

The Impact of Organisational Culture and Structural Empowerment on Participation of Autonomous Maintenance within Power Utilities

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ABSTRACT: The implementation of modern maintenance strategies has a positive impact on improving industrial assets. There are examples of asset high performance, quality, and reliability being achieved through successful maintenance approaches. Total Productive Maintenance (TPM) is an ideal approach to support the development and implementation of operation performance improvement. It systematically aims to understand the function of equipment, service quality relationship with equipment and probable critical equipment failure conditions. Implementation of TPM programme need strategic planning and there has been little research applied in this area within Middle-East power plants. Employee Empowerment is one of the main criteria in TPM implementation. TPM programme will not work without empowering the operators or the production workers to carry out the autonomous maintenance. However, there is a clear lack of literature that explores the influence of employee empowerment on autonomous maintenance participation and therefore, this research aims to examine the impact of organisation culture on the participation of autonomous maintenance within power plants using a structural equation modeling approach. Hofstede's (1980) dimensions of culture (power distance, collectivism/individualism, masculinity/femininity, and uncertainty avoidance) were used to inform the theoretical framework. Data were collected from 250 professionals in the Abu Dhabi power industry using a postal questionnaire. Structural equation modelling, using partial least squares path analysis (SmartPLS software version 3.0), was performed to test the hypothesised model. Participants in the study were requested to answer three main questionnaires: Hofstede's cultural dimensions questionnaire, structural employee empowerment questionnaire, and participation of autonomous maintenance questionnaire. Findings indicated that power distance and masculinity/femininity dimensions had a direct negative and meaningful effect on employee empowerment. On the other hand, collectivism had a direct positive effect on employee empowerment. Furthermore, structural empowerment had a direct positive impact on autonomous maintenance participation in the power industry. Besides, the effect of uncertainty avoidance on structural empowerment was not statistically significant. In short, the findings confirmed the role of organisational culture and structural employee empowerment in participation of autonomous maintenance. This research will contribute to bridge the current gap in knowledge.

KEYWORDS TPM, Participation of Autonomous Maintenance, National Culture, Hofstede Model, Structural Employee Empowerment, Kanter's Model, Structural Equation Modelling.

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I. INTRODUCTION

The implementation of modern maintenance strategies has a positive impact on improving industrial assets. There are examples of asset high performance, quality, and reliability being achieved through successful maintenance approaches. TPM is an ideal approach to support the development and implementation of operation performance improvement. Principally, TPM empowers employees by giving them mutual responsibilities and a sense of ownership and only companies that have been able to recognise this fact has managed to succeed in TPM adoption [1]. For accelerating this success, teams should have the authority to determine their individual tasks without the interference of management. Hence, it ensures more active involvement in taking decisions and accepting responsibilities. However, at times, the meaning of the word 'employee empowerment' is misinterpreted. The assumption that it signifies that all decisions must be taken by employees can result in

complete chaos. This is why rules and policies play an integral part in preventing or eliminating the confusion. Furthermore, what is most difficult is ascertaining decisions that must be taken by management and the ones that must be taken by employees, alongside the ones that must be mutually considered. Similarly, this misinterpretation can also lead to the incorrect decision of not giving adequate responsibilities to workers [2].

Several authors have acknowledged the significance of TPM implementation in the power industry Aljanabi et al. [3]; Wai Foon and Terziovski [4]; Reiman and Oedewald [5] and in the service sector Mad Lazim and Ramayah [6]. Correspondingly, Nasuridin et al. [7] opined that empowerment remains one of the most important philosophies entrenched in TPM which is expected to enhance employees' sense of autonomy. For example, in autonomous maintenance, operators are not merely permitted to oversee the efficacy of the machines/equipment within their care, but are also given the opportunity of deciding and initiating corrective actions in order to prevent unscheduled breakdowns [8]. In the same context, operators or shop floor workers are likely to enjoy greater autonomy. Therefore, Nasuridin et al. [7] advocated the concept of empowerment amongst employees in organisations performing TPM programmes. Under such circumstances, employees' flexibility and autonomy will be increased. Furthermore, as noted by Nakajima [9], operators are required to participate in giving suggestions to improve the production line in the form of small group activities, which in turn, guide them to experience greater autonomy. Thus, it can be concluded that involvement in TPM activities paves the way for heightened autonomy amongst employees. This evidences the importance of participation of autonomous maintenance for successful implementation of TPM programmes within power plants, and empowerment can be a significant to the development of such programmes. Employee Empowerment is one of the main criteria in TPM implementation. TPM programme will not work without empowering operators or production workers to carry out the autonomous maintenance. However, there is a clear lack of literature that explores the influence of employee empowerment on the autonomous maintenance participation and therefore, this research aims to examine the impact of organisation culture on the participation of autonomous maintenance within power plants.

