INTENTION OF UNIVERSITY STAFF INVOLVEMENT IN PREVENTIVE MAINTENANCE PROGRAMME: AN ANALYSIS BASED ON THEORY OF PLANNED BEHAVIOR

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ABSTRAK

Tujuan kajian ini adalah untuk membuktikan hasrat penglibatan pekerja dan kecenderungan niat pekerja untuk terlibat secara langsung atau tidak langsung dalam program penyelenggaran pencegahan yang dianjurkan oleh organisasi. Selaras dengan penyelidikan terdahulu, kertas ini meneroka pengaruh untuk terlibat dengan menggunakan teori gelagat terancang dan mengamalkan dasar penyelenggaraan pencegahan di tempat kerja. Ia akan membuktikan sama ada terdapat pengaruh tingkah laku di dalam program penyelenggaraan pencegahan di dalam organisasi atau tidak. Hasil kajian menunjukkan, pengaruh untuk terlibat dan tingkah laku antara individu dalam program penyelenggaraan pencegahan wujud di kalangan staf Universiti. Lebih daripada 80 peratus (%) daripada staf pentadbiran yang memberi tindak balas dalam program penyelenggaraan pencegahan dan ingin terlibat dalam program yang diperkenalkan oleh Universiti. Keputusan ini juga menunjukkan bahawa terdapat persamaan dan hubungan positif dalam setiap tingkah laku individu terhadap program penyelenggaraan pencegahan yang diadakan. Secara keseluruhannya, keputusan adalah konsisten dengan keterlibatan dalam program penyelenggaraan pencegahan tersebut. Kajian ini juga mendokumenkan kesesuaian mekanisme untuk terlibat di sebalik tingkah laku dan oleh itu, ia akan menambah pengetahuan semasa kewujudan tingkah laku di kalangan staf universiti.

Katakunci: Program penyelenggaraan pencegahan; Penglibatan staf; Teori gelagat terancang

ABSTRACT

The purpose of this study was to prove staff involvement and desire intention tendency for staff involved directly or indirectly in the preventive maintenance programed organize by the organization. In line with previous research, this paper explores the influence to get involved by using the theory of planned behavior and practice preventive maintenance policy in the workplace. It will prove whether there is influence behavior in preventive maintenance in the organization or not. The results show, to get involved and influence behavior between individual in preventive maintenance program exists among staff of the University. More than 80 percent (%) of the administrative staff that provide the response programmed of preventive maintenance and want to get involved in the program which was introduced by the University. This decision also shows that there are similarities and positive relationships in each individual behavior towards preventive maintenance program. Overall, the results are consistent with the preventive maintenance engagement. This study also documented the appropriateness of mechanisms to engage behind the behavior and therefore, it will add to the current knowledge of the existence of behaviors among university staff.

Keywords: Preventive maintenance program; Staff involvement; Theory of planned behavior

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LIST OF ABBREVIATIONS

PM	**Preventive Maintenance**
TPB	**Theory Planned Behavior**
TRA	**Theory Reasoned Action**
TPM	**Total Production Maintenance**
RM	**Reactive maintenance**
CBM	**Condition-based maintenance**
UUM	**Universiti Utara Malaysia**
CM	**Corrective maintenance**
ATT	**Attitude**
SN	**Subjective Norm**
PBC	**Perceived Behavior Control**
PCA	**Principal Component Analysis**
JPP	**Development and maintenance Department**
CMMIS	**Computerized Maintenance Management Information System**

CHAPTER 1

INTRODUCTION

1.1 Introduction

Research dealing with various aspects of the theory of planned behaviour (Ajzen, 1985, 1987) shall be reviewed, and some unresolved issues will also be discussed. In broad terms, the theory has been found to be well supported by empirical evidence. Intentions to perform behaviours of different kinds can be predicted with high accuracy from attitudes toward the behaviour, subjective norms, and perceived behavioural control; and these intentions, together with perceptions of behavioural control, account for considerable variance in actual behaviour. Attitudes, subjective norms, and perceived behavioural control are shown to be related to appropriate sets of salient behavioural, normative, and control beliefs about the behaviour, but the exact nature of these relations is still uncertain.

Preventive maintenance is planned maintenance of plant and equipment that is designed to improved equipment life and avoids any unplanned maintenance activity. Sometimes, maintenance concepts like total productive maintenance (TPM) or reliability-centred maintenance (RCM). The era of total productive maintenance (TPM) in the 1970s focused on preventive

maintenance efficiency. The emphasis is on individuals and total employee involvement through a comprehensive system (Nakajima, 1989). TPM shows an important aspect of employee involvement from all levels, teamwork, and continuous improvement activities. Preventive maintenance is divided into two broad categories: (1) buildings and structures and (2) utilities. Preventive maintenance programme would prevent equipment failure before it occurs. The development of preventive maintenance programme is a response to the rapid increase of safety care costs in the workplace, reducing waste, and minimising energy consumption (5%). This type of programmes has become common place in the business world; organisations have to develop ways to encourage and promote preventive maintenance programmes amongst their employees.

Caterpillar is improving their current preventive maintenance programme, addressing issues such as higher incidence of lack of involvement amongst their staff and providing staff involvement in preventive maintenance programmes. Much of the employee involvement research has centred on employee involvement as the antecedent to outcomes such as job satisfaction, cooperation, retention (MacDuffie et al., 1996; Scott et al., 2003), quality of work life (Hodson, 2002), and generalisation of training. Less progress has been made in establishing how and why workers decide to get involved (Glew et al., 1995).

1.2 Background of the Study

A major breakthrough for managing maintenance was preventive maintenance (Nakajima, 1988). Preventive maintenance has been more popular in principle than practice over the years. The focus has been on keeping the equipment well maintained to extend its expected life and avoid future repair costs, but less clear is the understanding of the actual relationship between cost of preventive maintenance and behaviour such preventive maintenance programmes can be expected to deliver. This dissertation describes a process of assessing the value of preventive maintenance programmes by analysing them using the theory of planned behaviour.

Preventive maintenance covers all actions carried out on a planned, periodic, and specific schedule to keep an item/equipment in working condition through the process of checking and reconditioning. Preventive maintenance is a cost saving, sensible practice now accepted by organisation and most industries. Many theses could be developed to demonstrate the derived benefits and impact on organisations, like public universities. Generally, the objective of maintenance is to reduce the adverse effects of breakdown and to maximise the availability of facilities at a minimum cost (Lofsten, 1999). It aims to optimise the availability and reliability of production equipment, and maintain its operability at an acceptable cost level (Coetzee, 1998). Setting the interval in preventive maintenance approach at 80% of preventive maintenance costs are spent on activities with a frequency

30 days or less and 30% to 40% of preventive maintenance costs are spent on assets with negligible failure impact.

Universiti Utara Malaysia (UUM), which was officially established on 16 February 1984, is the sixth Malaysian public university. It is the only university that was set up to specialise solely in management education from the very beginning of its establishment. UUM has evolved into an open campus where outsiders and tourists are allowed the freedom to visit and utilise the various amenities within it. An area encompassing 107 hectares of forest has been developed into various facilities both to attract tourists to the northern region and to satisfy the recreational needs of the members of the campus community. Among these facilities are a picnic area, a nine-hole golf course, a go-kart circuit, a shooting and archery range, an equestrian site, and many others that are fast gaining popularity among tourists and the members of the campus community alike.

Development and maintenance Department (JPP), Universiti Utara Malaysia (UUM) is the technical department at UUM which form the backbone of a public university in Malaysia. Development and maintenance Department (JPP) acts as the lead agency in the implementation of development projects and maintenance throughout campus. A Development and maintenance Department (JPP) objective is to become an efficient and effective organization to meet the vision, mission and objectives to meet the needs of the University. Development and maintenance Department (JPP) play a role as a catalyst for the development of Universiti Utara Malaysia. This department

is responsible for the development and maintenance of academic buildings, halls and lecture rooms, administrative buildings, residential colleges and many others as well as providing infrastructure and recreational facilities around the campus.

Development and maintenance Department (JPP) has several units consist unit of electrical, electronic, mechanical and civil. UUM staff can report any damage at the time when the damage occurred. Examples of the damage that has always experienced by each building is a roof leak, the blackout, central air-Cond is not function and many others. According to the report Computerised Maintenance Management Information System Unit (CMMIS) issued by Development and maintenance Department (JPP) related complaints received in 2014 as a whole was 21,813 complaints, while complaints were ready to maintain overall was 21,597 complaints. This also shows that the complaint was not prepared for the year is maintained only 216 complaints. Overall, the percentage of complaints that are ready to be carried out each month by Development and maintenance Department (JPP) in 2014 is 99.01%. According this report, clearly show that the staff involvement in the preventive maintenance program is high even though most of the complaints made were after something happens. The maintenance carried out at predetermined intervals or according to prescribed criteria and intended to reduce the probability of failure or the degradation of the functioning and the effects limited.

The public university in the survey practises extensive preventive maintenance, which is accomplished using teams organised by task types. For example, a team of technicians walks the underground utility tunnels daily looking for breakdowns and potential problems, such as leaking water or steam pipes. Building inspections are conducted on 3 to 5 year intervals with a team consisting of a general inspector, a mechanical inspector, and an electrical inspector. The team reports about problems relating primarily to health and safety, to the various department heads responsible for rectifying the problems. Based on data, appropriate repair/replace action shall be taken.

