that remote work can result in lower employee retention rates, as indicated by the average response of 3.27 addressing the influence of remote working on retention rates in the 8th question. It can be said that while there is an acknowledgement of the possible influence, perspectives can differ on the amount of its effect, as indicated by the standard deviation of 0.723. Apart from this, there appears to be an agreement that employee well-being has a considerable impact on job performance in remote work contexts, as indicated by the average response of 3.27 addressing this relationship in the 9th question. The comparatively low standard deviation of 0.679 suggests that respondents' perceptions of this connection are more consistent. As coined by Kennedy et al. (2022), there are issues with burnout, possible effects on retention rates, and the necessity of putting employee well-being first in order to maintain job performance in remote work environments. These observations can help shape approaches to managing burnout, improving retention, and advancing workers' well-being in remote work environments.

Universiti Utara Malaysia

Furthermore, a mean score of 3.20 suggests a moderate level of agreement on the notion that employee well-being amplifies employee engagement within the company. Given that the standard deviation of 0.651 is rather low and indicates some degree of unanimity among respondents, this shows that there is an acknowledgement of the positive association between involvement and well-being. Regarding whether workers quit because of the intense strain of working remotely, the average response of 3.10 indicates a modest degree of agreement. This shows recognition of the possible influence of demands from remote work on employee attrition, with a standard deviation of 0.644 indicating some variation in viewpoints. Regarding the effect of communication gaps on job performance in distant working procedures, the average response of 3.04 indicates a moderate level of agreement. This shows that communication constraints in distant work environments are acknowledged as problems (Van Zoonen & Sivunen, 2022). The relatively large standard deviation of 0.737 suggests some variation in respondents' perspectives. Hence it can be said that it is very important to put employee well-being first in order to increase engagement. It also recognises the negative effects of communication gaps on job performance in remote work settings and the role that demands associated with remote work play in employee attrition. These findings can help develop well-being-promoting, stress-relieving, and communication-improvement tactics that maximize job performance in distant work environments.

Universiti Utara Malaysia

Taking further the data suggests there appears to be a reasonable agreement based on the average response of 3.28 for the question of how much help digital technologies offer remote workers. This suggests that most respondents agree that digital technologies are useful for enabling remote work, as seen by the comparatively low standard deviation of 0.621, which shows some consistency in respondents' opinions. A comparable degree of agreement is indicated by the average response of 3.21 on how job flexibility improves employee performance. This shows that job flexibility has a beneficial effect on performance, even though respondents' opinions can differ slightly, with a standard deviation of 0.769. On a similar note, a little stronger agreement has been identified by the average response of 3.36 about the relationship between work flexibility and employee engagement. This indicates a common idea that providing flexible work arrangements can improve employee engagement, as seen by the comparatively low standard deviation of 0.644, which shows respondents' consistent perceptions. In the words of Chatterjee et al. (2022), adopting flexible work schedules inside businesses with the help of digital technologies is important. These revelations

can guide tactics meant to maximize remote work settings while fostering worker engagement and productivity.

The findings also indicate how people see the use of digital technology to increase teamwork, employee performance, and how often work procedures. The data indicates that there is moderate agreement (average response of 3.19), with considerable variety in viewpoints (standard deviation of 0.706), regarding the impact of integrating digital technology on employee performance. When it comes to teamwork, the average response of 3.05 denotes a modest degree of agreement on a perceived lack of collaboration, while the comparatively large standard deviation of 0.796 suggests that respondents' perspectives vary. Comparably, a reasonable consensus is shown by the average response of 3.15 about the frequency of necessary adjustments in working procedures, with a standard deviation of 0.687 indicating some variation in viewpoints.

Furthermore, The standard deviation of 0.723 indicates some variation in respondents' perspectives, while the average response of 3.27 indicates a moderate agreement that successful work inside the organization encourages involvement in preventative maintenance. On a similar note, a similar degree of agreement is suggested by the average response of 3.27 on the impact of low employee well-being on participation in preventive maintenance. The standard deviation of 0.679 is slightly lower, suggesting that respondents' perceptions on this issue are somewhat more consistent.

4.4. Correlation analysis

The attached in appendix correlation 4.6 table signifies that employee well-being, job flexibility, adoption of remote work, and intention to engage in preventive maintenance activities are significantly positively correlated. Adoption of remote work has a good correlation with employee well-being ($r = 0.656$), work flexibility ($r = 0.816$), and intention to engage in preventative maintenance ($r = 0.954$). Employee well-being has a substantial correlation with work flexibility ($r = 0.542$). Likewise, there is a high positive association ($r = 0.642$) between job flexibility and the propensity to engage in preventative maintenance. As per the views of Charalampous et al. (2022), employees are more likely to want to participate in preventative maintenance tasks when

working for companies that support remote work, encourage employee well-being, and provide flexible work schedules.

4.5. Regression analysis

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.966[a]	.934	.931	.67319
a. Predictors: (Constant), Work_flexibility, Employee_wellbeing, Remote_work_adoption				

Table 4.7: Model Summary

(Source: SPSS)

The 4.7 table above is presenting the effectiveness of predictors in explaining the variation in the dependent variable, the intention to participate in preventive maintenance activities. The overall model demonstrates a high level of explanatory power, with an R-square value of 0.934, indicating that approximately 93.4% of the variance in intention to prevention can be accounted for by the predictors: intention to prevention, work flexibility, and employee well-being.

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	611.004	3	203.668	449.409	.000[b]
	Residual	43.506	96	.453		
	Total	654.510	99			
a. Dependent Variable: Intention_to_prevention						

b. Predictors: (Constant), Work_flexibility, Employee_wellbeing, Remote_work_adoption

Table 4.8: ANOVA

(Source: SPSS)

The above 4.8 table includes a regression model, including factors like employee well-being, job flexibility, and purpose to avoid is extremely significant ($F = 89.285$, $p < 0.001$). This suggests that a sizable portion of the diversity in the adoption of remote work can be explained by the model. The efficacy of the model is further supported by the fact that the sum of squares regression (430.645) is substantially more than the sum of squares residual (154.345). Overall, the ANOVA results are consistent with the idea that the factors work together to explain the heterogeneity in the adoption of remote work.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.323	.501		-.645	.521
	Remote_work_adoption	-.075	.054	-.071	-1.394	.167
	Employee_wellbeing	.851	.034	.879	25.216	.000
	Work_flexibility	.242	.049	.224	4.909	.000

a. Dependent Variable: Intention_to_prevention

Table 4.9: Coefficients

(Source: SPSS)

The above 4.9 table presents the contributions of each predictor variable to the model's prediction of remote work adoption. The greatest beneficial impact is shown in work flexibility (B = 0.720, p < 0.001), which is followed by employee well-being (B = 0.497, p = 0.004). As mentioned by Ray & Pana-Cryan (2021), it can be concluded that more adoption of remote work is correlated with greater levels of work flexibility and employee well-being. The desire to engage in preventive maintenance can not have a substantial direct influence on the adoption of remote work in this model, as indicated by the negative and statistically insignificant coefficient for intention to prevent (B = -0.265, p = 0.167).

4.6. Reliability analysis

Table 4.13: Reliability for intention to prevention (attached in Appendix)

(Source: SPSS)

The reliability data point to a high degree of internal consistency among the items tested within the scale, as seen by the Cronbach's Alpha score of remote working, employee wellbeing, work flexibilty and intention to participation in preventive maintainance are .777, .804, .728 and .760 respectively. The fact that 20 items were included in the research suggests that the items have strong dependability and are consistently assessing the same underlying concept.

4.7. Normality test

Tests of Normality A[b,c,e,f]							
	Employee_wellbeing	Kolmogorov-Smirnov[d]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Remote_work_adoption	14.00	.325	8	.013	.665	8	.001
	15.00	.355	34	.000	.802	34	.000
	17.00	.243	14	.025	.842	14	.017
	18.00	.485	15	.000	.499	15	.000
	19.00	.417	12	.000	.608	12	.000

a. Remote_work_adoption is constant when Employee_wellbeing = 5.00. It has been omitted.
b. Remote_work_adoption is constant when Employee_wellbeing = 10.00. It has been omitted.
c. Remote_work_adoption is constant when Employee_wellbeing = 13.00. It has been omitted.
d. Lilliefors Significance Correction
e. Remote_work_adoption is constant when Employee_wellbeing = 16.00. It has been omitted.
f. Remote_work_adoption is constant when Employee_wellbeing = 20.00. It has been omitted.