The second section of this paper discusses the previous studies about TPM, autonomous maintenance, organisational culture and employee empowerment. The third section develops the theoretical framework and postulates hypotheses of this study. The fourth section explains the research methodology. The fifth section presents the results of this study. Finally, the discussion and conclusion are discussed in the sixth section.

II. TPM

Innovative TPM maintenance strategies are utilised for affecting an increase in overall equipment effectiveness. This is achieved by setting up inclusive productive maintenance schemes that cater for the complete life-cycle of equipment [10]. Correspondingly, for the entire lifespan of equipment, TPM allows the establishment of thorough PM systems [9]. It motivates maintenance staff and operators to collectively design high standard good working procedures, focused on improvement and teamwork, which in turn augment equipment and process effectiveness [11] – [12]. Nakajima [9], the chairman of the Japanese Institute of Plant Maintenance (JIPM) in 1971 introduced TPM in Japan and today this system exhibits wide scale adoption, particularly in the manufacturing sectors. Directed to-wards increased performance, availability, and quality, TPM aims to ensure zero defects, zero accidents, and zero equipment failures. TPM is underpinned by principle practices known as 'pillars', specifically: autonomous maintenance; education and training; focused improvement; development management; office TPM; planned maintenance; quality maintenance; and safety, health, and the environment. Correspondingly, an explanation about TPM processes can be found in Nakajima [9], and Reiman and Oedewald [5]. To support the achievement of a TPM philosophy, maintenance staff and operators need to exhibit high knowledge levels, which subsequently allows for job function sharing between colleagues, and new skill development [12]. Implementation of TPM is not easy and faces many obstacles; details about its barriers are articulated by Ahuja and Khamba [13]. However, according to Waeyenbergh and Pintelon [14], there is a lack of clarity in standard maintenance rules and utilisation of simple maintenance policies, and TPM can be limited in providing complete maintenance concepts. Therefore, in the power industry, whether participation of autonomous maintenance can result in robust TPM strategies needs to be further explored. Furthermore, autonomous maintenance is one of the most critical barriers that could affect the successful implementation of TPM [7]. The contributions of autonomous maintenance and planned maintenance pillars enable production operators to run equipment effectively, thus also preventing deterioration [6-9]. Moreover, Ben Daya [10] argues that in TPM implementation, the active involvement of operators results in permanent improvement in the overall effectiveness of equipment. Thus, employee empowerment and equipment management are two fundamental features of TPM. It is pertinent for mechanics and operators to cooperate and work in teams towards the same goals, since there is high significance placed upon the involvement of operators in successful TPM implementation. Thus, empowerment of operators can play a significant part in driving successful participation of autonomous maintenance.

2.1 Organisation Culture and Employee Empowerment

In this study, the authors propose a shift away from the direct and narrow concept of environment (like the workplace) to a broader framework as well as a concept of the indirect environment (like organisational culture). The reason behind this proposal is that culture is one of the most significant, stable and long-lasting factors that impacts upon behaviour and well as cognition. Furthermore, cultural issues also serve as barriers towards successful implementation of TPM. Thus, the current research takes an essential step in the development of proactively integrating culture into the realm and constructs of employee empowerment. Hofstede's theory [22] also assumes that cultural values and dimensions impact on employee empowerment. Moreover, employee empowerment are intrinsic needs for operators to participate in maintenance activities [23]. The element of empowerment is closely related to the emphasis to acquire organisational efficacy through effective and discerning human resource utilisation. Furthermore, empowerment techniques play a key role in improving group development as well as maintenance [18]. Kanter [19] was one of the oldest proponents of the concept of empowerment. She discussed that the organisation characteristics and structures determine the element of empowerment. More specifically formal job characteristics as well as informal partnerships affect the employees' ability to complete their work successfully. Based on the structural empowerment framework of Kanter [19], the researchers evaluated the effect of access to support, power, resources, opportunities and information on the autonomous maintenance (operators) participation in power plants. Kanter [19] defined that power is the ability to organise and secure resources in order to let the workforce complete their job in appropriate way. Employees get empowered (power is 'on') when they are able to access support, resources, information, as well as other opportunities to grow and learn. In case these lines become unavailable (power is 'off'), employees' ability to work effectively reduces drastically. The power lines are 'structural' empowerment sources in the concerned organisation. Kanter points out that these lines emanate from formal as well as informal systems within organisations. Orgambídez-Ramos and Yolanda Borrego-Alés [18], explained that formal power can be obtained from job characteristics. Furthermore, informal power can be sourced from social links, information communication channels with sponsors, friends, bosses, subordinates, and other assistive groups. Accessing these structures result in heightened levels of structural empowerment [18-19].