Preventive maintenance is performed to retain equipment in a satisfactory operational condition, where it is divided into time-based and condition-based maintenance. Time-based maintenance is performed after fixed time intervals, whether a problem is apparent or not, in order to avoid failure of items during operation. Time-based maintenance incurs a large cost for the user in maintaining the required level of reliability, because the majority of items are replaced prematurely despite still having useful lives remaining. Condition-based maintenance is applicable to components which tend to deteriorate rapidly with time. However, it is usually not cost effective to monitor the condition of each component: some will be relatively inaccessible for monitoring. Interval periods for specifying preventive maintenance frequencies would be monthly, quarterly (three months), semi-annually (six months), and annually.

Staff involvement is defined here as either any collective or workgroup / individual arrangements through which managers negotiate, consult, and inform employee representatives or employees directly on matters in which both have interests. Determining a precise definition of involvement has proven to be difficult. It has different meanings for many researchers, as well as for preventive maintenance programmes, with no real clear delineation of what “involvement" actually represents. Barling et al. (1992) also argued that the definition of involvement should extend beyond behaviour and include beliefs or values. Arguably, beliefs or values may impact on behaviour, but may be very distinct from the construct.

The willingness to get involved and the resource mobilisation theory are both based on the notion that staff get involved in activities when they know about opportunities to be involved, they are capable of participating, and they are willing to be involved. In general, expectancy value theories consider the individual action to be related to the person expectations and subjective value for the consequences that are perceived to follow the actions (Feather, 1982). By adapting an expectancy-value theory to get involved, cognitive factors gain more importance. This theory was based on the resource mobilisation theory, which deals with involvement in preventive maintenance.

Staff involvement in preventive maintenance programmes had received considerable attention. Although involvement research was revived briefly in the late 1970s (Anderson, 1978; Anderson, 1979; Glick, Mirvis, & Harder, 1977), there has been a marked resurgence in staff involvement research in the

1990s. The success of a preventive maintenance programme depends on staff involvement, where the better value of the minimum cost can be achieved because of the waste reduction and improvement in staff knowledge productivity. When an organisation decides to implement a preventive maintenance programme, it often assumes that simply communicating the reason for the enactment of the programme is sufficient to convince staff to get involved.

Staff involvement, simply stated, is getting active involvement from the staff. Grawitch and Gottschalk et al. (2006) discussed research conducted by Freeman and Rodgers, in which they found significant differences between staff who get involved in organisational activities and staff who do not. Specifically, participating staff reported higher levels of loyalty, increased job satisfaction, a higher commitment to their organisation, and a better opinion of management than staff who did not get involved in any programme.

A major concern in any organisation is finding the right work-life balance for staff. Most staff would prefer to spend their free time on activities that are not work-related. When staff members work overtime hours or are in a stressful environment, it can have a significant impact on their work-life balance. A simple solution to this problem is flexi-time, which allows staff to work non-standard hours, which can lead to enhanced involvement. Providing a safe work environment can also exemplify how valuable staff members are to the organisation. Morale can be negatively impacted if staff members feel that the organisation has them working in an unsafe environment, and there is

no recourse on such matters. The recognition of the staff efforts to increases staff involvement is important. An employee is more likely to become more involved if the employee feels the organisation appreciates them (Grawitch, & Gottschalk et al., 2006). These practices taken individually can inspire staff involvement, but taken together can provide staff with what they need to succeed.

The current study examined what factors affect the behaviour of staff involvement at the UUM regarding how the organisation motivates their staff and encourages their involvement in the preventive maintenance programmes. Gates and Brehm (2010) also encountered other considerations when they examined the process each organisation used when implementing staff involvement. For instance, one aspect of the programme involved changing the behaviour items available in the action, as well as changing the environment of the organisation.

Staff involvement was also differentially associated with predictors in the theory of planned behaviour such as attitude, subjective norm (SN) and perceived behavioural control (PBC). For example, attitudes to get involved in preventive maintenance programmes were associated with active staff administration involvement, but not with staff involvement. It stands to reason that a particular predictor might be theoretically and empirically associated with one type of programme, but not with another (McShane, 1986a). Each programme represents different kinds of behaviour and may require different explanations. Social scientists have recommended that greater attention should

be directed toward behavioural outcomes which are associated with specific staff attitudes since they explain much more about the employee than had been previously thought (Fullagar & Barling, 1987; Fullagar & Barling, 1989). Intentions to perform behaviour are conceptualised as the most immediate and important predictor of behavioural performance, including the effects of attitudes, subjective norms and perceived behavioural control (Ajzen, 1991). Behavioural intentions are believed to summarise staff attitude to perform behaviour. Ajzen (1991) stated intentions are assumed to capture the attitude factors that influence a behaviour, where they are indicators of how hard people are willing to try, of how much effort they are planning to exert, in order to perform the behaviour.

A distinction can be made in the motivational concept of implementation intentions. According to Gollwitzer (1990) and Heckhausen (1991), the motivational concept involves a subjective evaluation of costs and benefits of performing the behaviour which culminates in the development of a goal intention or decision to perform the behaviour. This study supported the view that implementation intention increases the likelihood of a goal intention being enacted. Implementation intention is likely to be particularly effective in the context of behaviours or goals which are complex or where the timing and location for action are uncertain. Bargh (1990) pointed out that intention which can be acted upon in a variety of different ways, or intentions which are poorly specified are unlikely to result in action initiation. Implementation intention can provide a simple and effective solution to these problems.

1.3 Problem Statement

Staff involvement in preventive maintenance programme is a concern for any organisation that decides to implement due to various reasons, such as to minimise cost, losses, reduce time waste, and get staff to be more effective and proactive. In addition, how to get maximum staff involvement in preventive maintenance programmes is paramount because each organisation faces different problems in this matter. However, this study investigated the extent of staff involvement in preventive maintenance programme in UUM. Moreover, at present, it is difficult to attract staff involvement to engage in preventive maintenance program because there is no awareness and less information about advantages of the programme. Based on the theory of planned behaviour, the extent of staff involvement in preventive maintenance programme can be identified, for example when the possibility of damage to surrounding occupied buildings by early detection can definitely save the building from further damage. Work environment in each organization usually involves building and facilities such as office space, toilets, meeting rooms, and others require the staff involvement for the efficient and consistent maintenance.

The theory of planned behaviour is appropriate to put as their main intention by comparing attitudes, subjective norms, and perceived behavioural control. The relationship exists to be either positive or negative in the theory of planned behaviour to the preventive maintenance programme when staff is

involved. The organisation needs to attract more staff to engage in the preventive maintenance programme.

This study is about intention, explained based on the theory of planned behaviour. The purpose is to explore the intention of university staff involvement in the preventive maintenance programme offered at UUM, and what factors influence the staff would consider in order to increase their involvement. The outcomes of this study will help determine the current staff involvement level in the preventive maintenance programme, identify reasons using theory of planned behaviour for not having higher involvement rates, and suggest what actions the organisation can take in order to achieve a higher level of involvement amongst its staff administration. The present study was designed to show the intention of staff involvement in a preventive maintenance programme. Preventive maintenance reduces the amount of reactive maintenance to a level that allows other practices in the maintenance process to be cost effective with a ratio of more than 80% proactive maintenance to less than 20% reactive maintenance.

Since the 1950s, numerous studies were conducted in order to gain a better understanding of this problem (Anderson, 1979; Kelloway & Barling, 1993; Kolchin & Hyclak, 1984; Perline & Lorenz, 1970; Spinrad, 1960; Sayles & Strauss, 1952). Understanding the attitude, subjective norm, and perceived behavioural control of active staff involvement is an important question that needs to be addressed so that the goals of the preventive maintenance programme can be achieved.

To determine the extent of staff involvement in preventive maintenance program is necessary to ensure that all maintenance staff have the technical skills to understand and maintain the plant and equipment are able to communicate intelligently with other departments within the organisation about pertinent matters, and can be able to work in teams or as a group. In addition, the staff involvement affected by the item contained in the theory planned behaviour like attitude, subjective norms, perceived behavioural control, intention and actual behaviour. This shows the relevance of staff involvement relations based on theory planned behaviour. To appreciate the benefits, which could result from the implementation of a wise maintenance policy, it is important to appreciate the various costs involved.

1.4 Research Question

The research questions for this study include the following:

i. What is the extent of university staff involvement in the preventive maintenance programme?
ii. What is the relationship among attitude, subjective norm, and perceived behaviour control on the intention of staff involvement in the preventive maintenance programme?
iii. What is the relationship between intention of staff involvement in preventive maintenance and actual staff involvement in the preventive maintenance programme?

1.5 Research Objectives

Generally, this study observed the behaviour in the preventive maintenance programme in this organisation. The specific objectives of this study include:

1. to study the extent of university staff involvement in preventive maintenance programme,
2. to investigate the relationship among subjective norm, attitude, and perceived behaviour control on the intention of staff involvement in preventive maintenance programme, and
3. to examine the relationship between intention and actual staff involvement in preventive maintenance programme.