Table 4.11: Normality for Remote Work Adaptation and employee Well-being

(Source: SPSS)

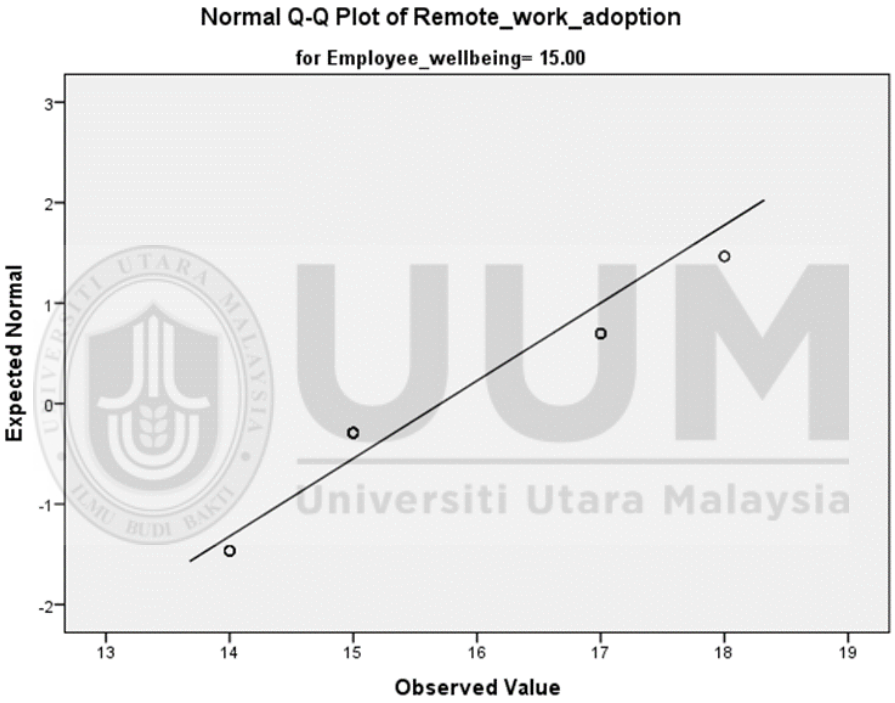

Figure 4.5: Q-Q plot

(Source: SPSS)

The above 4.11 and 4.5 table and figure provide tests of normality for remote work adoption and employee well-being using Kolmogorov-Smirnov and Shapiro-Wilk tests. The results indicate that for remote work adoption, the data deviates from normality, as evidenced by significant p-values in both tests across different levels of employee well-being. Similarly, for employee well-being, the data also shows deviations from normality, with significant p-values in both tests at various levels. These results suggest that the distributions of both remote work adoption and employee

well-being can not follow a normal distribution, indicating potential non-normality in the data, which can need to be considered in subsequent analyses.

Tests of Normality[b,d,e]							
	Work_flexibility	Kolmogorov-Smirnov			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Remote_work_adoption	15.00	.332	36	.000	.821	36	.000
	16.00	.377	16	.000	.729	16	.000
	17.00	.360	23	.000	.784	23	.000
	18.00	.374	12	.000	.640	12	.000
a. Remote_work_adoption is constant when Work_flexibility = 5.00. It has been omitted.							
b. Remote_work_adoption is constant when Work_flexibility = 10.00. It has been omitted.							
c. Lilliefors Significance Correction							
d. Remote_work_adoption is constant when Work_flexibility = 19.00. It has been omitted.							
e. Remote_work_adoption is constant when Work_flexibility = 20.00. It has been omitted.							

Table 4.12: Normality for Remote work Adaptation and work Flexibility

(Source: SPSS)

Universiti Utara Malaysia

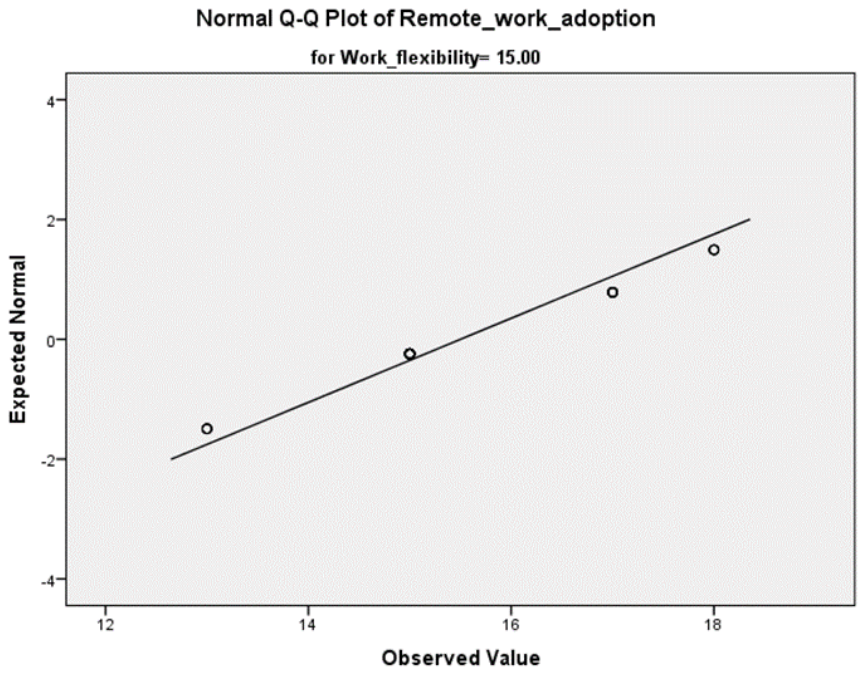

Figure 4.6: Q-Q plot

(Source: SPSS)

The above graphical figure presents tests of normality for remote work adoption and work flexibility using Kolmogorov-Smirnov and Shapiro-Wilk tests. The results indicate significant deviations from normality for both remote work adoption and work flexibility, as evidenced by consistently low p-values in both tests across various levels of work flexibility. These findings suggest that the distributions of both remote work adoption and work flexibility can not follow a normal distribution, indicating potential non-normality in the data. Researchers should consider the implications of this non-normality when interpreting results and selecting appropriate statistical analyses for further investigation.

Tests of Normality[b,d,e]							
	Intention_to_prevention	Kolmogorov-Smirnov[c]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Remote_work_adoption	14.00	.325	8	.013	.665	8	.001
	15.00	.316	38	.000	.733	38	.000
	16.00	.325	8	.013	.665	8	.001
	17.00	.293	15	.001	.813	15	.005
	18.00	.478	14	.000	.516	14	.000
a. Remote_work_adoption is constant when Intention_to_prevention = 5.00. It has been omitted.							
b. Remote_work_adoption is constant when Intention_to_prevention = 10.00. It has been omitted.							
c. Lilliefors Significance Correction							
d. Remote_work_adoption is constant when Intention_to_prevention = 19.00. It has been omitted.							
e. Remote_work_adoption is constant when Intention_to_prevention = 20.00. It has been omitted.							