III. DEVELOPMENT OF THEORETICAL FRAMEWORK

This research paper is concerned with examining the impact of organisational culture and employee empowerment on the participation of autonomous maintenance. Organisation culture that has bad practices may affect the empowerment of employees. Furthermore, workplaces in the UAE have not widely considered organisational culture [20]. According to Al-Khalifa and Aspinwall [21], the quality implementations in organisations are impacted by national cultures, which affects organisational culture, as it is representative of commonly shared society/country values. Correspondingly, the culture differences amongst clustered cultures and nations have four dimensions [22]; and are categorised as (1) "Masculinity-Femininity"; (2) "Power-distance"; (3) "Individualism-collectivism"; and (4) "Un-certainty avoidance" on high or low level positioning of these dimensions. Hofstede [22] provided explanation about each dimension of national culture. On the other hand, the authors took into consideration, the concept of 'structural' empowerment to forecast the participation of operators in the power plants' maintenance activities. Meanwhile they employed these dimensions: (formal and informal power, opportunity, access to resources, access to information, and access to support) in the research model that was premised on Kanter's structural empowerment framework. Considering all these points aforementioned, the present research plans to investigate the relationship between cultural organisation based on Hofstede's cultural dimensions as well as employee empowerment. Furthermore, there is no research which has tackled the issue of how culture affects the employee empowerment with autonomous maintenance (operators) participation in the power industry. Carrying out such a study will contribution towards building upon the existing body of knowledge and hence understanding of the way culture affects the employee empowerment with autonomous maintenance (operators) participation. Based on the aforementioned theoretical framework (Fig. 1), the following hypotheses can be postulated:

- H1:** Employee empowerment has a direct impact on participation of autonomous maintenance (operators) in the power plants.
- H2:** Power distance has a direct impact on employee empowerment.
- H3:** Masculinity versus femininity has a direct impact on employee empowerment.
- H4:** Collectivism versus individualism has a direct impact on employee empowerment.
- H5:** Avoidance of uncertainty has a direct impact on employee empowerment.