The overall objective of this dissertation was to ultimately gain an understanding of factors that might impact on a decision of staff involvement, or otherwise, in their programmes, as well as to gain an understanding of the type of preventive maintenance programme an organisation might perform successfully. To achieve these intended objectives, the theory of planned behaviour will be used as the theoretical framework for this study.

1.6 Significance of the Study

This study is very significant because it provides answers for UUM to encourage staff involvement in preventive maintenance programmes, to explore the benefits to the staff and the organisation (especially UUM) about what involvement provides, and what challenges discourage staff involvement

in the programmes. The staff involvement in preventive maintenance programme had a positive effect on the present and future. This programme provides an opportunity for staff to detect faults that existed earlier in the environment. This will impact the organization in which organizations can reduce maintenance costs.

UUM is an education organisation, thus this research could help others trying to implement a new preventive maintenance programme or simply increase staff involvement on an existing programme. Each organisation has different and unique challenges, but organisations in similar education settings may face the same issues regarding staff involvement in their preventive maintenance programme. According to Ahmad and Kamaruddin (2012), has been introduced as an alternative approach to enhance the effectiveness of preventive maintenance strategy to increase staff involvement.

In addition, UUM can benefit substantially by discovering what factors will motivate staff involvement actively in a preventive maintenance programme. The organisation is currently trying to gain better involvement and this study can help them in that effort. As their environment workplace becomes safe and more facilities are being built, the potential exists for lowering maintenance costs, thereby increasing the high knowledge from the preventive maintenance programme. By discovering challenges of staff involvement in preventive maintenance programme within the organisation, this dissertation can help the staff by targeting programmes that will be beneficial to them. At its core, the TPB is concerned with the prediction of

intentions as well as attitudes, subjective norms and perceptions of behavioural control are explaining behavioural intentions (Ajzen, 2011).

This research used quantitative research methods for data collection. The quantitative data helped to determine what the barriers are to enhancing staff involvement and what can UUM do to increase involvement rates. The respondents for this study were all from various departments in UUM. This research reviewed data, as well as by a colleague familiar with the preventive maintenance programme currently in place. Once the data were coded for themes, these themes were matched to the research questions. The study by Cooke and French (2011) nicely illustrates a related issue of attitudes, subjective norms and perceived behavioural control.

1.7 Scope and Limitation of the Study

This study covered the UUM preventive maintenance programmes. Randomly selected staff involvement for this study came from the administration, approximately 130 staff members. Each staff received a questionnaire to be involved in the study. The findings of this study could be used by other organisations that are looking at implementing a preventive maintenance programme or to find ways of increasing staff involvement in existing programmes. The challenges to be involved in this study may well be similar to other departments, not just in the maintenance department. The staff themselves may be a limitation in that their responses to questions may be less than truthful. The answers the respondents give could possibly be what they

believe. Often the staff members who are unaware are the hardest to get involved in a preventive maintenance programme.

The difficulty of finding data and other information arises when this study only used a sample focused on administrative staff of an education institution in 2015. Therefore, the results and findings are only representing this administration department and might not reflect the whole organisation. In this study, the academic staff members were not included because, for the academic staff, existing knowledge as a lecturer may cause them to be more knowledgeable about preventive maintenance programme.

1.8 Organization of the Thesis

The content of this study is organised into five (5) chapters. This chapter focuses on the background of staff involvement in preventive maintenance using the theory of planned behaviour. The next chapter provides a review of existing literature.

Chapter 2 will review in more detail the literature about the preventive maintenance programme using in theory of planned behaviour. The study found that an organisation may inform the staff about preventive maintenance issues such as staff participation, and cost, and benefit of preventive maintenance programme. Lack of participation and staff unawareness is always included as the true cost of programme to the organisation. Effective communication within the organisation provides the foundation that enables

the employee to understand the reasons behind the behaviour. Gates and Brehm's study substantiated the need for UUM to investigate ways to more effectively communicate about benefits of staff involvement in the preventive maintenance programme.

Chapter 3 discusses the methodologies applied in this study, where the determinant model and research hypotheses are elaborated. Data sources and descriptions of variables are also explained in this chapter.

Chapter 4 analyses the results and delivers the discussion on the descriptive findings of the preventive maintenance programme using the theory of planned behaviour and observes the determinant factors.

Last but not least, Chapter 5 contains the conclusions, recommendations, and implications of this study together with limitations and suggestions for future research.

1.9 Summary

With the population in the UUM becoming more aware and proactive, and the fact that preventive maintenance can minimise cost, employers have to find a way to motivate their staff to be involved in preventive maintenance. Offering preventive maintenance programme in battling the organisational expense in the long run is one such way. However, simply having a preventive maintenance programme in place does not guarantee involvement. Many

times, those who need it the most are also the least likely to be involved. Once the organisation understands why the staff members do not get involved in certain preventive maintenance programmes, it can then address these issues and concentrate on programmes in which the staff will want to be involved.

This study also asked UUM staff how to more effectively communicate the benefits of the programme, reasons they choose not to be involved in the preventive maintenance programme, what they view as benefits from involvement, and what incentives the organisation could offer to motivate them to be involved. With the results identified, the intention of university staff involvement in preventive maintenance could be because of less information and negative perception against preventive maintenance programme. This programme will help each staff adopt the theory of planned behaviour in making the preventative maintenance programme a success.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The purpose of this chapter is to examine previous research and the theoretical framework of the theory of planned behaviour. This literature review begins with a thorough description of the preventive maintenance programme for this study, and then discusses the concepts regarding behavioural intentions, attitudes, subjective norm, and perceived behavioural controls. These variables are all components of the theory and this dissertation explains intention of university staff involvement in preventive maintenance programmes.

The review of this literature concludes with the study's hypotheses. This literature review will provide background of staff involvement in preventive maintenance programmes. The use of the theory of planned behaviour in preventive maintenance programme is common among organisations that wish to improve the knowledge of their staff.

2.2 Theory of Planned Behaviour (TPB)

The theory of planned behaviour was designed to predict and explain human behaviour in a specific behaviour (Ajzen, 1991). This theory suggests that the intention of carrying out a behavior is influenced by the attitude toward the behaviour, subjective norms, and perceived behavioural control (Ajzen, 1991). In the area of preventive maintenance, the literature on this theory is difficult to find. As a general model, then it makes sense that this model is used in behavioural intention to explain staff involvement in preventive maintenance programmes.

The theory of planned behaviour "is an extension of the widely applied theory of reasoned action" (Conner, Povey, Sparks, James, & Shepherd, 2003, p. 76). Though the theory of planned behaviour is over 30 years old, yet it still has applications today and into the 21st century (Zint, 2002). The theory of planned behaviour, based on the theory of reasoned action, holds that intention is a determinant of behaviour. Attitude, perceived behavioural control, and subjective norms are functions of intentions (Zint, 2002; Conner et al., 2003).

The theory of planned behaviour has become the dominant social-psychological model for relating attitudes to behaviour (Conner et al., 2003). Incorporated into the TPB was the recognition that behaviour was not only determined by intentions, but also by an individual's actual of control over the behaviour, which was operationalized as a measure of perceived behavioural control (Hankins et al., 2000; Ajzen, 1988), namely the "belief as to how easy

or difficult performance of the behaviour is likely to be" as a predictive indicator of intention to act and behave. Thus, the path between perceived behavioural control and intention to act reflects an individual's perceived control of the behaviour, whereas the path between perceived behavioural control and behaviour reflects actual control over the behaviour (Ajzen, 1985; Zint, 2002, p. 827).

According to the TPB, there are three latent constructs that influence a person's intentions and behaviours. As Ajzen (1985) explained, these constructs are attitude, subjective norm, and perceived behavioural control. Ajzen and Driver (1991) stated that the theory "postulates that performance or non-performance of behaviour is a function of salient information, or beliefs, relevant to the behaviour. These salient beliefs are considered to be the prevailing determinants of a person's actions" (p. 186). The beliefs are behavioural (attitude), normative (social influences), and control (perceived behavioural control). To clarify, these beliefs are the underlying foundation of attitudes, subjective norm, and perceived behavioural control. These three constructs combine together to form a person's intentions, which ultimately should drive the actual behaviours.

The TPB ultimately seeks to predict and understand behaviours through a set of mediating relations. According to the theory, the most direct predictor of behaviours is behavioural intentions. Beliefs provide the ultimate foundation of intention but the effect of selected kinds of beliefs are mediated through attitude, subjective norm, and perceived behavioural control.

According to Ajzen (2002), these beliefs "are assumed to provide the cognitive and affective foundations for attitudes, subjective norms, and perceptions of behavioural control".

2.2.1 Attitude

Attitudes have been the subject of many researchers' interests. A person's attitude is a leading determinant that drives a person's intentions and behaviours. It has recently (2001) been generally agreed that attitudes represent a summary evaluation of a psychological object captured in such attribute dimensions as good-bad, harmful beneficial, pleasant-unpleasant, and likeable-dislikeable (Ajzen, 2001; Ajzen & Fishbein, 2000; Eagly & Chaiken, 1993; Petty et al., 1997) are compiled in a person's mind to aid in the formation of the attitude; hence, the perception drives the attitude.