Table 4.13: Normality for remote work adaptation and Intention to prevention

(Source: SPSS)

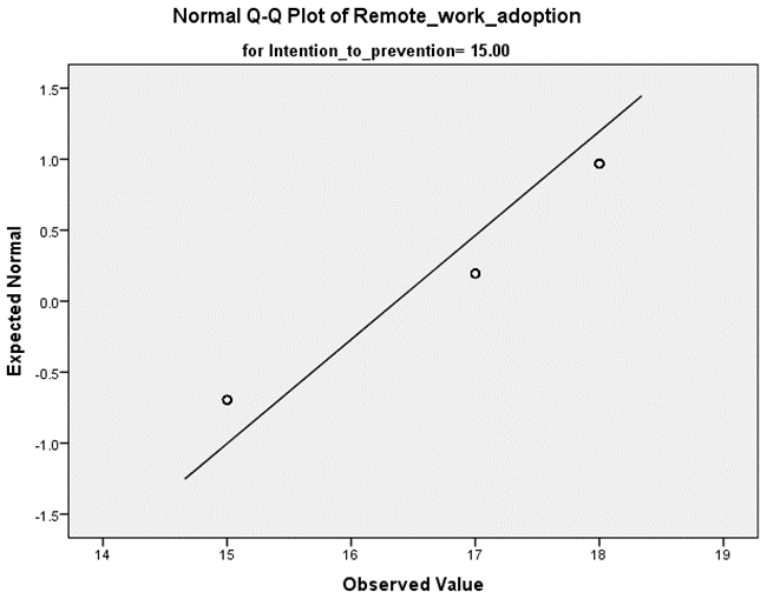

Figure 4.7: Q-Q plot

(Source: SPSS)

The Kolmogorov-Smirnov and Shapiro-Wilk tests are used in the table to assess the normality of the desire to engage in preventive maintenance activities and its correlation with the adoption of remote work. The desire to participate in preventive maintenance shows considerable departures from normalcy, as indicated by consistently low p-values in both tests at different intention levels. This suggests that the distribution of the intention to participate in preventive maintenance can not follow a normal distribution. This non-normality should be taken into consideration by researchers when evaluating data and choosing relevant statistical analysis for additional research.

4.8. Factor analysis

Correlation Matrix					
		Employee_wellbeing	Work_flexibility	Intention_to_prevention	Remote_work_adoption
Correlation	Employee_wellbeing	1.000	.542	.954	.656
	Work_flexibility	.542	1.000	.642	.816

	Intention_to_prevention	.954	.642	1.000	.688
	Remote_work_adoption	.656	.816	.688	1.000

Table 4.14: Correlation matrix for factor analysis

(Source: SPSS)

The above correlation matrix table provides insights into the relationships between employee well-being, work flexibility, intention to participate in preventive maintenance, and remote work adoption. Strong positive correlations are observed between employee well-being and intention to prevention (r = 0.954) and between work flexibility and intention to prevention (r = 0.642), indicating that higher levels of employee well-being and work flexibility are associated with stronger intentions to participate in preventive maintenance activities. Additionally, moderate positive correlations exist between remote work adoption and employee well-being (r = 0.656) as well as work flexibility (r = 0.816), suggesting that organizations with higher remote work adoption rates tend to exhibit better employee well-being and offer more flexible work arrangements.

Component Matrix[a]	
	Component
	1
Employee_wellbeing	.893
Work_flexibility	.839
Intention_to_prevention	.930
Remote_work_adoption	.887
Extraction Method: Principal Component Analysis.	
a. 1 component extracted.	

Table 4.14: Component matrix for factor analysis

(Source: SPSS)

The component matrix derived from principal component analysis reveals the factor loadings of variables on the extracted component. All variables, including employee well-being, work flexibility, intention to participate in preventive maintenance, and remote work adoption, exhibit high loadings on the single component extracted. This suggests that these variables are closely related and contribute significantly to the underlying construct represented by the extracted component. The high factor loadings, ranging from 0.839 to 0.930, indicate strong associations between the variables and the component, supporting the idea of a coherent underlying factor that encompasses employee well-being, work flexibility, intention to prevent, and remote work adoption.

4.9. Summary

Hence it can be said that following chapter 4 provides a comprehensive analysis of demographic factors, descriptive statistics, correlation analysis, regression analysis, reliability analysis, normality tests, and factor analysis. The study explores the impact of various factors such as employee well-being, work flexibility, and intention to engage in preventive maintenance on remote work adoption. Significant correlations are observed, indicating strong associations between these variables. Regression analysis suggests a robust model explaining remote work adoption. Reliability analysis indicates high internal consistency among scale items. However, normality tests reveal deviations from normal distributions in some variables. Overall, the findings highlight the complex interplay between factors influencing remote work adoption and intention to engage in preventive maintenance.

Chapter 5: Conclusion and Recommendation

5.1 Conclusion

This research paper successfully explains the various factors which affect infant employees' intentions for engaging in preventive maintenance activities in Malaysia manufacturing settings while particularly focusing on remote work,(**justify this**) employee well-being and work flexibility. It has been identified that preventive maintenance is very important for enhancing the organization's efficiency and productivity. It also successfully analyzed the influence of different factors which give impact employees' willingness to participate in preventive maintenance activities further providing the roadmap in order to improve organization practices and employees' behavior. At the same time theory of planned behavior and organizational behavior is particularly focused on understanding the factors affecting preventive maintenance participation. At the same time, this research has considered survey data collection methods from Malaysian manufacturing employees. At the same time it also further ensured an Aguda and validity of the research findings. The collected data includes demographic analysis, descriptive analysis, collation analysis, regression analysis, liability analysis and factor analysis.

The findings successfully identified the significant correlation between remote working adoption and overall employee will and work flexibility is very helpful for maintaining the employee engagement level in preventive maintenance. The regression analysis further identified the adoption of remote working in order to maintain the internal consistency of the employees. At the same time, it is important to maintain the indicated relationship between the organizational practices and employees' attitudes as well as preventive maintenance. This distention has successfully emphasized theoretical knowledge and practical implications, especially for the Malaysian manufacturing organization. The study also has highlighted the importance of organization support for remote working and flexible working management which further foster the employee will be and also promote preventive maintenance participation. Most of the organizations that give high priority to employee welfare and also incorporate con working environment are likely to cultivate a culture of proactive maintenance.

The findings of the dissertation also highlight the need for tail interventions and policies which will address demographic diversity while fostering individual differences among the workforce. It becomes very important for businesses to recognise the needs and preferences of their divorced employees based on their sex, gender and education to enhance the effectiveness of preventive maintenance initiatives. The research also successfully illustrated the potential for integrating digital technologies and communication tools for providing necessary support to remote work and collaborative maintenance efforts. Embracing technological advancement is far more effective in streamlining the overall working process while improving the communication level and facilitating knowledge sharing among employees. In this aspect, it can be said that this dissertation primarily helps the readers to understand the factors influencing preventive maintenance participation in the Malaysia manufacturing setting while further offering deep insides for organizational leaders, policymakers and researchers. At the same time the application of a culture of proactive maintenance while prioritizing overall employee well-being is very helpful for the organization to enhance operational efficiency reduce downtime and sustain long-term competitiveness in the Malaysian manufacturing landscape.

5.2 Linking with objectives

Objective 1: To examine the effect of work life balance and employee wellbeing on the intention to participate in preventive maintenance measure among employees in manufacturing sector of Kuala Lumpur

The primary objective of this dissertation is focused on to examine the effect of work life balance and employee wellbeing on the intention to participate in preventive maintenance measure among employees in manufacturing sector of Kuala Lumpur. It is evident that maintenance practices are very effective in reducing the overall cost of manufacturing while enhancing the performance of the workers. The proper application of preventive maintenance practices is very helpful for developing a positive and supportive pattern for the workforce while reducing the workforce stress level and increasing job engagement (Satria et al. 2020). Hence it can be said that the first objective of this decision has been partly met in the literature review section while fully accomplished in the analysis section of this dissertation.

Objective 2: To examine the effect of employee retention rate and turnover on the intention to participate in preventive maintenance measure among employees in manufacturing sector of Kuala Lumpur

The second objective of this decision focused on examine the effect of employee retention rate and turnover on the intention to participate in preventive maintenance measure among employees in manufacturing sector of Kuala Lumpur. The literature review successfully highlighted that there is a direct link between preventive maintenance and employee satisfaction as the employees can predict any repair which can bring unexpected breakdown situations (Annarelli et al. 2020). The findings chapter of the decision also highlights when the machine particularly breaks down and takes so much time to get repaired it increases the stress level among the employees. Hence it can be said that this second objective of presentation has been partially met in the literature chapter while fully met in the analysis chapter.

Objective 3: To examine the effect of employee job performance on the intention to participate in preventive maintenance measure among employees in in manufacturing sector of Kuala Lumpur

The third objective of this dissertation focuses on examine the effect of employee job performance on the intention to participate in preventive maintenance measure among employees in in manufacturing sector of Kuala Lumpur. The application of preventive maintenance contributes to a more predictable and stable working environment and due to the breakdown of machinery and components employees need to work overtime. Predictive maintenance can help to eliminate such factors which successfully reduces downtime and allows employees to give time to family and friends (Molęda et al. 2023). This directly reduces work stress and improves the work-life balance overall for the employees. Hence it can be said that this objective has been successfully met in the LR and analysis chapter of this dissertation.