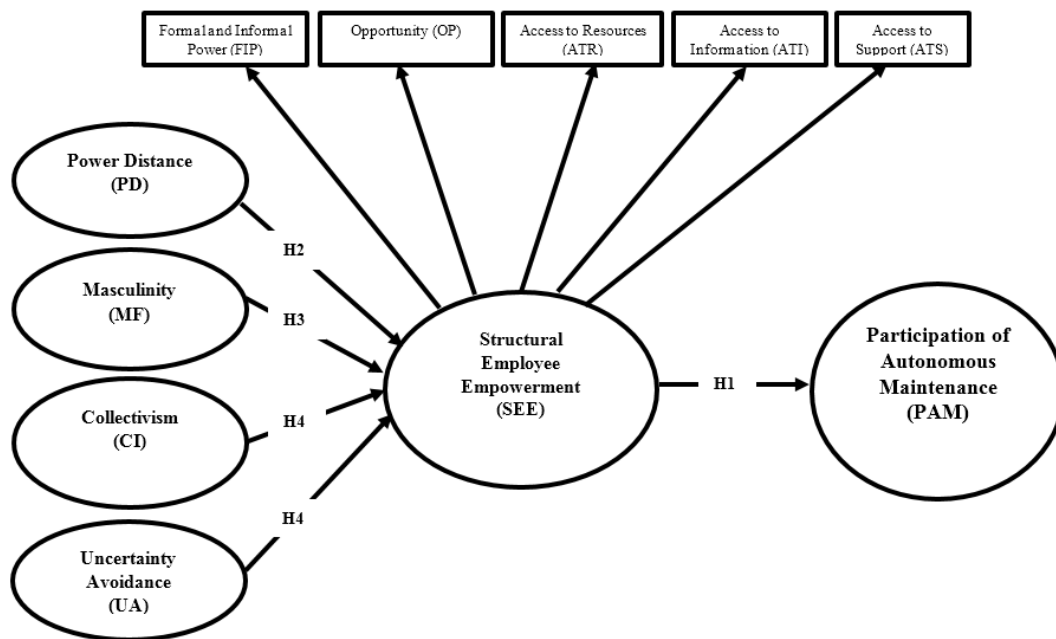


Fig. 1. Theoretical Model

IV. RESEARCH METHODOLOGY

Many industries have shown an understanding of the needs and significance of TPM. However, participation of autonomous maintenance is one of the most critical barriers for implementing TPM due to organisational culture issues. Conversely, within Abu Dhabi power plants, there is little literature to evidence research application in this specific area. Thus, this research paper aims to examine the impact of organisation culture on the participation of autonomous maintenance within Abu Dhabi power plants using a structural equation modeling approach.

3.1 Procedure and Design of Data Collection Tool

Data were collected from 250 professionals in the Abu Dhabi power plants using a postal questionnaire. A sample comprising of three participant organisations was selected based on their experience in operations and maintenance of power plants, particularly in the power sector and included power generation, transmission as well as distribution organisations. A response rate of 89.6% was achieved with the receipt of 250 out of 224 responses. Snowball sampling was used for this study; it is a famous methodology of survey sample selection frequently used to trace hidden populations. The authors used this strategy to recruit people who are often difficult to identify due to critical issues shown in the questionnaire that asked them about current maintenance practices and organisation culture. Structural equation modelling, using partial least squares path analysis (SmartPLS software version 3.0), was performed to test the hypothesised model. Participants in the study were requested to answer three main questionnaires: Hofstede's cultural dimensions questionnaire, structural employee empowerment questionnaire, and participation of autonomous maintenance questionnaire. The authors included multiple items for each construct in addition to a seven Likert scale by deploying declarative statements along with a list of response categories. These statements were rated on a Likert-scale with the range being from 1 (which means strongly disagree) to 7 (which means strongly agree). Participation of autonomous maintenance construct was measured using 5 items, each adapted from previous studies [4 and 6]. Hofstede's cultural dimensions construct was measured using 17 items adapted from Sadeghi et al. [25]. Employee empowerment construct was measured using 19 items, each adapted from previous studies [4, 27, and 28]. In order to measure this construct, the authors used Kanter's theory [19] for structural employee empowerment. This construct is made of 19 statements measuring five types of empowerments: formal and informal power (4 items), opportunity (4 items), access to resources (3 items), access to information (4 items), and access to support (4 items).

3.2 Analytical Methods

This research used statistical techniques to undertake the analysis of data sourced from the questionnaires in order to interpret and analyse the research's results. Statistical and numerical analysis was undertaken through SmartPLS (version 3.2.4) software that employs the concept of partial least squares-structural equation modelling (PLS-SEM) was utilised for examining the relationship between in-dependent

variables (signified by organisation culture factors) and the sole dependent variable (participation of autonomous maintenance in power plants). In this study, the authors considered PLS-SEM due to exploratory nature of the pre-sent study [29]. Also, they used this approach to test new theory since there is no literature that examines the casual relationship between cultural dimensions, structural employee empowerment and participation of autonomous maintenance in the power industry. The second reason for considering PLS-SEM is focus on prediction and development of new knowledge [32]. Furthermore, the authors adopted a two-step approach related to PLS-SEM, based on the findings of Anderson and Gerbing [31]. The first step is an evaluation of measurement model that is used to check the reliability and validity of research constructs and measuring instruments within the research model. The second step is an evaluation of structural model that is utilised to examine path coefficients (hypotheses) between the model's constructs thereby highlighting the path significance of the research model.

V. RESULTS AND ANALYSIS

The authors analysed the research model into two stages. In the first part, the measurement model is studied in order to determine the reliability (internal consistency) and validity (discriminant validity) of the constructs and research instruments. In the second stage, the structural model is analysed in order to test the hypotheses of the research model.