Attitude is a person's general favourable or unfavourable feeling toward some stimulus objects (Fishbein & Ajzen, 1975). The set of salient beliefs that the individual holds about performing behaviour determines a person's attitude toward that behaviour. Attitude is the first and most important antecedent of behaviour intention (Albrecht & Carpenter, 1976). Initially, individuals hold positive and negative beliefs about performing a particular behaviour. Once an attitude is formed about an action, the attitude will lead to a behavioural intention in preparation for action. In other words, an individual will intend to perform or not based on his/her positive or

negative attitude about behaviour. Several studies showed that attitude is the best predictor of a behaviour and behavioural intention.

2.2.2 Subjective Norm

Within the TPB model, subjective norm refers to the social influence brought to bear on intention by others (Ajzen, 1991; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). Global subjective norm is a product of referents that influence one's intention, weighted by one's motivation to comply with those referents, concerning a particular behaviour (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). Ajzen and Driver (1991) described subjective norm as "the perceived expectations of important others" (p. 186). Fishbein and Ajzen (1975) described subjective norms as "the person's perception that most people who are important to him think he should or should not perform the behaviour in question" (p. 302).

A subjective norm refers to perceived social pressure to perform or not to perform the behaviour (Ajzen, 1991). It is assumed that an individual will intend to perform a certain behaviour when he/she perceives that significant others or groups think he/she should. Although participation in preventive maintenance programme is voluntary, the normative pressure from friends, management, professionals, or community organisations should have some impact on intention to participate in programme.

2.2.3 Perceived Behavioural Control

A person's perception of their control over the behaviour is another important determinant, many times referred to in the literature as perceived behavioural control (PBC). Perceived behavioural control "refers to the perceived ease or difficulty of performing the behaviour and it is assumed to reflect past experience as well as anticipated impediments and obstacles" (Ajzen, 1991, p. 188). A person can have a desire to achieve a behaviour, but the opportunity may not be within the power of that person. An example would be getting hired for a specific job. The person's intent is to get hired, but the decision requires the actions of one or more people (Ajzen, 2002). Trost, Saunders, and Ward (2002) referred to perceived behavioural control as an overall assessment of factors internal to the individual such as skills, ability, willpower, knowledge, and adequate planning as well as external factors such as social support, opportunity, and time. Some specific problems with perceived behavioural control are its nature and measurement.

The definition of PBC is the extent to which the person believes that he/she has control over internal or external factors that may facilitate or constrain behaviour (Ajzen, 1991). Ajzen (1991) also stated that people are not likely to form a strong intention to perform a behaviour if the individual believes that he/she does not have any resources or opportunities to do so, even if he/she holds positive attitudes toward the behaviour and believes that important others would approve of the behaviour.

Ajzen and Driver (1991) described perceived behavioural control as a set of beliefs that deal with staff involvement. These beliefs are known as control beliefs and are usually more effective than behavioural beliefs (Ajzen, 1991).These beliefs are obtained and based on a person's past experience, information obtained from a second or third party, the experiences of friends or acquaintances, and other factors which may increase or decrease the perceived difficulty in performing the behaviour (Ajzen & Driver, 1991). If all else is considered equal, a high level of perceived control should strengthen a person's intention to perform the behaviour, and increase effort and perseverance (Ajzen, 2002).

2.3 Preventive Maintenance Programme

Preventive maintenance programme can be called different names such as worksite safety promotion or safety and productivity management. The preventive maintenance programme can even be given a programme name itself but no matter what the term or programme name, the premise is the same: to address issues such as management, overall safety, and obesity control (Johnson & Denham, 2008). This preventive maintenance concept was introduced in 1951, which is a kind of physical check-up of equipment to prevent equipment breakdown and prolong equipment service life. TPM consolidates the preventive and predictive maintenance approaches with an emphasis on staff involvement. The preventive maintenance programme using theory planned behaviour can detect any abnormality amongst staff of the facility and building also supports the predictive maintenance principle.

Additionally, TPM integrates preventive maintenance, condition-based maintenance and predictive maintenance programmes as well.

A preventive maintenance (PM) system is critical to effective asset management. From inspection tasks designed to detect impending failures to lubrication and wear part replacement, PM system is the first line of defence against unplanned downtime and equipment failure. Preventive maintenance is the activity that replaces before it breaks down. Preventive maintenance involves the repair, replacement, and maintenance of equipment in order to avoid unexpected failure during use. The objective of any preventive maintenance programme is the minimisation of total cost of inspection and repair, and reduction of time waste, losses, and equipment downtime (measured in terms of lost production capacity or reduced product quality). Maintenance activities have been regarded as a necessary expense that belongs in the operating budget.

This study represents basic or fundamental research. The main purpose of such research is to generate more knowledge and understanding of the phenomena that occur and to build theories based on the results (Sekaran, 1992). The theory of planned behaviour provides a variable framework to explain the phenomena of staff involvement. The theory is defined to be a set of interrelated constructs, definitions, and propositions that presents a systematic view of phenomena, by specifying relations among variables, for the purpose of explaining natural phenomena (Kerlinger, 1979).

One fundamental goal of a preventive maintenance programme is to improve the knowledge of staff, which is more about benefits from the programme, reduction of time waste, more effective and proactive actions, and losses by the organisation. Additionally, organisations may choose to implement staff involvement in preventive maintenance programme in order to provide the management a showing of support for staff, which ultimately focuses on employee satisfaction (Aldana et al., 2004).

Providing a safe work environment can also exemplify how valuable staff is to an organisation. Morale can be impacted if staff feels an organisation has them working in an unsafe environment, and there is no recourse on such matters. Since the result of any preventive maintenance programme is to improve the employee's knowledge and safety, the programme must be viewed as attitude change. This means that the staff should be involved in all aspects of a preventive maintenance programme, from design to the implementation of the programme. Allowing staff involvement in the development of the preventive maintenance programmes improves the ability of the programme to meet the needs of its involvement. Grawitch and Ledford et al. (2009) further explored these practices and examined their effectiveness of them in an organisational setting.

2.3.1 Challenges in Preventive Maintenance Programme

Challenges of staff involvement, such as those identified by Haines and his colleagues, were also addressed by Bungum et al. (1997). In addition to the common theme of not having enough time, the staff identified effort as another major obstacle to involvement. The employee realises that they are either too lazy or unaware about the preventive maintenance programme enough to get involved.

As staff members try to achieve a better work-life balance, they realise that time is a precious commodity. At some point, just about everyone wishes they had more time in the day to enjoy their favourite programme, or even accomplish more at work. This lack of time is one of the reasons cited by staff when asked about why they do not get involved in a programme (Haines et al., 2007). Other challenges reported by Haines et al. include lack of motivation to get involved or continue participating, having job commitments that interfere with involvement, and physical problems that preclude them from involvement.

Staff participation discovered from previous study include being too busy, not having time to be dedicated to the programme, the staff view it as part of their job, and a benefit of employment at the organisation (Henke et al., 2011). The management must also be included as an integral part of the programme. The integrated role of management in programmes also highlights the importance the organisation has placed on the programme (Drennan et al.,

2006). In addition to the individual involvement, when staff members are placed into natural groups, the teams are able to share a common goal and help each other toward achieving those goals. The success of a preventive maintenance programme depends upon staff participation. The more staff that participate in preventive maintenance programmes, the better the value of staff involvement because of the improvement in employee productivity and safety. When an organisation decides to implement a preventive maintenance programme, it often assumes that simply communicating the reasons for the enactment of the programme is sufficient to convince staff to participate.

Others have argued that there has been too much reliance on defining involvement since it tends to be driven by instrumentation and operationalization (Kryl, 1990), rather than by a clear conceptualisation and precise definition of the construct of interest. The argument is that each of the activities listed under involvement represents very different types of behaviour, requiring different explanations, and motivations (McLean Parks et al.,1995).

2.3.2 Cost and Benefit of Preventive Maintenance Programme

Preventive maintenance is also seen as a measure of management excellence. It requires a long-term commitment, constant monitoring of new technology, constant assessment of financial and organisational trade-offs in contracting out versus in-house maintenance, and an awareness of the impact of regulatory and legal environment.

The benefits of preventive maintenance are many. Some of them are listed below:

a. Safety. Machinery that is not well-maintained can become a safety hazard. Preventive maintenance increases the margin of safety by keeping equipment in top running condition.

b. Lower cost. A modern and cost-effective approach to preventive maintenance shows that there is no maintenance cost optimum. However, maintenance costs will decrease as the costs for production loss decreases. Obviously, no preventive maintenance action is performed unless it is less costly that the resulting failure.

c. Reduction in failures and breakdowns. Preventive maintenance aims at reducing or eliminating unplanned downtime, thereby increasing machine efficiency. Downtime is also reduced when the preventive maintenance process gives maintenance personnel sufficient warning so repairs can be scheduled during normal outages.

d. Extension of equipment life. Obviously, equipment that is cared for will last longer than equipment that is abused and neglected.

e. Improved trade-in/resale value of equipment. If the equipment is to be sold or traded in, a preventive maintenance programme will help keep the machine in the best possible condition, thereby maximising its used value.

f. Increased equipment reliability. By performing preventive maintenance on equipment, a firm begins to build reliability into the equipment by removing routine and avoidable breakdowns.

g. Increased plant productivity. Productivity is enhanced by the decrease in unexpected machine breakdown. Also, forecast shutdown time can allow the

firm to utilise alternate routings and scheduling alternatives that will minimise the negative effect of downtime.

h. Fewer surprises. Preventive maintenance enables users to avoid the unexpected. Preventive maintenance does not guarantee elimination of all unexpected downtime, but empirically it has proven to eliminate most of it caused by mechanical failure.

i. Reduced cycle time. If process equipment is incapable of running the product, then the time it takes to move the product through the factory will suffer. There is a strong correlation between preventive maintenance and cycle-time reductions as well as near-perfect on-time delivery rates. Also, approximately 35% of the surveyed plants that widely adopted preventive maintenance achieve on-time delivery rates of 98%, compared to only 19.5% for non-adopters.

j. Increased service level for the customer and reduction in the number of defective parts. These have a positive direct effect on stock-outs, backlog, and delivery time to the customer.

k. Reduced overall maintenance. By not allowing machinery to fall into a state of disrepair, overall maintenance requirements are greatly decreased.