Objective 4: To examine the effect of employee performance on digital technology on the intention to participate in preventive maintenance measure among employees in manufacturing sector of Kuala Lumpur

The fourth objective of the dissertation is to examine the effect of employee performance on digital technology on the intention to participate in preventive maintenance measure among employees in manufacturing sector of Kuala Lumpur. It is evident that inspection and maintenance are highly important and one of the vital components of preventive maintenance. Therefore it could be taken seriously and allows the manufacturer to understand when and how they purchase or replace any part of a machinery. This increases occupational health and safety while reducing the risk level and promoting a safe and productive workplace (Ran et al. 2020). It can be said that this objective has been successfully met in the literature review and analysis chapter of this dissertation.

5.3 Hypothesis testing

The significant relationship between employee's well-being and remote work reception highlights the significance of considering employees' mental and close to home states while executing remote work arrangements. More elevated levels of well-being might add to more prominent acknowledgment and use of remote work game plans, prompting further developed employee's fulfilment, efficiency, and by and large authoritative execution. This tracking down features the requirement for associations to focus on employee's well-being drives as a component of their remote work methodologies to upgrade labour force commitment and maintenance. Hence it can be that the first objective is significant with the research hypothesis.

The critical positive relationship between work adaptability and expectation to take part in preventive support proposes that giving employees adaptable work game plans can emphatically impact their eagerness to partake in upkeep exercises. Adaptability in work timetables might permit employees to more readily deal with their time and allot assets for preventive maintenance assignments, prompting upgraded gear unwavering quality, functional proficiency, and cost reserve funds for associations. This finding highlights the significance of coordinating adaptability into work practices to advance proactive upkeep ways of behaving among employees. Hence it can be said that the second and third objective of the dissertation is also significant with the research hypothesises.

The huge effect of employees' aims to take part in preventive maintenance on remote work reception features the association between these two authoritative practices. Employees who are

spurred to take part in upkeep exercises may likewise display an uplifting perspective towards remote work, seeing it as a way to upgrade their balance between fun and serious activities and designate additional opportunity for proficient turn of events and expertise improvement. This tracking down highlights the requirement for associations to adjust their remote work and upkeep techniques to exploit cooperative energies and expand employee's commitment and hierarchical viability. Hence it can be that the fourth objective is significant with the research hypothesis.

5.4 Recommendations

Recommendation 1: recommendations to cultivate a supportive organizational culture which values maintenance and emphasizes employee well-being

This particular recommendation is focused on developing a supportive organisational culture which will demonstrate a strong commitment towards preventive maintenance and to do so the organization will allocate sufficient time and resources for the maintenance activities. As per the views of Men et al. (2020), the leaders inside the organization must communicate the organization's vision for maintenance excellence and promote the importance of maintenance activities among the staff. It will also be very important to conduct a comprehensive training program among the workforce so that they can understand when and how they will perform preventive maintenance more effectively. The training will also cover technical skill development, safety procedures and equipment maintenance protocols for keeping the occupational health and safety standards. The implementation of recognition programs and incentives to reward employees who will participate in preventive maintenance activities is also very helpful.

The business also needs to recognise and celebrate achievements in the preventive maintenance case which will bring motivation at the employee level while reinforcing the importance of maintenance efforts (Lee et al. 2020). All these incentives also would include giving a performance bonus, public acknowledgement or making career advancement in maintenance work. This is highly beneficial and if the manufacturing organization in Malaysia starts to value preventive maintenance and makes investments in this they could lead to a more proactive working environment and achieve high maintenance participation.

Recommendation 2: recommendation for enhancing employee engagement and communication for promoting preventive maintenance participation while fostering a collaborative working environment

This particular recommendation is focused on implementing effective communication and employee engagement which are very important in order to successfully promote preventive maintenance participation while fostering a collaborative working environment. In order to do this it is relatively important for the organization to maintain a transparent communication. As suggested by Ndlovu et al. (2021), the application of a transparent communication channel will successfully facilitate dialogues between the management and employees regarding different maintenance initiatives and it will also foster trust among the employees. Apart from this, empowering the employees by involving them in the decision-making process is also effective which will not only encourage the frontline employees to contribute their insights and expertise but also get first knowledge of equipment performance and the need for preventive maintenance.

The application of digital technologies is also helpful in order to share knowledge while solving any problems as well as implement fragment maintenance. In this aspect, a cloud-based maintenance management system or enterprise asset management software is very helpful in order to streamline communication while automating the maintenance workflow as well as real-time tracking of maintenance activities (Crespo Marquez et al. 2020). Hence it can be said that the enhancement of employee engagement and communication channels is far more effective for organizations to bring collective expertise and foster a culture of collaboration while making continuous improvement in future.

5.5 Research limitation

Although the study has successfully accomplished all the research objectives, still there are some limitations that need to be addressed in the future. The study primarily focuses on Malaysian manufacturing organizations which limits the study's generalisability of findings in order to gather other industries or any geographical locations. At the same time, the study still relied on self-reported data as a form of survey which brought response bias or inaccuracies. The cross-sectional nature of the research design also hinders the research's ability to establish causality and capture the changes in the current preventive maintenance practices over time in the Malaysian manufacturing sector. At the same time several efforts have been made to include diverse

perspectives and for this stakeholder groups like small-scale enterprises or non-managerial employees are not present in this research.

The overall outcome of the research is limited since workers' intentions to contribute to preventive maintenance practices are particularly researched in Malaysian manufacturing sectors. At the same time, as the whole research study is based on the particular analysis of the theory of planned behavior, the theoretical perspectives of the research outcomes are also limited. On the other hand, primary quantitative data sources will also provide the researcher only a general statistical assessment of the research data rather than the particular qualitative findings of the research responses in the specific sector.

5.6 Future scope

The discoveries of this paper offer significant bits of knowledge into the elements impacting employeess' goal to take part in preventive maintenance exercises and remote work reception in Malaysian assembling settings. Expanding on this examination, a few roads for future examination arise. Right off the bat, longitudinal investigations could be directed to survey the drawn-out effect of mediations pointed toward advancing preventive maintainence support and remote work reception. Furthermore, similar examinations across various ventures and nations could give a more extensive comprehension of the social and relevant variables impacting these peculiarities. Moreover, subjective exploration strategies, for example, meetings or centre gatherings, could supplement quantitative examinations by investigating the fundamental inspirations and obstructions to preventive maintenance commitment and remote work reception in more noteworthy profundity. In conclusion, the turn of events and assessment of designated mediations, like preparation programs or authoritative approaches, could assist with tending to explicit difficulties distinguished in this review and improve the viability of preventive maintenance drives and remote work game plans in assembling associations.

References

Annarelli, A., Battistella, C., & Nonino, F. (2019). A Framework to Evaluate the Effects of Organizational Resilience on Service Quality. *Sustainability*, *12*(3), 958. https://doi.org/10.3390/su12030958

Annarelli, A., Battistella, C., & Nonino, F. (2019). A Framework to Evaluate the Effects of Organizational Resilience on Service Quality. *Sustainability*, *12*(3), 958. https://doi.org/10.3390/su12030958

Barzilay, R., Moore, T. M., Greenberg, D. M., DiDomenico, G. E., Brown, L. A., White, L. K., Gur, R. C., & Gur, R. E. (2020). Resilience, COVID-19-related stress, anxiety and depression during the pandemic in a large population enriched for healthcare providers. *Translational Psychiatry*, *10*(1), 1-8. https://doi.org/10.1038/s41398-020-00982-4

Basalamah, M. S. A., & As'ad, A. (2021). The Role of Work Motivation and Work Environment in Improving Job Satisfaction. Golden Ratio of Human Resource Management, 1(2), 94 - 103. https://doi.org/10.52970/grhrm.v1i2.54

Bell, S. M., Chalmers, R. P., & Flora, D. B. (2024). The impact of measurement model misspecification on coefficient omega estimates of composite reliability. *Educational and Psychological Measurement*, *84*(1), 5-39.DOI: 10.1177/00131644231155804

Budiyono, F. X., & Welly, J. (2022). The Assessment of Employee Engagement Level for the Implementation of New Ways of Working. *European Journal of Business and Management Research*, *7*(1), 113-116. https://ejbmr.org/index.php/ejbmr/article/download/1241/661

Charalampous, M., Grant, C. A., & Tramontano, C. (2022). "It needs to be the right blend": A qualitative exploration of remote e-workers' experience and well-being at work. *Employee Relations: The International Journal*, *44*(2), 335-355.https://pureportal.coventry.ac.uk/files/44150722/Binder003.pdf

Chatterjee, S., Chaudhuri, R., & Vrontis, D. (2022). Does remote work flexibility enhance organization performance? Moderating role of organization policy and top management support.