4.1 Results of Measurement Model

Firstly, the measurement model was assessed in order to underpin and meet the convergent validity. This was examined through the average variance extracted (AVE), composite reliability (CR), and factor loadings [32]. In concurrence with Hair et al. [32] the Composite Reliability (CR) was used to measure the constructs' internal consistency. A threshold criterion of 0.70 has been reported for CR [30] and in this study all the included latent variables were found to exceed this threshold criterion. In addition, the assessment of both the parameters of Factor Loadings, and Average Variance Extracted (AVE) were used to assess the constructs' convergent validity. It has been reported by Hair et al. that for social science studies the acceptable factor loadings are between 0.6-0.7 [32]. Similarly, an adequate convergent validity is suggested for cases with AVE value above 0.5 [29, 30, 32]. In this study all the involved latent variables demonstrated AVEs and factor loadings, which were above the recommended levels. Correspondingly, for all the constructs, the results of CR, Cronbach's alpha, and AVE as well as the factor loadings are presented in Table 1 and Table 2.

Forner-Lacker criterion was used to assess the discriminant validity as suggested by Hair et al. [32]. According to this criterion each latent variables' square root of AVE is supposed to be more than its correlation with other latent variable. The authors in the current paper, as such, inferred a higher correlation with other latent variable of each latent variables' square root of AVE with the application of this approach. The correlation matrix and square root of AVE is presented in Table 3.

Table 1: Assessment of Organisation Culture Factors (Hofstede's Model) Measurement Model

Constructs	Items Code	Factor Loading	Average Variance Extracted (AVE)	Cronbach's Alpha	Composite Reliability			
Power Distance	PD1	0.926	0.848	0.955	0.966			
	PD2	0.937						
	PD3	0.932						
	PD4	0.901						
	PD5	0.910						
Collectivism / Individualism	CI6	0.765	0.625	0.800	0.810			
	CI7	0.851						
	CI8	0.757						
	CI9	0.786						
Masculinity / Femininity	MF10	0.886	0.680	0.768	0.800			
	MF11	0.804						
	MF12	0.781						
Uncertainty Avoidance	UA13	0.945	0.917	0.978	0.990			
	UA14	0.966						
	UA15	0.973						
	UA16	0.956						
	UA17	0.948						
	PAM1	0.691				0.582	0.819	0.830
	PAM2	0.856						

Participation of Autonomous Maintenance	PAM3	0.803
	PAM4	0.687
	PAM5	0.765

Table 2: Assessment of Structural Employee Empowerment Measurement Model

Constructs	Items Code	Factor Loading	Average Variance Extracted (AVE)	Cronbach's Alpha	Composite Reliability
Formal and Informal Power	FIP1	0.784	0.552	0.726	0.750
	FIP2	0.809			
	FIP3	0.767			
	FIP4	0.592			
Opportunity	Opp5	0.899	0.761	0.891	0.903
	Opp6	0.933			
	Opp7	0.931			
	Opp8	0.705			
Access to Resources	ATR9	0.719	0.578	0.637	0.804
	ATR10	0.802			
	ATR11	0.758			
Access to Information	ATI12	0.785	0.580	0.817	0.825
	ATI13	0.851			
	ATI14	0.754			
	ATI15	0.734			
Access to Support	ATS16	0.698	0.574	0.751	0.760
	ATS17	0.789			
	ATS18	0.849			
	ATS19	0.682			
	SEE		0.509	-	0.804
Structural Employee Empowerment					

Table 3: Correlation Matrix and Square Root of AVE (Fornell-Larcker Criterion)

Variable	ATI	ATS	MF	EE	CI	Opp	PAM	PD	ATR	FIP	UA
ATI	0.851										
ATS	0.205	0.758									
MF	-0.209	-0.224	0.826								
EE	0.763	0.64	-0.288	0.564							
CI	0.279	0.374	-0.273	0.472	0.736						
OPP	0.938	0.235	-0.213	0.806	0.266	0.872					
PAM	0.135	0.255	-0.128	0.235	0.244	0.127	0.763				
PD	-0.108	-0.098	0.091	-0.163	-0.208	-0.109	-0.011	0.92			
ATR	0.504	0.398	-0.22	0.772	0.336	0.514	0.126	-0.131	0.761		
FIP	0.23	0.417	-0.177	0.618	0.466	0.225	0.213	-0.143	0.369	0.743	
UA	-0.13	-0.112	0.063	-0.187	-0.275	-0.135	-0.117	0.736	-0.154	-0.143	0.958

The values on the matrix diameter show the correlation for the square root of AVE

4.2 Results of Structural Model

The relative importance is highlighted through the significance of each indicator's weight. Also, through boot-strapping process, one can examine the absolute importance, which is represented by the loading. The bootstrapping procedure needs at least equivalent cases as original samples' observation [32]. In the current study, the boot-strap technique with 1000 sub-samples was utilised to estimate T statistic and hence indicate the path coefficients' significance [30]. Furthermore, for the determination of each predictor variable's share in deriving an explanation of the variable variance the criteria of path coefficients are applied as per Hair et al.