The study focused mainly on preventive maintenance programme, particularly their benefit of staff involvement to the organisation, their benefit to the staff, and the obstacles in implementing a preventive maintenance programme. The staff involvement process may be significantly different from one organisation to another (Grawitch et al., 2009). The current study shall provide UUM with a framework to develop their preventive maintenance

programmes further by identifying what factors will affect their staff in making successful preventive maintenance programmes and how to improve their involvement.

A crucial aspect is to develop information that will be provided to the target staff involvement that highlights the excess of benefits over costs of preventive maintenance. In order to accomplish this target, the management must identify the costs and benefits associated with preventive maintenance adoption or expansion that are likely to be incurred and achieved by the organisation. The total cost of preventive maintenance activities includes the costs of the following items: labour, materials, equipment, contract services, and overhead. In determining the cost of preventive maintenance programmes, it is recommended to use larger cost data population, as it is more reliable in reflecting the average unit cost within the same management environment. Most literature placed heavy emphasis on the examination of financial benefits for those involved in preventive maintenance programmes. The researchers found the staff involvement thought that information regarding the programme was better received when it was more personalised, rather than searching for programme information. The study revealed that staff preferred programmes that were more personal in nature rather than a corporate style programme (Nohammer et al., 2010).

2.4 Summary

This review of literature covered issues related to a study of staff involvement in the preventive maintenance programme at UUM. Common barriers include not enough time, lack of motivation, and unawareness amongst employee. Studies also reported that the return on benefit would be more evident with increased staff involvement. Greater involvement would help staff detect early any problems at the workplace and ultimately minimise cost for the organisation. Attitudes, subjective norms, and perceived behavioural control act together as factors that have an effect on a person's intentions. Each of these can be measured by asking direct questions about evaluations of performing the attitude, subjective norm, and perceived behavioural control. "Intentions play an important role in guiding human action, but recent research also reveals the complexities involved in translating intentions into actual behaviour" (Ajzen, 2001, p. 47). The theory of planned behaviour indicates that preventive maintenance programmes have the capability to attract more staff involvement.

Chapter 3 will cover the methodology of the research study, which includes the research design, population and sample, instruments used, the pilot study, data collection and analyses, reliability, the role of the researcher, and the protection of the staff involvement. Meanwhile, Chapter 4 will provide the results of the study. Last but not least, Chapter 5 will interpret those findings as well as provide recommendations for future research.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This study is a field study, conducted in a non-contrived setting, with no interference in the normal flow of events. The purpose was to determine why certain staff members become actively involved in their preventive maintenance programme. Therefore, the unit of analysis is at the individual level. A field study is most appropriate in this setting since the research question concerns individuals and the decisions they make within their environment.

The analysis was based on quantitative methods for the purpose of testing the theoretical model. Respondents were the administration staff selected at random from any administration department at Universiti Utara Malaysia. These respondents were given consent forms that provided a brief description of the study and its purpose. The forms included questions concerning the age, race, gender, and status. They were also asked to rate attitude, subjective norm, perceived behaviour control, and actual behaviour on a five-point scale (Strongly disagree, Disagree, Normal, Agree, or Strongly Agree) in questionnaires regarding staff involvement in the programmes.

3.2 Research Framework

Intentions can best be understood through an examination of the TPB. Ajzen,(2001) depicted the TPB to capture the specific reasons why people act the way they do. The theory states "people act in accordance with their intentions and perceptions of control over the behaviour, while intentions in turn are influenced by attitudes towards behaviour, subjective norms, and perception of behavioural control". These determinants can be further described as follows: a favourable or unfavourable evaluation of the behaviour (attitude toward the behaviour), perceived social pressure to perform or not perform the behaviour (subjective norm), and the perceived ease or difficulty of performing the behaviour (perceived behavioural control) (Ajzen, 2002; Ajzen, Brown, & Carvajal, 2004).

The more positive people's attitudes and subjective norms, and the greater their perceived behavioural control regarding a behaviour, the more likely they are to intend to perform that behaviour in preventive maintenance programmes. Similarly, the stronger people's intention, the more likely they are to perform the behaviour. To the extent that perceptions of control accurately reflect the person's actual control over behavioural performance, perceived behavioural control can also directly affect behaviour (Rivis & Sheeran, 2002).

According to the theoretical framework, Ajzen and Fishbein (1980) postulated that only a small number of components explain the theory of planned

behaviour, and they can be used to predict, explain, and influence human behaviour in applied settings. It is this simple nature of the theory, and the parsimonious structure, that makes this theory attractive, as well as its predictive ability in a number of settings, measuring different behaviours.

The literature review is through the theoretical model, explaining first the independent variable, and then the dependent variables. Various aspects of the model represent numerous opportunities for major research studies as well. However, the purpose of this study is not to necessarily challenge each of the variables in detail, but rather to test the prediction of the model as theorised by Ajzen and Fishbein (1980) and Ajzen (1985), including intention and certain other variables. Therefore, particular emphasis will focus on these proposed external variables, as well as on staff involvement, as the behavioural variable in question. A concerted effort has been made during the past 25 years to determine the construct validity of staff involvement measures. Establishing the construct validity of preventive maintenance programme measures is important and cannot be properly achieved without a precise definition of involvement.

The theory of planned behaviour (TPB) is a valuable tool for predicting and understanding individual behaviour. It is an extension of the theory of reasoned action (TRA). The TRA is based on the assumption that human beings are typically rational, and make systematic use of the information available to them (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). Moreover, a person's behavioural intention is determined by the

attitudes that individuals hold toward the behaviour and the person's perception of social pressure from individuals or groups placed on him/her to perform or not to perform the behaviour. However, TRA assumes that behaviour is volitional. To improve the prediction power of TRA, one factor, namely perceived behaviour control (PBC), was added thus giving the TPB model (Ajzen, 1988; Ajzen, 1991). PBC refers to people's perception of the ease or difficulty of performing the behaviour of interest (Ajzen, 1991). Based on theory of planned behaviour, attitude, subjective norm, and PBC are direct measures of predictor variables of behavioural intention.

The research framework for this study is to use the items contained in the theory of planned behaviour, which consists of attitudes, subjective norms and perceived behavioral control. The model is depicted in Figure 1 and represents the three variables which the theory suggests will predict the intention to perform staff involvement in preventive maintenance programmes. Intentions are the precursors of behaviour.

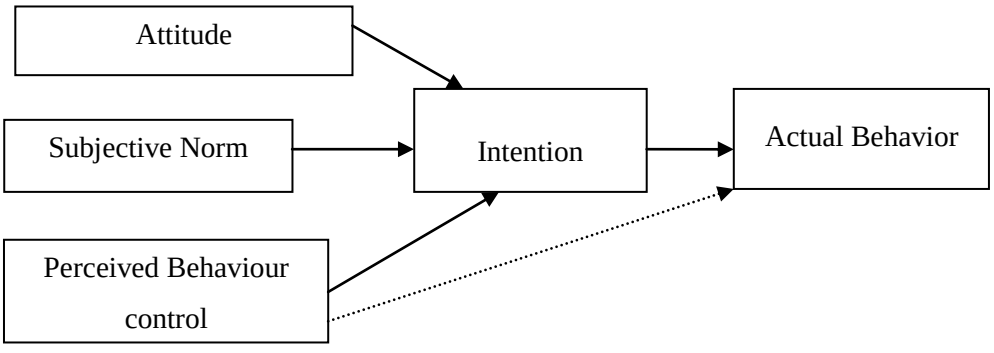

Figure 1: Adopt from the theory of planned behaviour (Ajzen, 1991)

3.2.1 Attitudes (Toward the Behaviour)

Attitude toward the behaviour is a person's overall evaluation of the behaviour. It is assumed to have two components which work together, namely beliefs about consequences of the behaviour (behavioural beliefs; e.g., referring the staff involvement in preventive maintenance programmes), and the corresponding positive or negative judgement about each features of the behaviour (outcome evaluations; e.g., decreasing staff involvement because it is desirable/undesirable).