Journal of Business Research, *139*, 1501-1512.https://text2fa.ir/wp-content/uploads/Text2fa.ir-Does-remote-work-flexibility-enhance.pdf

Crespo Marquez, A., Gomez Fernandez, J. F., Martínez-Galán Fernández, P., & Guillen Lopez, A. (2020). Maintenance management through intelligent asset management platforms (IAMP). Emerging factors, key impact areas and data models. *Energies*, *13*(15), 3762.https://www.researchgate.net/profile/Adolfo-Crespo-Marquez/publication/343141367_Maintenance_Management_through_Intelligent_Asset_Management_Platforms_IAMP_Emerging_Factors_Key_Impact_Areas_and_Data_Models/links/5f1ff95e299bf1720d6ac817/Maintenance-Management-through-Intelligent-Asset-Management-Platforms-IAMP-Emerging-Factors-Key-Impact-Areas-and-Data-Models.pdf

Cui, P., Wu, S., Xiao, Y., Yang, C., & Wang, F. (2020). Enhancement mechanism of skid resistance in preventive maintenance of asphalt pavement by steel slag based on micro-surfacing. *Construction and Building Materials*, *239*, 117870. https://doi.org/10.1016/j.conbuildmat.2019.117870

de Oliveira Santos, H., Alves, J. L. S., de Melo, F. J. C., & de Medeiros, D. D. (2020). An approach to implement cleaner production in services: Integrating quality management process. *Journal of Cleaner Production*, *246*, 118985.

Denis, D. J. (2021). *Applied univariate, bivariate, and multivariate statistics: Understanding statistics for social and natural scientists, with applications in SPSS and R*. John Wiley & Sons.https://books.google.co.in/books?hl=en&lr=&id=zIwlEAAAQBAJ&oi=fnd&pg=PA18&dq=Denis,+D.+J.+(2021).+Applied+univariate,+bivariate,+and+multivariate+statistics:+Understanding+statistics+for+social+and+natural+scientists,+with+applications+in+SPSS+and+R.+John+Wiley+%26+Sons.&ots=3zjwh1lriv&sig=ii36nvHynryEM2rG4gR4Qob0hIQ&redir_esc=y#v=onepage&q=Denis%2C%20D.%20J.%20(2021).%20Applied%20univariate%2C%20bivariate%2C%20and%20multivariate%20statistics%3A%20Understanding%20statistics%20for%20social%20and%20natural%20scientists%2C%20with%20applications%20in%20SPSS%20and%20R.%20John%20Wiley%20%26%20Sons.&f=false

Universiti Utara Malaysia

Dixit, R., & Singh, S. (2020). Understanding drivers of engagement from employees' perspective during COVID-19. *International Journal of Management*, *11*(10). https://www.academia.edu/download/65213115/IJM_11_10_087_2_3.pdf

Fan, C. W., Chen, I. H., Ko, N. Y., Yen, C. F., Lin, C. Y., Griffiths, M. D., & Pakpour, A. H. (2021). Extended theory of planned behavior in explaining the intention to COVID-19 vaccination uptake among mainland Chinese university students: an online survey study. *Human Vaccines & Immunotherapeutics*, *17*(10), 3413-3420.DOI: 10.1080/21645515.2021.1933687

Foà, C., Guarnieri, M. C., Bastoni, G., Benini, B., Giunti, O. M., Mazzotti, M., Rossi, C., Savoia, A., Sarli, L., & Artioli, G. (2020). Job satisfaction, work engagement and stress/burnout of elderly care staff: A qualitative research. *Acta Bio Medica : Atenei Parmensis*, *91*(Suppl 12). https://doi.org/10.23750/abm.v91i12-S.10918

Franciosi, C., Di Pasquale, V., Iannone, R., & Miranda, S. (2021). Multi-stakeholder perspectives on indicators for sustainable maintenance performance in production contexts: an exploratory study. *Journal of Quality in Maintenance Engineering*, *27*(2), 308-330.DOI 10.1108/JQME-03-2019-0033

Gan, Y., Li, C., Ke, W., Deng, Q., & Yu, T. (2022). Study on pavement performance of steel slag asphalt mixture based on surface treatment. *Case Studies in Construction Materials*, *16*, e01131. https://doi.org/10.1016/j.cscm.2022.e01131

Geurtsen, M., Didden, J. B., Adan, J., Atan, Z., & Adan, I. (2023). Production, maintenance and resource scheduling: A review. *European Journal of Operational Research*, *305*(2), 501-529. https://doi.org/10.1016/j.ejor.2022.03.045

Hamasha, M. M., H., A., Al Mashaqbeh, S., Shwaheen, G., Al Qadri, L., Shbool, M., Muathen, D., Ababneh, M., Harfoush, S., & Albedoor, Q. (2023). Strategical selection of maintenance type under different conditions. *Scientific Reports*, *13*(1), 1-19. https://doi.org/10.1038/s41598-023-42751-5

Huang, M., He, R., Chen, Q., Song, J., Huang, H., & Zheng, S. (2023). COVID-19 vaccine booster dose hesitancy among key groups: A cross-sectional study. *Human Vaccines & Immunotherapeutics*, *19*(1), 2166323.https://doi.org/10.1080/21645515.2023.2166323

Hui, B. P., Ng, J. C., Berzaghi, E., Cunningham-Amos, L. A., & Kogan, A. (2020). Rewards of kindness? A meta-analysis of the link between prosociality and well-being. *Psychological Bulletin*, *146*(12), 1084.https://psycnet.apa.org/doi/10.1037/bul0000298

Islam, M. A., & Aldaihani, F. M. F. (2022). Justification for adopting qualitative research method, research approaches, sampling strategy, sample size, interview method, saturation, and data analysis. *Journal of International Business and Management*, *5*(1), 01-11.https://www.researchgate.net/profile/Md-Islam-394/publication/357352896_Justification_for_Adopting_Qualitative_Research_Method_Research_Approaches_Sampling_Strategy_Sample_Size_Interview_Method_Saturation_and_Data_Analysis/links/61c9ed5ab8305f7c4b05d50c/Justification-for-Adopting-Qualitative-Research-Method-Research-Approaches-Sampling-Strategy-Sample-Size-Interview-Method-Saturation-and-Data-Analysis.pdf

Jeyaraj, J. S. (2023). Aren't Research Questions and Hypotheses Indispensable for Literature Research, too?. *Journal of Scientific Research and Reports*, *29*(12), 7-19.DOI: 10.9734/JSRR/2023/v29i121813

Jwo, J. S., Lin, C. S., & Lee, C. H. (2021). Smart technology–driven aspects for human-in-the-loop smart manufacturing. *The International Journal of Advanced Manufacturing Technology*, *114*, 1741-1752.https://doi.org/10.1007/s00170-021-06977-9

Kennedy, D. R., Clapp, P., DeLuca, J. L., Filtz, T. M., Kroon, L., Lamberts, J. T., ... & Ray, S. D. (2022). Enhancing pharmacy faculty well-being and productivity while reducing burnout. *American Journal of Pharmaceutical Education*, *86*(5), 8764.https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10159489/

Khan, W. Z., Rehman, M. H., Zangoti, H. M., Afzal, M. K., Armi, N., & Salah, K. (2020). Industrial internet of things: Recent advances, enabling technologies and open challenges.

