

# **THE EFFECTS OF THE INTERACTION OF TECHNOLOGY, STRUCTURE, AND ORGANIZATIONAL CLIMATE ON JOB SATISFACTION**

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## **ABSTRACT**

This study examines the effects of the interaction of technology, structure, and organizational climate on job satisfaction in power-generation plants. Correlation tests and series of hierarchical regression analyses were performed. The study reveals several significant correlations among these three organizational variables and with employee job satisfaction.

Key words: structure, technology, performance, interaction, job satisfaction.

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## **INTRODUCTION**

The question of whether an organization's structure should be designed to accommodate and facilitate technology has been addressed by management advocates in search of the best approaches for an effective organization to adopt. The importance of structure-technology relationship was evident when the issues of whether structures and technology complement each other in successful organizations were widely deliberated in past literature.

Identification of factors that predict organizational effectiveness has in fact become the central themes within the study of organization, and a wide range of factors had been examined, such as technology, structure, strategy and environmental conditions (e.g., Burns and Stalker, 1961; Lawrence and Lorsch, 1967; Thompson, 1967; Woodward, 1965).

Most researchers seem to focus on the issues of technology and structure, with little consideration of organizational climate's role and contribution to the organization. Studying organizational climate's relationship to technology and structure could reveal some new insights for managers to achieve a higher organizational performance.

Technology and organizational structure have been studied mainly in manufacturing and service organizations (e.g., Woodward, 1965; Perrow, 1967; Thompson, 1967), while little or no work has been carried out on power-generation organizations. Previous studies were more focused on the relationship and correlation of the contextual variables, rather than examining the effects of contextual variables when interacting with one other.

Therefore, this study attempts to examine the interaction effects of these selected organizational contexts—structure, technology, and organizational climate—on organizational performance, specifically job satisfaction, i.e. job attitudes that contribute towards achieving organizational goals. It is strongly viewed that the interactions of these organizational contexts affect job satisfaction. Investigating each pair of factors—technology and structure, structure and organizational climate, technology and organizational climate—at the same time enables a different effect to be detected, i.e. the interaction effect, which has been of little interest in previous research work.

## **LITERATURE REVIEW**

Technology and structure, as aforementioned, have been studied in relation to organizational performance (e.g., Woodward, 1965; Perrow, 1967). Woodward (1965) found in her research that there was a link between technology, structure, and effectiveness of the organization. Perrow (1967) further developed an understanding of the impact of technology on organizational structure. In studies that examined the contribution of organizational climate towards organizational performance, Muchinsky (1979) found that job satisfaction and organizational climate were correlated. Other studies have also shown similar results (e.g., Johnson and McIntye, 1998).

### **Job Satisfaction**

Blum and Naylor (1968) defined job satisfaction as a general attitude formed as a result of specific job factors, individual characteristics, and relationships outside the job. Job satisfaction is an individual's general attitude toward his job, which is also conceptualized as a personalistic evaluation of conditions existing on the job—work, supervision, or outcomes, that arise as results of having a job (Schneider and Snyder, 1975). Smith et al. (1969) treated job satisfaction both as a general attitude and as satisfaction with five specific dimensions: pay, work, promotion, supervision, and co-workers.

### **Organizational Structure**

Organizational structure defines how job tasks are formally divided, grouped, and coordinated. It is defined as the hierarchical relations among members of the organization (March and Simon, 1958), and is viewed as facilitating interaction and communication for coordination and control of the organization's activities (El Louadi, 1998). It is implemented in terms of specialization, formalization, and centralization. Specialization refers to the number of occupational specialties, and the length of training required by each (Hage, 1965), or the degree to which highly specialized requirements are spelled out in formal job descriptions for various functions (Reimann, 1974). Formalization refers to rules, procedures, and written documentation, such as policy manuals and job descriptions, that prescribe the rights and duties of employees (Walsh and Dewar, 1987). Centralization refers to the level of hierarchy with authority to make decisions (Thompson, 1967). The design of

an appropriate structure is vital in achieving performance and accomplishing organizational goals.