3.2.2 Subjective Norms (About the Behaviour)

Subjective norms are a person's own estimate of the social pressure to perform or not to perform the target behaviour. Subjective norms are assumed to have two components which work in interaction, which are beliefs about how other people, who may be in some way important to the person, would like them to behave (normative beliefs), and the positive or negative judgement about each belief (outcome evaluations), e.g., doing what employer thinks the employee should do is important/unimportant.

3.2.3 Perceived Behavioural Control (of the Behaviour)

Perceived behavioural control is the extent to which a person feels able to enact the behaviour. It has two aspects, namely how much a person has control over the behaviour and how confident a person feels about being able to

perform or not to perform the behaviour (e.g., not sufficient knowledge in measuring staff involvement). It is determined by control beliefs about the power of both situational and internal factors to inhibit or facilitate the performing of the behaviour.

3.2.4 Intention

Although there is not a perfect relationship between behavioural intention and actual behaviour, intention can be used as a proximal measure of behaviour. This questionnaire was one of the most important contributions of the theory of planned behaviour model in comparison with previous models of the attitude-behaviour relationship. Thus, the variables in this model can be used to determine the effectiveness of implementation staff involvement in preventive maintenance even if there is not a readily available measure of actual behaviour.

3.2.5 Actual Behaviour

Actual behaviour is about the application of the theory of planned behaviour to specific behaviours. It is possible to use the model to investigate more actual behaviours, but it is important to observe the "principle of compatibility" (Fishbein, 1967).

3.3. Hypotheses

A hypothesis is a statement, which if true, solves the problem. Research hypotheses specify a possible relationship between different aspects of the problem, i.e., between the independent variable and the dependant variable. This study, the independent variables consisted of attitudes, subjective norms, and perceived behavioural control and the dependent variable is the intention and actual behaviour. A Hypothesis testing is a technical analysis of the inferences (inferential analysis) that can help us use sample data to estimate population parameters.

For this study, the hypotheses have been carried out where there is a significant relationship. A hypothesis showed is relationship between attitudes, subjective norms, and perceived behavioural control and intention. Likewise, there is a relationship between intention and actual.

3.4 Research design

This study explored current staff involvement in a preventive maintenance programme, why more staff members are not participating, and what the organisation can do to elicit greater involvement. This study examines the extent to which employees are passionate about their staff involvement in preventive maintenance programme. This study design is appropriate when the phenomenon under examination is a real-life situation; in this case, why the

staff members do not get involved in the preventive maintenance programmes offered by UUM.

This research design is using quantitative research. The quantitative study is the study using quantitative data that can be measured through the measurement process and requires measurement tools such as questionnaires. This study examines a representative sample of the population or the population. To get a good review, typically require large sample of 100 to 1,000 subjects. For this study, the theory of planned behaviour is appropriate because it allows for better understanding of why there is less staff involvement in preventive maintenance programmes, and how the organisation can effectively address these issues to increase involvement. Furthermore, this study research design is also used in a bounded area, which is UUM.

This research design allows the researcher to look within these boundaries in order to answer the research questions (Creswell, 2007). Additionally, it allows the researcher to determine the perceptions of staff involvement in preventive maintenance programmes, of the sample, which in this study, was the administrative staff of UUM. These perceptions were vital in determining challenges to active staff involvement in preventive maintenance programmes.

3.5 Operational Definition

An operational definition establishes a term by describing the set of manipulations necessary to create the presence of the object or by describing the measuring operations which identify the terms presence. Operating in this study to measure the quantitative relation between the independent variables consisted of attitudes, subjective norms and perceived behavioural control with independent variables such intention and actual behaviour. This research tool is a questionnaire. Operating strategy does is ensure that all staff involved to answer all the questions submitted by the attitude, SN and PBC in daily activities related to preventive maintenance programme.

3.6 Measurement of Variables

The instrument used to collect data was a set of researcher-developed questionnaire, used for the in-person survey conducted by the researcher. The basis for the development of the questions was a study of staff involvement in programmes by Nohammer et al. (2010).

To appropriately measure the theory of planned behaviour, variables including attitudes, subjective norms and perceived control, Francis et al. (2004) suggested both direct and indirect measurements of each construct should be determined since both methods make distinct assumptions about the underlying cognitive structures. Direct measurement assumes that people can

accurately summarise and report their beliefs that may actually be ambivalent (i.e., consisting of some positive and some negative beliefs). In contrast, the indirect measurement does not make the assumption that individuals can give a summary estimate of their beliefs about behaviour. By measuring constructs using both methods, the variables may explain more variance of intention and actual behaviour targeted in the study. The present study thus developed a theory of planned behaviour questionnaire using both direct and indirect methods to capture attitudes, subjective norms, and perceived control. In addition, it is believed that indirect measurement provided additional benefits by delineating beliefs that may become targets for any programmes in future studies.

3.6.1 Measurement of Dependent Variables

An increasing concern pertains to "how" staff involvement in preventive maintenance should be measured. Involvement has been operationalised with either single-item measures (Chacko, 1985; Glick et al., 1977; Kolchin & Hyclak, 1984), or with single composite indexes (Fullagar & Barling, 1989; Huszczo, 1983). Kelloway and Barling (1993) considered a cumulative approach to measuring staff involvement. Another issue related to involvement has been "what" items to measure. Measurement of involvement, for the most part, has been limited to staff administrative factors. In most cases, awareness about preventive maintenance programmes has been chosen as the primary measures of involvement (Anderson, 1979; Montgomery, 1989; Brief & Rude, 1981). The focus on staff administrative factors has been

considered to be most critical, because that is where active members performed the bulk of the work deemed important. As noted by Anderson (1979), staff involvement in preventive maintenance is not just about the office environment, but it is also about staff involvement in day to day operations and decision making. Many acts of staff involvement make small contributions.

3.6.2 Measurement of Independent Variables

There was concern expressed by the respondents about the length of time it might take staff to complete the survey. The variables used in this study were based on methods proposed by Fishbein and Ajzen (1975). These methods have been employed in previous research with better than average results. Measurement of these variables should also be specific, rather than being too general. This is particularly important in measures of "attitude" and "actual" beliefs, as they apply to this theoretical model. As will be discussed, many of the measures found in previous studies have been general.

3.7 Data Collection

Data obtain from questionnaires. The questionnaire is defined as a set of questions / printed item is used to collect / receive data Self-report studies of subjects / respondents.

This is step to measures and to build the questionnaire for item attitudes, subjective norms, perceived behavioural control, intention and actual behaviour.

(i) Develop the item in accordance with the objectives of the study.

(ii) Provide appropriate analytical procedures.

(iii) To carry out the test pilot to test the suitability of the item.

(iv) Improve the item after feedback from the pilot test.

(v) Provide training to the interviewers or data collectors.

3.7.1 Sampling

The research population for this study was from the staff at Universiti Utara Malaysia, consisting of academic staff (1528 people) and administrative staff (1974 people). The total number of staff members in Universiti Utara Malaysia is 3502 people. The university has 1,486 administrative staff with permanent status, while 393 persons are on a contract basis, and the rest have part-time status (95 persons). (Sources of Registrar Department, 2015).

This research was more focused on supporting staff like the administration because this group forms the majority in Universiti Utara Malaysia. The study will assess the intention by administrative staff involvement in preventive maintenance programmes at UUM. The selection of this administration faculty was due to the researcher's familiarity. This familiarity allows the researcher to conduct surveys and get knowledge about the intention of staff involvement in preventive maintenance programme.

The ever increasing demand for research has created a need for an efficient method of determining the sample size needed to be representative of a given population. In the article “Small Sample Techniques”, the research division of the National Education Association has published a formula for determining sample size (Krejcie Morgan, 1970), which is the following.

$$s = X2NP(1- P) \div d\ 2\ (N -1) + X\ 2P(1- P)$$

where

s = required sample size,

$X2$ = the table value of chi-square for 1 degree of freedom at the desired confidence level,

N = the population size,

P = the population proportion (assumed to be .50 since this would provide the maximum sample size), and

d = the degree of accuracy expressed as a proportion (.05).

This requires the specification of the study design and the expected effect size (Everitt, 1996). Generally, a sample size of 130 would be acceptable. Response rates are often around 50%, thus this research needed to send out at least 200 questionnaires to achieve the required sample size. It is also important to establish the representativeness of the sample, either by reporting a very high response rate or by comparing the known characteristics of responders and non-responders.

3.7.2 Data Collection Procedures

The major procedure used in this study was by questionnaire analysis. The staff involvement in preventive maintenance survey collected information from administrative staff at any department in the university. Data were collected using a self-administered questionnaire. The theory of planned behaviour model would determine the relationship effects that were hypothesis for this study.

3.7.3 Data Analysis

The method of putting together facts and figures and to solve research problem is the systematic process of utilising data to address the research questions. This includes breaking down research issues through utilising controlled data and factual information in this research.

Data should be processed on the category, percentage, mean and standard deviation. This is steps in data analysis:

(a) Pre-analytical phase

(b) A reduction in the size of the phase data

(c) Phase display data

(d) Data validation phase

(e) Phase insights

Below is how the writing of the data sought:

(a) Questionnaires distributed and filled them ask for sample.

(b) Raw data shall be obtained in advance for background research subjects

(c) Data from research tools, such as questionnaires should be amended to score the variables of the study.

(d) Start analysing the study data answer questions and / or hypotheses of the study.