[32]. Also, using predictor variables the explained variance of criterion variable is indicated by the R² amount [30]. The authors in this study were used SmartPLS 3 software for modeling and examining the significance of indicators' weights and relevance. The tested model is illustrated in Fig. 2.

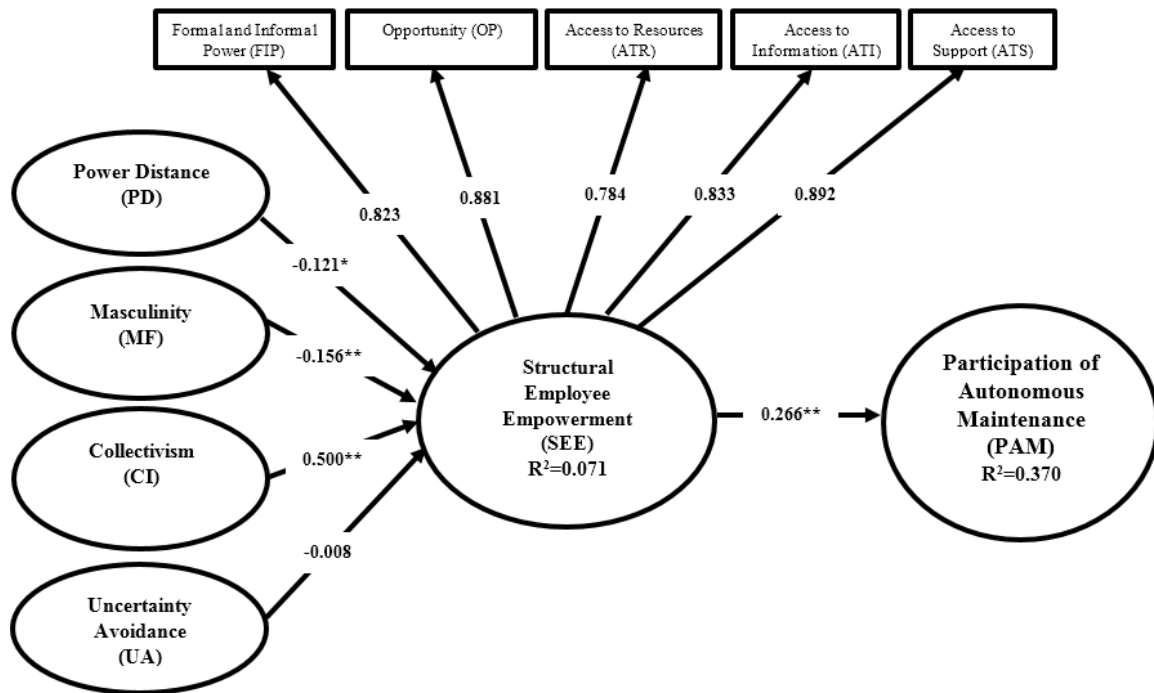


Fig. 2. Tested Model of the Research (* p < 0.05; ** p < 0.01)

As Fig. 2 specifies, the impact of employee empowerment on participation of autonomous maintenance in the power industry is positive and significant at 0.001 (0.47). The impact of power distance (-0.24) and masculinity (-0.22) on employee empowerment is negative and significant at 0.01. However, the impact of collectivism (0.18) on employee empowerment is positive and significant at 0.01. On the other hand, the impact of uncertainty avoidance on structural empowerment was not statistically significant. Furthermore, employee empowerment explains 25% of changes in participation of autonomous maintenance; and cultural dimensions in general explain 22% of changes in employee empowerment. Table 3 shows the results of testing the research hypotheses. According to the Table 3, hypotheses 1, 2, 3, and 4 are supported but hypothesis 5 is rejected.