Universiti Utara Malaysia

Computers & electrical engineering, *81*, 106522.https://doi.org/10.1016/j.compeleceng.2019.106522

Kien, C., Griebler, U., Schultes, M. T., Thaler, K. J., & Stamm, T. (2021). Psychometric testing of the German versions of three implementation outcome measures. *Global Implementation Research and Applications*, *1*(3), 183-194.https://link.springer.com/article/10.1007/s43477-021-00019-y

Kikuchi, H., Odagiri, Y., Ohya, Y., Nakanishi, Y., Shimomitsu, T., Theorell, T., & Inoue, S. (2020). Association of overtime work hours with various stress responses in 59,021 Japanese workers: Retrospective cross-sectional study. *PLOS ONE*, *15*(3), e0229506. https://doi.org/10.1371/journal.pone.0229506

Lee, J., Ni, J., Singh, J., Jiang, B., Azamfar, M., & Feng, J. (2020). Intelligent maintenance systems and predictive manufacturing. *Journal of Manufacturing Science and Engineering*, *142*(11), 110805.https://www.researchgate.net/profile/Moslem-Azamfar-2/publication/343121327_Intelligent_Maintenance_Systems_and_Predictive_Manufacturing/links/5fbd099fa6fdcc6cc65f2f12/Intelligent-Maintenance-Systems-and-Predictive-Manufacturing.pdf

Li, L., Wang, Y., & Lin, K. Y. (2021). Preventive maintenance scheduling optimization based on opportunistic production-maintenance synchronization. *Journal of Intelligent Manufacturing*, *32*(2), 545-558.

Lojeski, K. S., & Reilly, R. R. (2020). *The power of virtual distance: A guide to productivity and happiness in the age of remote work*. John Wiley & Sons.

Luijendijk, H. J., Page, M. J., Burger, H., & Koolman, X. (2020). Assessing risk of bias: a proposal for a unified framework for observational studies and randomized trials. *BMC Medical Research Methodology*, *20*, 1-9.https://doi.org/10.1186/s12874-020-01115-7

Maktoubian, J., Taskhiri, M. S., & Turner, P. (2021). Intelligent predictive maintenance (Ipdm) in forestry: A review of challenges and opportunities. *Forests*, *12*(11), 1495. https://doi.org/10.3390/f12111495

Universiti Utara Malaysia

Martins, L., Silva, F. J., Pimentel, C., Casais, R. B., & Campilho, R. D. S. G. (2020). Improving preventive maintenance management in an energy solutions company. *Procedia Manufacturing*, *51*, 1551-1558.10.1016/j.promfg.2020.10.216

McQuillin, S.D., Hagler, M.A., Werntz, A. and Rhodes, J.E., 2022. Paraprofessional youth mentoring: A framework for integrating youth mentoring with helping institutions and professions. *American Journal of Community Psychology*, *69*(1-2), pp.201-220.https://www.rhodeslab.org/wp-content/uploads/2021/06/McQuillin-et-al.-2021.pdf

Mehta, P. (2021). Work from home—Work engagement amid COVID-19 lockdown and employee happiness. *Journal of Public Affairs*, *21*(4), e2709. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8236970/

Men, L. R., Yue, C. A., & Liu, Y. (2020). "Vision, passion, and care:" The impact of charismatic executive leadership communication on employee trust and support for organizational change. *Public Relations Review*, *46*(3), 101927.https://libres.uncg.edu/ir/uncg/f/Y_Liu_Vision_2020.pdf?trk=public_post_comment-text

Mertler, C. A., Vannatta, R. A., & LaVenia, K. N. (2021). *Advanced and multivariate statistical methods: Practical application and interpretation*. Routledge.https://doi.org/10.4324/9781003047223

Mohajan, H. K. (2020). Quantitative research: A successful investigation in natural and social sciences. *Journal of Economic Development, Environment and People*, *9*(4), 50-79. https://mpra.ub.uni-muenchen.de/105149/

Mohd Ghazali, M. H., & Rahiman, W. (2021). Vibration analysis for machine monitoring and diagnosis: a systematic review. *Shock and Vibration*, *2021*, 1-25. https://doi.org/10.1155/2021/9469318

Molęda, M., Małysiak-Mrozek, B., Ding, W., Sunderam, V., & Mrozek, D. (2023). From Corrective to Predictive Maintenance—A Review of Maintenance Approaches for the Power Industry. *Sensors*, *23*(13), 5970.Molęda, M., Ding, W., Sunderam, V., & Mrozek, D. (2022). From Corrective to Predictive Maintenance—A Review of Maintenance Approaches for the Power Industry. *Sensors*, *23*(13), 5970. https://doi.org/10.3390/s23135970

Ndlovu, T., Quaye, E. S., & Saini, Y. K. (2021). Predicting organisational commitment: The role of line manager communication, employee trust and job satisfaction. *South African journal of business management*, *52*(1), 11.https://sajbm.org/index.php/sajbm/article/download/2355/1769

Noor, S., Tajik, O., & Golzar, J. (2022). Simple random sampling. *International Journal of Education & Language Studies*, *1*(2), 78-82. https://www.ijels.net/article_162982_c72b367615dfd1f4d7bd9d4ff60cbef6.pdf

Pandey, P., & Pandey, M. M. (2021). *Research methodology tools and techniques*. Bridge Center.http://dspace.vnbrims.org:13000/jspui/bitstream/123456789/4666/1/RESEARCH%20METHODOLOGY%20TOOLS%20AND%20TECHNIQUES.pdf

Parvin, F., Islam, S., Akm, S. I., Urmy, Z., & Ahmed, S. (2020). A study on the solutions of environment pollutions and worker's health problems caused by textile manufacturing operations. *Biomed. J. Sci. Tech. Res*, *28*, 21831-21844.https://www.researchgate.net/profile/Shaharia-Ahmed-3/publication/355778898_A_Study_on_the_Solutions_of_Environment_Pollutions_and_Worker's_Health_Problems_Caused_by_Textile_Manufacturing_Operations/links/617d55dca767a03c14d1ae28/A-Study-on-the-Solutions-of-Environment-Pollutions-and-Workers-Health-Problems-Caused-by-Textile-Manufacturing-Operations.pdf

Patel, V., Chesmore, A., Legner, C. M., & Pandey, S. (2022). Trends in workplace wearable technologies and connected-worker solutions for next-generation occupational safety, health, and productivity. *Advanced Intelligent Systems*, *4*(1), 2100099.DOI: 10.1002/aisy.202100099

Prasad, K. D. V., & Mangipudi, M. R. (2021). A general linear model approach: development of psychological well-being, remote working, employee engagement, job satisfaction, scales, data analysis and reporting concerning to information technology sector. *Journal of Contemporary Issues in Business and Government Vol*, *27*(1). https://www.researchgate.net/profile/Kdv-Xxx/publication/349309799_A_General_Linear_Model_Approach_Development_Of_Psychological_Well-Being_Remote_Working_Employee_Engagement_Job_Satisfaction_Scales_Data_Analysis_And_Reporting_Concerning_To_Information_Technology_Sect/links/6029e872a6fdcc37a8290f5f/A

Universiti Utara Malaysia

-General-Linear-Model-Approach-Development-Of-Psychological-Well-Being-Remote-Working-Employee-Engagement-Job-Satisfaction-Scales-Data-Analysis-And-Reporting-Concerning-To-Information-Technology.pdf

Ran, L., Chen, X., Wang, Y., Wu, W., Zhang, L., & Tan, X. (2020). Risk factors of healthcare workers with coronavirus disease 2019: a retrospective cohort study in a designated hospital of Wuhan in China. *Clinical Infectious Diseases*, *71*(16), 2218-2221.https://static1.squarespace.com/static/54ebbf42e4b0c686e91e4f76/t/5e97f4e535894f7f72133819/1587016935615/Ran-2020-Risk+Factors+of+Healthcare+Workers+wi.pdf

Ray, T. K., & Pana-Cryan, R. (2021). Work flexibility and work-related well-being. *International journal of environmental research and public health*, *18*(6), 3254.https://www.mdpi.com/1660-4601/18/6/3254