3.4 Summary

This third chapter discussed how the research designs that was chosen. The questions used for questionnaires were related to a research question. From these sources, the final themes pertaining to the research questions were developed. The chapter also discussed reliability and validity of the study, and respondent involvement in preventive maintenance through the research.

Chapter 4 will present the results of the research study, examining the significance of the study and including themes, while Chapter 5 will interpret the findings, provide conclusions, implications, and discuss potential areas of further research.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

The findings of the survey were analysed based on the research objectives in Chapter 1 and the data were analysed in the form of texts, figures, and tables. This chapter also discusses and demonstrates the complete result and the interpretation of the study. The data were analysed using Statistical Package for the Social Science (SPSS) version 19 software. The following categories shall explain the analysis:

i- exploratory factor analysis,

ii- validity and reliability tests,

iii- descriptive analysis,

iv- regression analysis, and

v- correlation analysis.

Several outputs and discussions regarding the result were summarised in accordance with the research objectives. The summary of the findings was highlighted to further facilitate staff involvement in preventive maintenance. After the collection of completed questionnaires, the quality control of data from the survey was essential and a complicated task. For this matter, the

researcher needed to ensure that all questions were answered. Referring Hojstrup (1993) stated that it would be very helpful to simply distinguish the good or bad data with sufficient amount of time which were obtained from respondents.

4.2 Exploratory Factor Analysis

According to Hair, Black, Babin, and Anderson (2010), the missing data observed by the researcher should be deleted if the missing data is more than 15%, but the researcher needs to ensure that the sample of the study is still adequate. The first step to determine staff involvement in preventive maintenance programme, exploratory factor analysis was conducted using a principal components analysis, with oblique rotation. Oblique rotation was chosen over varimax to overcome the assumption of orthogonality (Kim & Mueller, 1978), as a number of factors were expected to be correlated. As discussed in Barling et al. (1992, p. 97), one would expect the three factors to be related with each other.

This study used items that can actually measure the variables under review, which was the intention of staff to be involved in preventive maintenance programmes. The independent variables (IVs) in this study were attitude, subjective norm, and perceived behaviour control, while the dependent variable (DV) is intention and actual. These items need to have positive relationships with each other in order to be significant. The extent of university staff involvement in preventive maintenance programmes based on

the theory of planned behaviour has no issues because communalities (*see Appendix 1*) for the three IVs (attitude, subjective norm, and perceived behavioural control) and DV have values greater than 0.5. The very high value of communalities was 0.817 (SN4) and the lowest value was 0.549 (PBC2). KMO and Bartlett's Test appear from the factor analysis measurement of IV was 0.778, while for DV (intention) and DV (actual) were 0.729 and 0.652, respectively.

The Bartlett' Test of Sphericity index describe in detail the two indicators used for the checking of the interest of the implementation of the Principal Component Analysis (PCA) on the dataset. PCA is a dimension reduction technique where the factors are linear combinations of the original variables. The approach can handle only quantitative variables. Anti-image view of valuation was also greater than 0.5. Rotated component matrix is the finalist factor for independent variables (attitude, subjective norm, and perceived behavioural control), as shown in Table 4.1 below:

Table 4.1
Finalist Factor (IV)

Item	No.
Attitude	3
Subjective Norm	3
Perceived behavioural control	5

4.3 Validity and Reliability Analysis

The validity and reliability analyses in this part were done to ensure the questionnaires can be accepted and used in this study to find out about staff involvement in preventive maintenance program.

4.3.1 Validity Test for Independent and Dependent Variables

Based on measurement of validity for independent variables and dependent variables, the overall measurement for independent and dependent variables have a relationship. Using the same measurement in the same scope proved that the instrument for independent and dependent variables were valid to be applied in this study.

4.4 Reliability Test

Reliability analysis is important to the researcher in order to measure data consistency. Reliability is a measurement technique to ensure consistency on the repeated application (Weiner, 2007). Cronbach's Alpha was used to test the reliability of the questionnaires. According Sekaran and Bugie (2013) emphasised that an alpha value which is close to 1 means that the research data has a high level of reliability (Cronbach's Alpha => 0.90). Conversely, if the alpha value is less than 0.6, it is assumed that the instrument used in this study has low reliability (Cronbach's Alpha =< 0.60).

The reliability result for this study and based on result analysis, the reliability test for independent and dependent variables in this study was acceptable and very good. For independent variable, Cronbach's Alpha value for staff involvement in preventive maintenance scored very good reliability, which was attitude (ATT) with the value of 0.818, subjective norm (SN) with 0.823, and perceived behavioural control (PBS) with 0.810. Meanwhile the

Cronbach's Alpha for overall independent variable (ATT, SN, and PBC) showed excellent reliability, with a score greater than 0.80. The Cronbach's Alpha for dependent variable items intention (0.873) and actual (0.941) were also very high. This means that the level of reliability was very good and represented that the level was acceptable.

The statistics of reliability analysis for independent and dependent variables are shown in Table 4.2 and Table 4.3.

Table 4.2
Reliability Statistic for the Data Gathered from Survey (IV)

IV	Cronbach's Alpha Based on Standardised Items	No.
Attitude	.818.	3
Subjective Norm	.823	3
Perceived Behavioural Control	.810	5

Table 4.3
Reliability Statistic for the Data Gathered from Survey (DV)

DV	Cronbach's Alpha Based on Standardised Items	No.
Intention	.873	3
Actual	.941	5

4.5 Descriptive Analysis

Descriptive analysis had been applied in this study to perform frequency analysis and to determine the value of mean. For a clear indication, a total of 130 questionnaires were distributed to staff administration in Universiti Utara Malaysia using disproportionate stratified random sampling. At the end of study, the researcher used all sets of questionnaires for analysis after the

process of data cleaning and elimination of five outliers. Before going through the descriptive analysis, it was necessary to compute the variables attitude, subjective norm, perceived behaviour control, intention, and actual, by condensing several raw data points into one. For example, when using standardised questionnaires, it is often needed to calculate a total and/or several sub-scale scores rather than analysing every question separately.

Frequency analysis was one of the important analyses in this research development. Frequency analysis can be conducted to gain the total number of participation in this study with the differences of respondents' and background. Based on 130 samples that were successfully collected by the researcher, this study can effectively analyse the variables in question. There were seven questions that related to the demographic of respondents such as gender, age, ethnic, status, years of experience and percentage knowledge about preventive maintenance program and questions related to staff involvement in preventive maintenance program. The composition of gender is shown in table 4.4.

Table 4.4
Composition of Respondents by Gender

Gender	Frequency	Percentage (%)
Male	44	33.8
Female	86	66.2

In terms of the job status, most of the respondents were permanent which was representing 64.6% of total respondent, contract status is 22.3% and only 12.3

% were representing part time status. The composition of respondents based on job status is shown in Table 4.5.

Table 4.5
Composition of Respondents by Job Status

Status	Frequency	Percentage (%)
Permanent	84	64.6
Contract	30	23.1
Part Time	16	12.3

The next part was concerned with the years of experience of staff. The years of experience of staff of the highest in this study is same of the age 2-8 years (33.1%) and 9-15 years (33.1%) followed by >15 years (23.1%). The years of experience staff below 1 year only 10.8% of the total sample for this study. This means that most of the respondents were experienced in UUM. Table 4.6 presents the respondents based on years of experience.

Table 4.6
Composition of Respondent by Years of Experience

Years of Experience	Frequency	Percentage (%)
< 1	14	10.8
2 - 8	43	33.1
9 - 15	43	33.1
> 15	30	23.1

Based on the opinion of respondent, the percentage of implementation of preventive maintenance program in workplace can be seen in table 4.7. The total percentage of implementation of preventive maintenance program highest was 38.5% while the lowest percentage of implementation is 6.9%.

Table 4.7
Composition of respondent by Percentage of Implementation

Percentage of Implementation	Frequency	Percentage (%)
< 20	9	6.9
20 - 40	31	23.8
40 - 60	50	38.5
> 80	40	30.8

Descriptive analysis becomes the common and general trend in measuring the instrument in data analysis. Descriptive analysis summarises all of the data and explains what occurred in the data samples. The full descriptive analysis on this study is shown in Table 4.8.

Table 4.8
Summary of Descriptive Statistics (N=130)

	Mean	Std. Deviation
Independent Variable:		
Attitude	3.8205	0.56170
Subjective Norm	3.7031	0.49383
Perceived Behavioural Control	3.8500	0.45507
Dependent Variable:		
Intention	3.7667	0.55164
Actual	3.7808	0.57820

Based on the finding of descriptive analysis (Table 4.8), the highest mean for independent variables was perceived behavioural control with 3.8500 (standard deviation of 0.545507), followed by 3.8205 for attitude, and the least mean was subjective norm with 3.7031. For standard deviation, attitude was 0.56170 and the smallest standard deviation was subjective norm with 0.49383. Meanwhile, the finding for dependent variables showed the mean was 3.7667 for intention and actual was 3.7808. For standard deviation, the dependent variable (intention) was 0.55164 and actual was 0.57820. The

overall the result in descriptive analysis from the five items showed the extent of Universiti staff involvement in preventive maintenance programme to be very high because the value of mean was above 2.5 and standard deviation was above 0.3.