Table 3 Testing of Research Hypotheses

Statistically Significant (* p < 0.05; ** p < 0.01)

Hypothesis	Path Coefficient(β)	Standard Deviation (S.D)	Significance (P-Values)	Result
Employee Empowerment >> Participation of Autonomous Maintenance	0.266	0.059	0.000**	H1 Supported
Power Distance >> Employee Empowerment	-0.121	0.072	0.046*	H2 Supported
Masculinity >> Employee Empowerment	-0.156	0.054	0.002**	H3 Supported
Collectivism >> Employee Empowerment	0.500	0.056	0.000**	H4 Supported
Uncertainty >> Employee Empowerment	-0.008	0.045	0.432	H5 Not Supported

VI. DISCUSSION AND CONCLUSION

The aim of this study is to examine in-depth the impact of organisation culture on the participation of autonomous maintenance within power plants based on the context of Kanter's structural empowerment framework and cultural dimensions of Hofstede's model. To achieve this purpose, the study proposed a conceptual model, which was underpinned by a cohesive theory and practice review and further structural equation modelling was used on it for a thorough examination. According to study results, in autonomous maintenance participation 37% of the changes were attributed to ensuring employee empowerment. Moreover, in employee empowerment with the use of Hofstede's cultural dimension 7% of the changes were predicted. In addition, it was inferred that employee empowerment had a direct effect on participation of autonomous maintenance, which in turn, signified that empowerment is achieved through: senior management support, association with maintenance team, inter-departmental communication and coordination, rewards and motivation, information sharing and analysing. This furthermore affects positive organisational behaviour with high self-esteem. In addition, employees as regards their day-to-day equipment operation presented higher inclination towards developing a sense of ownership [26]. Herein, for the assurance of TPM success an ownership towards this equipment constitutes a crucial factor. This can be attributed to individual attention and focus of every operator to maintain the equipment through cleaning, tightening, and lubrication in order to keep equipment in good condition and hence achieve the target of as good as new condition. These study inferences are in alignment with the proposed research's theoretical model, which envisages the significant positive effect of meeting employee empowerment on autonomous maintenance participation in the power industry.

Another imperative study finding reveals that power distance negatively impacts employee empowerment. These findings demonstrate the resultant effect of forced compliance to supervisors' directives, authorities taking technical decisions and authorities' perception of restraint on operators for expression of their maintenance issues views. It was found that under these conditions, operators will get less opportunity for growth and they are challenged with limited materials and resources in order to contribute within maintenance activities, limited sharing and analysing of power plants' failure data with the lack of support in form of superiors, peers and subordinate oriented feedback and guidance. This observation can be attributed to the restriction and limitation of autonomy and freedom of action amongst personnel. As a matter of fact, power companies having higher power distance levels provide limited opportunities to their operators for demonstrating their freedom of action, initiation, and competence. In addition, Ramayah et al. [33] state that with concerns of avoiding damage to expensive equipment, managers in some organisations do not trust on the operators' capability and restrict operators from engaging in machine adjustments and repairs. This has been evident in organisations not prepared or inclined towards TPM programme implementation. Moreover, a decrease in trust, confidence, and sense of ownership is seen in power plants, which have hierarchical systems, in combination with managers/supervisors having more power in power utilities. This can be explained by the fact that subordinated relationships lead to more power and associated increase in control, which further deteriorate relationships between members. This finding is in line with Kanter's theory "structural empowerment framework" that high-lights the negative effect of a controlling environment on employee empowerment [19]. The study also significantly highlights that employee empowerment is negatively impacted by masculinity/femininity. Progress and competition are overemphasised with the external motivation promoted through higher masculinity levels in power utilities. According to Sadeghi et al. [25], external motivation is directly related to restrictions in the environment that impacts employee empowerment negatively [19]. Conversely, it is observed that power companies demonstrating lower masculinity levels offer increased opportunities towards employee empowerment. This is attributed to supportive and friendly peer relationships. Also, higher autonomy and augmented sense of ownership in power companies is evidenced amongst operators who support each other as per Nasurdin et al. [34].

On the other hand, the study significantly highlighted that employee empowerment is positively impacted by collectivism. It is inferred that employees in power utilities with higher levels of collectivism have: high loyalty for organisations to achieve their goals, high sense of interdependence, and joint responsibility to systems. This kind of loyalty results in patterns of cooperation between groups and increasing the work productivity. Moreover, high collectivism fosters more informal coordination and communication mechanisms between operators and maintenance staff. According to Kirkman and Shapiro [35], collectivism leads to team empowerment and hence improves work performance through reducing resistance to team participation. Mad Lazim and Ramayah [6] highlighted that communication and coordination between operators and other departments is the critical success factor that may empower autonomous maintenance participation positively.