Riaz, S. (2023). Empowering Future Nurses: Overcoming Challenges and Embracing the Benefits of Research in Nursing Education.https://d1wqtxts1xzle7.cloudfront.net/101410631/906-libre.pdf?1682289674=&response-content-disposition=inline%3B+filename%3DEmpowering_Future_Nurses_Overcoming_Chal.pdf&Expires=1707982409&Signature=IWyLS5kZk3tboodM8p0FvUwWGyog4-kf-myZqoWQ7kNERwk42sZI7dzGyMVAWhgfiwx8QoyJUIQE3Um09lTvpCrKkXK3JwnD-tLB67lBszRkfJZ52QE6Xx4xDuTvn4UQ69Yl3RA-4QwLTWQ7~BM6WE2OPEgj37loeTiX6Cxs8zkiinYJNTevvNzoQ8BAhCHBwD5hYBfh4YZxEbxhCSs9RCMwEptbR0-v~XindD76lhHsEfZLkdcTzWRUoUFDSK0Nb8MKOCoP2shksbNvypEupdXC1hrLCJ8VlJp0onvtlH0o~Koc-TYHmimMOkq-jm3~IwajZXzlrjwZKIk~SsJf0Q__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA

Rodríguez-Sánchez, J. L., González-Torres, T., Montero-Navarro, A., & Gallego-Losada, R. (2020). Investing time and resources for work–life balance: The effect on talent retention. *International journal of environmental research and public health*, *17*(6), 1920.https://doi.org/10.3390/ijerph17061920

Universiti Utara Malaysia

Rojek, I., Piechowski, M., & Mikołajewski, D. (2022). An Artificial Intelligence Approach for Improving Maintenance to Supervise Machine Failures and Support Their Repair. *Applied Sciences*, *13*(8), 4971. https://doi.org/10.3390/app13084971

Sandberg, E., Oghazi, P., Chirumalla, K., & Patel, P. C. (2022). Interactive research framework in logistics and supply chain management: Bridging the academic research and practitioner gap. *Technological Forecasting and Social Change*, *178*, 121563. https://doi.org/10.1016/j.techfore.2022.121563

Sasitharan, D., Lazim, H. M., Lamsali, H., Iteng, R., & Osman, W. N. (2020). The impact of preventive maintenance practices on malaysian manufacturing performance. *International Journal of Supply Chain Management*.

Satria, T., Indrayanto, A., & Najmudin, N. (2020). Strategic Study: The Role of Condition-Based Maintenance and Preventive Maintenance of Electrical Reliability. *Sustainable Competitive Advantage (SCA)*, *10*(1), 25-30.https://dsgate.uum.edu.my/jspui/bitstream/20.500.12793/4981/1/2-s2.0-85087766196.pdf

Sok, J., Borges, J. R., Schmidt, P., & Ajzen, I. (2021). Farmer behaviour as reasoned action: a critical review of research with the theory of planned behaviour. *Journal of Agricultural Economics*, *72*(2), 388-412.doi: 10.1111/1477-9552.12408

Sugiarti, E. (2022). The Influence of Training, Work Environment and Career Development on Work Motivation That Has an Impact on Employee Performance at PT. Suryamas Elsindo Primatama In West Jakarta. *International Journal of Artificial Intelligence Research*, *6*(1), 1-11.https://download.garuda.kemdikbud.go.id/article.php?article=2745096&val=10290&title=The%20Influence%20of%20Training%20Work%20Environment%20and%20Career%20Development%20on%20Work%20Motivation%20That%20Has%20an%20Impact%20on%20Employee%20Performance%20at%20PT%20Suryamas%20Elsindo%20Primatama%20In%20West%20Jakarta

Svystunova, L., Muratova, Y., Fortwengel, J., & Edwards, T. (2023). Multinational Corporations' Interactions with Host Institutions: Taking Stock and Moving Forward. *Management International Review*, 1-31.https://doi.org/10.1007/s11575-023-00525-1

Tanveer, A., Zeng, S., Irfan, M., & Peng, R. (2021). Do perceived risk, perception of self-efficacy, and openness to technology matter for solar PV adoption? An application of the extended theory of planned behavior. *Energies*, *14*(16), 5008.

Trading Economics. (2023) Malaysia GDP From Manufacturing. https://tradingeconomics.com/malaysia/gdp-from-manufacturing

Usman, H. (2021). Job satisfaction and employee engagement of Finnish teachers: Remote working during COVID-19. https://www.theseus.fi/bitstream/handle/10024/511922/Usman_Hira.pdf?sequence=2

Van Zoonen, W., & Sivunen, A. E. (2022). The impact of remote work and mediated communication frequency on isolation and psychological distress. *European Journal of Work and Organizational Psychology*, *31*(4), 610-621.https://www.tandfonline.com/doi/pdf/10.1080/1359432X.2021.2002299

Voinea, G., Gîrbacia, F., Duguleană, M., Boboc, R. G., & Gheorghe, C. (2022). Mapping the Emergent Trends in Industrial Augmented Reality. *Electronics*, *12*(7), 1719. https://doi.org/10.3390/electronics12071719

Wang, N., Ren, S., Liu, Y., Yang, M., Wang, J., & Huisingh, D. (2020). An active preventive maintenance approach of complex equipment based on a novel product-service system operation mode. *Journal of Cleaner Production*, *277*, 123365. https://doi.org/10.1016/j.jclepro.2020.123365

Wellsandt, S., Klein, K., Hribernik, K., Lewandowski, M., Bousdekis, A., Mentzas, G., & Thoben, K. (2021). Hybrid-augmented intelligence in predictive maintenance with digital intelligent assistants. *Annual Reviews in Control*, *53*, 382-390. https://doi.org/10.1016/j.arcontrol.2022.04.001

Xu, W., & Zammit, K. (2020). Applying Thematic Analysis to Education: A Hybrid Approach to Interpreting Data in Practitioner Research. *International Journal of Qualitative Methods*. https://doi.org/10.1177/1609406920918810

Yadav, G., Luthra, S., Huisingh, D., Mangla, S. K., Narkhede, B. E., & Liu, Y. (2020). Development of a lean manufacturing framework to enhance its adoption within manufacturing

Universiti Utara Malaysia

companies in developing economies. *Journal of Cleaner Production*, *245*, 118726.DOI: https://doi.org/10.1016/j.jclepro.2019.118726

Yang, F., Di, N., Guo, W. W., Ding, W. B., Jia, N., Zhang, H., ... & Yin, Y. (2023). The prevalence and risk factors of work related musculoskeletal disorders among electronics manufacturing workers: a cross-sectional analytical study in China. *BMC Public Health*, *23*(1), 10. https://doi.org/10.1186/s12889-022-14952-6

Yuriev, A., Dahmen, M., Paillé, P., Boiral, O., & Guillaumie, L. (2020). Pro-environmental behaviors through the lens of the theory of planned behavior: A scoping review. *Resources, Conservation and Recycling*, *155*, 104660.https://doi.org/10.1016/j.resconrec.2019.104660

Questionnaire resources

IV

De Koeijer, R., Paauwe, J., Huijsman, R. and Strating, M., 2022. Examining of the effect of HRM in mitigating negative effects of LM&SS on employee well-being in health care. *International Journal of Lean Six Sigma*, *13*(1), pp.67-100.

Siegel, A., Hoge, A.C., Ehmann, A.T., Martus, P. and Rieger, M.A., 2021. Attitudes of company executives toward a comprehensive workplace health management—results of an exploratory cross-sectional study in Germany. *International Journal of Environmental Research and Public Health*, *18*(21), p.11475.

Roma, P., Monaro, M., Muzi, L., Colasanti, M., Ricci, E., Biondi, S., Napoli, C., Ferracuti, S. and Mazza, C., 2020. How to improve compliance with protective health measures during the COVID-19 outbreak: testing a moderated mediation model and machine learning algorithms. *International journal of environmental research and public health*, *17*(19), p.7252.

DV

Teng, X., Wu, Z. and Yang, F., 2022. Research on the relationship between digital transformation and performance of SMEs. *Sustainability*, *14*(10), p.6012.

Appendix 1

Pusat Pengajian Pengurusan Perniagaan
SCHOOL OF BUSINESS MANAGEMENT
Universiti Utara Malaysia

SURVEY QUESTIONNAIRE

Dear respected respondents,

I am student Master of Science Management, Universiti Utara Malaysia (UUM SINTOK) is conducting a study on "EMPLOYEE INTENTION TO PARTICIPATE IN PREVENTIVE MAINTENANCE AMONG MANUFACTURING IN MALAYSIA". The study aims to identify the factor that influence on employee intention to partipate. This questionnaire is divided into Five (5) sections: Section A(Demographic Information of the respondent), Section B (Remote work adoption), Section C (Employee wellbeing), Section D (Work flexibility), SectionE (Intention to preventive).