4.6 Regression Analysis

Regression analysis was conducted to analyse the relationship between independent variables and dependent variables. Independent variables (IVs) included attitude, subjective norm, and perceived behavioural control, while dependent variables (DVs) were intention and actual. This analysis was important to analyse whether the independent variables were able to influence the dependent variables. The analysis also was conducted to answer the research objectives. Regression analysis is a statistical technique for estimating the relationships among variables. It includes many techniques for modelling and analysing several variables, when the focus is on the relationship between a dependent variable and one or more independent variables. The regression will determine factors that become predictor to intention. ATT, SN, and PBC become predictor factors to determine the intention of staff participation in preventive maintenance programmes.

The results showed of regression for 130 staff involvement in preventive maintenance. The adjusted r-square is a standardized indicator of r-square, adjusting for the number of predictor variables. This shows the standardized variance of the independent variables on the dependent variable in regression

analysis. The adjusted r-square includes the degrees of freedom for the statistical model, which is the total number of variables minus one. The value of Adjusted R Square in this research was 0.341 (34.1%) and significant value is 0.000 ($p<0.05$). This result indicates that 34.1% of PBC which is, staff involvement in preventive maintenance or otherwise, can be explained by the combination of three predictors which were ATT, SN, and PBC with intention as a dependent variable.

The relationship between the predictor of intention and actual, for staff involvement, was positive and significant. Adjusted R Square showed that 0.926 (92.6%) of the variance in intention was significantly explained by the model. This is a statistically significant contribution, as indicated by the Sig. F Change value for line (0.000). Summary of the discussion is as shown in Table 4.9 and Table 4.10 below.

Table 4.9
Result of Regressions (a)

Model	Adjusted R Square	Std. Error of the Estimate
1	.341	.44770

a. Predictors: (Constant), PBC, SN. Att
b. Dependent Variable: Int.

Table 4.10
Result of Regressions (b)

Model	Adjusted R Square	Std. Error of the Estimate
1	.926	.15761

a. Predictors: (Constant), Int
b. Dependent Variable: Actual

4.7 Correlation Analysis

Based on this study, the researcher conducted this analysis to explore the strength and direction between these two variables. This analysis was done to determine, 1) the extent of universiti staff involvement in preventive maintenance programmes, 2) the relationship among ATT, SN, and PBC on the intention of staff involvement, and 3) the relationship between intention and actual of staff involvement in preventive maintenance programmes. If the value of the correlation is 0, this means there is no correlation, while 1.0 means there is a positive correlation and -1.0 means that the correlation is negative (Pallant, 2001). It is a statistic representing how closely three variables co-vary. The relationship between two variables could be very disagree, disagree; normal, agree or very agree of relation (Hair, Money, Samouel, & Page, 2008).

The correlation determines the relationship between ATT, SN, and PBC with intention and actual. The correlation was done in this study clearly showed the ATT, SN, and PBC have a connection with intention. ATT, SN, and PBC together predicted intention of staff involvement in preventive maintenance programmes. However, only SN and PBC were found to have significant correlation with intention when analysed independently, where respondents reported positive and high SN. PBC was more likely to also report intent to staff involvement in preventive maintenance programmes. The non-significant relationship between attitude and intention does not support TPB assumption, but does agree with some previous studies utilising TPB. Table 4.11 and Table 4.12 show the summary of the correlation analysis.

Table 4.11
Coefficients (a)

Model		Unstandardised Coefficients		Standardised Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.733	.391		1.874	.063
	Int	-.028	.080	-.028	-.346	.730
	Att	.469	.090	.420	5.195	.000
	SN	.364	.101	.300	3.618	.000
	PBC	.733	.391		1.874	.063

a. Dependent Variable: Int

Table 4.12
Coefficients (b)

Model		Unstandardised Coefficients		Standardised Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	-.019	.096		-.198	.843
	Int	1.009	.025	.962	40.103	.000

a. Dependent Variable: Actual

The table also shows the relationship with ATT, SN, and PBC on the intention of staff involvement in preventive maintenance programmes. There are two independent variables that are significantly correlated at the level of 0.00. The two variables are SN and PBC. However, the ATT variable is insignificantly correlated with the dependent variables.

When IVs are correlated, there are problems in estimating regression coefficients. Collinearity (Table 4.13) means that within the set of IVs, some of the IVs are (nearly) totally predicted by the other IV. From this result it can also be checked whether there is multi-collinearity or not between the independent variables. Multi-collinearity is a statistical phenomenon in which two or more predictor variables in a multiple regression model are highly

correlated, meaning that one can be linearly predicted from the others with a non-trivial degree of accuracy. If tolerance is less than 1, this variable has collinearity (for this study, it was 0.773). In this table, all independent variables were less than 1 which means there is no multi-collinearity.

Table 4.13
Collinearity statistic

Model		Unstandardised Coefficients		Standardised Coefficients	T	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.733	.391		1.874	.063		
	Att	-.028	.080	-.028	-.346	.730	.773	1.294
	SN	.469	.090	.420	5.195	.000	.781	1.281
	PBC	.364	.101	.300	3.618	.000	.741	1.350

a. Dependent Variable: Int

4.8 Summary

In conclusion, based on TPB is able to answer research questions about the extent of staff involvement in preventive maintenance programme and the relationship between item TPB such as attitude, SN, PBC and relationship between intention and actual behaviour. This theory, clearly shows that all items are linked together to determine the extent of staff involvement in preventive maintenance programme.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter provides the overall summary of this study. The main objective of this study was to prove the extent of university staff involvement in preventive maintenance programmes and the relationship between intentions of staff involvement in preventive maintenance programmes, with three variables of ATT, SN, and PBC using theory of planned behaviour. The study obtained a result which reveals a significantly positive relationship between terms in theory of planned behaviour with staff involvement. A total of 130 questionnaires were collected, which provided the results that will be interpreted in this chapter. Among the themes that emerged were lack of awareness of the preventive maintenance programmes offered and having more knowledge that one goal of the preventive maintenance programme is to make the employee always be more sensitive to working conditions which can save cost for organisation.

5.2 The existence intention of university staff involvement in preventive maintenance programme

Intention is a normal behaviour that happens naturally in real life. It describes how individuals in a group can act together with planned direction using TPB. TPB explain why one would tend to follow others in decision making in order to ensure that one has made the right decision. For example, when one chooses to get involved in preventive maintenance, one would first ask for opinions from others about the information and advantage given by the programme primarily to individuals and the organisations. But what if the individual is alone and still needs an opinion about the programme that they are to involved. Thus, in order to make this decision, one would observe other people in choosing their preventive maintenance programme. One shall end up choosing the preventive maintenance programme to the extent that it may be similar to others. TPB is the one of best way to study or judge about staff involvement in preventive maintenance programmes.

TPB can demonstrate the existence of the desire staff involvement in preventive maintenance program. There are many factors that influence the attitudes, subjective norms and perceived behavioural control to increase the staff involvement in preventive maintenance program. The management must provide periodic training programs for staff and decided to get involved in the programs. Normally, staff does not have accurate information and correct related programs run by the organization. Therefore, intention staff involvement is low but if the staff gained a lot of information on preventive

maintenance program and the benefits to themselves and the organization, the greater the likelihood of staff involvement could be improved. These findings support the TPB model in the prediction of staff involvement in preventive maintenance programmes related to intention and actual behaviour. Furthermore, the point of view of programmes being negative had a direct and impact on staff involvement.

This study also revealed that the management needs to learn how to attract more staff involvement in preventive maintenance programmes by utilising and gaining strength from a team-based approach to goal setting and problem solving. In addition, the model TPB supports the use and expertise of other management to better understand what and how the internal and external environment workplace can not only drive change in staff involvement, but can also be used to measure the effectiveness of implemented changes. It happens naturally when they have to make decisions in implementation of preventive maintenance programmes.

5.3 Limitations and Recommendations

Limitations must be considered when interpreting the results of this study which can explain both the positive and negative behaviours toward staff involvement in preventive maintenance programmes. This study used three variables which were based on the theory of planned behaviour. Thus, further research is recommended to use more variables and possibly other theories that could lead to other findings and results regarding staff involvement in

preventive maintenance programmes. Thus, findings may be generalised to all staff administration, as well as other target populations which would further add and support by contributing this field of study.

The sample of this study also focused only on administrative staff. Therefore, it is recommended that in future research, researchers could use a sample that is in various positions and locations. The result could be different and more accurate, since this research was limited to collecting data from the administrative staff at any department in one single institution.

The use of the extended TPB model could be applied in future interventional studies to further understanding of staff involvement in preventive maintenance, especially the influence of intention and other behaviour. Upcoming research is also encouraged to use other methods so as to ensure that the findings and results are the same, or more significant or even differs from this study; all of which would further enrich this field of study. By using other theories, the next researcher could be able to find which position and organisation in other departments could provide different/similar findings.

Last but not least, rather than using only one administrative part in UUM, in future research, it is recommended to choose another organisation or industry using the other theories with a larger sample size that has more data.

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Online Resources

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http://uum.edu.my/index.php/en/

http://en.wikipedia.org/wiki/Principal_component_analysis

http://data-mining-tutorials.blogspot.fr/2009/04/principal-component-analysis-pca.html

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