The current study takes into consideration the correlation matrix, which highlights a negative relationship of Hofstede's cultural dimensions (excluding collectivism dimension) with employee empowerment. This is manifested through formal and informal power, opportunity, access to resources, access to information and access to support. This means that the higher the ambiguity avoidance, power distance and masculinity in power organisations, the less the staff will feel autonomous and skilled. Furthermore, power

organisations with high profiles for power distance, ambiguity avoidance, and masculinity have the distinctive characteristic of limiting individual freedom of action, which in turn affects operator's autonomy adversely. In addition, the efficacy feeling is negatively impacted in such organisations due to the power gap between members. The use of initiative also prevents high ambiguity avoidance rates. This is primarily observed in power organisations displaying an adherence to traditional characteristics that impact competence and efficacy of members negatively. Operator competence similarly is adversely influenced from gaps in focus on innovative activities by individuals, as well as the emphasis on collectivism. Likewise, in masculine societies efficacy feelings can be negatively affected with competition overemphasis resulting in increased pressure on operators' participation within maintenance activities.

According to Hofstede [22] in organisations, change is often resisted due to the cultural values that represent organisation most stable aspects. Also, resistance to change is further augmented due to individual organisational values presented as a subculture in the form of social values. Hofstede also defines the improbability of organisations undergoing direct change in their values as these are in fact, a semblance of a hidden mental software that regulates the behaviour of members. Correspondingly, at a power utility the organisational culture displaying a controlling characteristic and employee empowerment confinement will encounter a challenge in changing such values and regulating the environment's controlling power. According to Hofstede [22] a change in explicit behaviours is the ideal mechanism to affect a change in values. For example, introducing changes in rules and regulations of power companies, with the purpose of impacting a reduction in the environment's controlling power. Such changes, moreover can lead to provision of increased initiation and freedom of action to operators, self-esteem promotion in operators' maintenance participation and also active decision-making as regards maintenance activities. It also validates: (i) system regulations and control; (ii) augmented cooperation within operators; (iii) emphasised freedom of action; (iv) initiative use; and (v) de-emphasis of progress and competition. Notably, in the Abu Dhabi power sector, the centralisation system imposes a reduction in managers' extent of power and assets performance planners. Within the company TPM ideally should be directed and managed by full-time employees with qualities of expertise and enthusiasm according to Park and Han [24]. These coordinators should be equipped to implement TPM methodology with adequate educational qualifications, motivational and persevering temperament, and necessary skills for seamless change process management.

Findings from this study reveal an inversely proportional relationship between power distance and masculinity in an organisation with fulfilment experience of organisation members as regards basic employee empowerment. This will lead to a lower level of operators participation within maintenance activities, which can be a serious threat to the success of implementing a TPM programme within power industry. These findings thus recommend an inculcation of cooperativeness and support amongst members in the power sector by managers and authorities to drive progress and competitiveness with a singular focus on individual needs. Moreover, rather than focusing on the end products of action, it is recommended to encourage members to address the process. With this process-oriented focus, members experience a higher internal motivation with satisfactory workplace. Thus, it is recommended that in organisations to lower the power distance the organisations should adopt moderate hierarchical structure, motivate direct work associations between managers and their staff members. Also, concurrently bureaucracy should be avoided. Moreover, transparent, real-time and sharing of relevant information has been observed to be critical to employee empowerment, as such information sharing is directly proportional to organisational performance. The main deterrents to information sharing are lack of trust and power distance. Thus, organisations should encourage staff and managers to foster workplace relationships which are control-free, direct and more friendly. For employee empowerment support, a two-way communication which is well-structured and developed is crucial. Improved involvement and commitment results in frequent and open communication. This communication can be achieved via formal and/or informal modes and the following personnel should be included in this communication at a power utility: employees, supervisors, shop floor executives, engineers and managers. Such open communication stimulates an augmented understanding of the motives underpinning TPM implementation. Furthermore, operators within maintenance activities participation can be propelled with adoption of various mechanisms of employee empowerment like: rewards and incentive, recognition of the efforts, training for skill improvement, promotion of knowledge and cross functionality. Thus, it can be inferred that empowering operators constitutes a significant criteria in successful implementation of a TPM strategy and their empowerment is necessary to foster a high sense of power plant ownership.

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