I hope you will be able to assist by answering all the enclosed questionnaires. All responses given by the respondent will be classified as CONFIDENTIAL and will beused for academic purposes. Please answer ALL questions by fulfilling the appropriate boxes. Your cooperation and contribution for this survey is highly appreciated. Please return the completed questionnaire at your earliest convenience. Thank you for spending your time and cooperation.

Should you have any queries, do

contact me:

Mavitra Sethuraman

Master of Science (Management)

UUM

Appendix 1: Questionnaire

The questionnaires have been formulated based on the research objectives

SECTION A: DEMOGRAPHIC
SEKSYEN A: DEMOGRAFIK

Please tick (√) where is applicable */ Sila tandakan (√) pada yang berkenaan*

1. **Gender /** *Jantina*:
   - ☐ Male / *Lelaki*
   - ☐ Female / *Perempuan*
2. **Age /** *Umur*:
   - ☐ 17-24
   - ☐ 25-34
   - ☐ 35-42
   - ☐ 43-48
3. **Educational qualification/** *Kelayakan pendidikan*:
   - ☐ Upper secondary
   - ☐ Undergraduate
   - ☐ Graduate
   - ☐ Post-graduate
4. **Profession /** *Profesion*:
   - ☐ Professional
   - ☐ Non-professional

Universiti Utara Malaysia

SECTION B: MAIN SECTION
SEKSYEN B: BAHAGIAN UTAMA

From scale 1 – 5, please indicate your degree of agreement or disagreement on the following statement by circling the appropriate column / Dari skala 1 – 5, sila nyatakan tahap persetujuan atau ketidaksetujuan anda pada penyataan berikut dengan membulatkan ruangan yang bersesuaian.

1	2	3	4	5
Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**

Remote work adoption / Penerimaan kerja jauh						
1	**Do you agree that working remotely causes less productivity?** Adakah anda bersetuju bahawa bekerja dari jauh menyebabkan kurang produktiviti?	**1**	**2**	**3**	**4**	**5**
2	**Do you believe that remote working causes less employee engagement?**					

	Adakah anda percaya bahawa kerja jauh menyebabkan kurang penglibatan pekerja?	**1**	**2**	**3**	**4**	**5**
3	**To what extent do you think that remote working affects job satisfaction adversely?** Sejauh manakah anda berpendapat bahawa kerja jauh menjejaskan kepuasan kerja dengan buruk?.	**1**	**2**	**3**	**4**	**5**
4	**Do you agree that remote working has many challenges?** Adakah anda bersetuju bahawa kerja jauh mempunyai banyak cabaran?	**1**	**2**	**3**	**4**	**5**
5	**Do you agree that remote working affects the employee performance?** Adakah anda bersetuju bahawa kerja jauh menjejaskan prestasi pekerja?	**1**	**2**	**3**	**4**	**5**
	Employee wellbeing / *Kesejahteraan pekerja*					
6	**In your opinion, is work-life perfectly balanced in remote working?** Pada pendapat anda, adakah kehidupan kerja seimbang dengan sempurna dalam kerja jauh?	**1**	**2**	**3**	**4**	**5**
7	**To what extent do you believe that employees feel burnout in remote working?** Sejauh manakah anda percaya bahawa pekerja berasa keletihan dalam kerja jauh?	**1**	**2**	**3**	**4**	**5**
8	**Do you agree that remote working causes a decrease in the employee retention rate?** Adakah anda bersetuju bahawa kerja jauh menyebabkan penurunan kadar pengekalan pekerja?					
9	**Do you agree that employee wellbeing affects the job performance?** Adakah anda bersetuju bahawa kesejahteraan pekerja mempengaruhi prestasi kerja?	**1**	**2**	**3**	**4**	**5**
10	**Do you agree that employee wellbeing enhances employee engagement within the organisation?** Adakah anda bersetuju bahawa kesejahteraan pekerja meningkatkan penglibatan pekerja dalam organisasi?	**1**	**2**	**3**	**4**	**5**
	Work flexibility / *Fleksibiliti kerja*					
11	**Do you believe that employees leave their jobs due to the high pressure of remote working?** Adakah anda percaya bahawa pekerja meninggalkan pekerjaan mereka kerana tekanan kerja jauh yang tinggi?	**1**	**2**	**3**	**4**	**5**
12	**Do you think that in remote working processes communication gaps affect job performance?** Adakah anda berpendapat bahawa dalam proses kerja jauh jurang komunikasi menjejaskan prestasi kerja?.	**1**	**2**	**3**	**4**	**5**
13	**In your opinion, to what extent do you believe that digital tools provide support the remote workers?** Pada pendapat anda, sejauh manakah anda percaya bahawa alat digital memberikan sokongan kepada pekerja jauh?	**1**	**2**	**3**	**4**	**5**
14	**Do you agree that work flexibility improves employees' performance within the organization?**		**1**	**2**	**3**	**4**

Universiti Utara Malaysia

	Adakah anda bersetuju bahawa fleksibiliti kerja meningkatkan prestasi pekerja dalam organisasi?					
15	**Do you agree that work flexibility increase employee engagement?** Adakah anda bersetuju bahawa fleksibiliti kerja meningkatkan penglibatan pekerja?	**1**	**2**	**3**	**4**	
	Intention to prevention / *Niat untuk pencegahan*					
16	**Do you feel that integration of digital technologies enhances the performances of the employees?** Adakah anda merasakan bahawa penyepaduan teknologi digital meningkatkan prestasi pekerja?	**1**	**2**	**3**	**4**	**5**
17	**Do you feel a lack of collaboration with your teammates?** Adakah anda merasakan kekurangan kerjasama dengan rakan sepasukan anda?	**1**	**2**	**3**	**4**	**5**
18	**How often do you think that working processes need to be improved?** Berapa kerapkah anda berpendapat bahawa proses kerja perlu diperbaiki?.	**1**	**2**	**3**	**4**	**5**
19	**Do you agree that effective work within the organization increase the participation in preventive maintenance?** Adakah anda bersetuju bahawa kerja yang berkesan dalam organisasi meningkatkan penyertaan dalam penyelenggaraan pencegahan?	**1**	**2**	**3**	**4**	**5**
20	**Do you agree that poor employee wellbeing restricts from participation in preventive maintenance?** Adakah anda bersetuju bahawa kesejahteraan pekerja yang lemah menyekat daripada penyertaan dalam penyelenggaraan pencegahan?	**1**	**2**	**3**	**4**	**5**

Universiti Utara Malaysia

APPENDIX 2 : CORRELATION ANALYIS

. Correlation analysis

Correlations

		Remote_work_adoption	Employee_wellbeing	Work_flexibility	Intention_to_prevention
Remote_work_adoption	Pearson Correlation	1	.656**	.816**	.688**
	Sig. (2-tailed)		.000	.000	.000
	N	100	100	100	100
Employee_wellbeing	Pearson Correlation	.656**	1	.542**	.954**
	Sig. (2-tailed)	.000		.000	.000
	N	100	100	100	100
Work_flexibility	Pearson Correlation	.816**	.542**	1	.642**
	Sig. (2-tailed)	.000	.000		.000
	N	100	100	100	100

Universiti Utara Malaysia

Intention_to_prevention	Pearson Correlation	.688**	.954**	.642**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	100	100	100	100
**. Correlation is significant at the 0.01 level (2-tailed).					

Reliability analysis

Universiti Utara Malaysia

Reliability Statistics	
Cronbach's Alpha	N of Items
.777	5

Table 4.10: Reliability for remote work adaption

(Source: SPSS)

Reliability Statistics	
Cronbach's Alpha	**N of Items**
.804	**5**

Table 4.11: Reliability for employee wellbeing

(Source: SPSS)

Reliability Statistics	
Cronbach's Alpha	**N of Items**
.728	**5**

Table 4.12: Reliability for work flexibility

(Source: SPSS)

Reliability Statistics	
Cronbach's Alpha	**N of Items**
.760	**5**

Universiti Utara Malaysia