### **Technology**

Technology has been defined in many ways. According to Little (1981), technology refers either to a practical application of science to address a particular product or manufacturing need, or to an area of specialized expertise. A number of previous studies have shown the effects of technology on people's behavior, the most notable being Blauner's (1964) study. This study revealed how changes in technology have effects on people's behavior in the workplace, while technology changes that did not account for human factors were likely to result in low morale and productivity (Trist and Bamforth, 1951). These findings highlighted the importance of technology in affecting employees' behavior, thus determining performance.

### **Organizational Climate**

Organizational climate refers to workers' perception of events and conditions that occur in their work place (Schneider and Snyder, 1975). The construct has evolved within the research tradition stemming from the Human Relations approach to organizational effectiveness, but little work was done on whether organizational climate predicts organizational performance.

The controversy over the conceptualization of organizational climate derived from whether it is redundant with other concepts and whether it is useful. Some evidence was found to show that organizational climate and job satisfaction are related (e.g., Johnson and McIntye, 1998; Muchinsky, 1979), whereas other evidence has shown that while organizational climate and job satisfaction are related, they are not of the same construct (LaFollete and Sims (1975). In the Malaysian context, Razali (1999) conducted a comparative study which supports this latter finding. In a modern organization, employees prefer to work under the climate of flexibility, where they feel that they are part of the organization, and are given some opportunity in decision making.

## **METHODOLOGY**

### **Sample**

The coverage of the survey was sufficiently representative as it included all the 18 power plants in Peninsular Malaysia, Sabah, and Sarawak: 14 owned by the national power producer, Tenaga Nasional Berhad (TNB), and 4 private or state-owned power plants.

The population of the survey consisted of employees working in the power plants which consisted of rural station, hydro, and steam/gas turbine types. The survey was a simple random sampling as employees who were on duty were requested to respond to the questionnaires. The respondents randomly comprised employees at all levels: lower, middle,

and top; they were of different cultural backgrounds and age groups. The total sample size in this study was 345, which was almost 20% of the total of 1768 employees, and they fulfilled the variability on the subject being studied, specifically in relation to the structural, technological, and organizational-climate aspects. The total number of questionnaires distributed was 536, out of which 345 questionnaires were completed and qualified for data analysis.

## **Measurement**

A total of 85 questions were included in the final set of the questionnaire, assessed on a 7-point Likert scale. Measures on technology were developed through an adaptation of Hickson et al.'s (1969) measures, which consisted of 11 items for automation, work flow rigidity, and work flow interdependence. Twenty-five items for structure were derived from an adaptation of Hage and Aiken's (1969) measures, which were mainly based on structural variables of specialization, formalization, and centralization dimensions.

The organizational-climate measure was based on Taylor and Bowers (1972) and consisted of 21 items covering seven dimensions of organizational climate. These were decision making, communication flow, influence and control, organization of work, emphasis on people, coordination, and bureaucracy (see also Jainabee et al., 1997).

Job satisfaction, the dependent variable in the study, was measured using an adaptation of the Job Description Index (JDI) (Smith et al., 1969), which was used to measure the affective responses to satisfaction. The questionnaire consisted of items on employees' satisfaction with job, satisfaction with co-workers, and satisfaction with supervisor; these provided information on employees' feelings and perceptions toward their job, workplace and organization.

The demographic profile consisted of 10 items that asked the respondents to provide information on their age, race, gender, education level, training, tenure, and position level. In addition, respondents were also asked to indicate the type of power plant that they were working in.

## **RESULTS**

### **Sample Profile**

The sample comprised 93.6% male respondents and 6.4% female respondents. The higher percentage of male respondents was expected due to the nature of the jobs in the power plants requiring workers with technical skills. The highest percentage of respondents participating in the survey was in the age range of 36 to 40 years (24.6%), followed by respondents in the age range of 41 to 45 years (21.7%). Respondents above 50 years of age comprised only 7.2% of the sample, while respondents below 20 years of age contributed to a very small number (0.6%). Forty-nine percent of the respondents worked as auxiliary workers, 25.2% were in the supervisory capacity, 21.9% were executives or engineers, and 1.7% were functional managers or plant managers. The majority of the respondents (59.1%)

had worked in the organization for more than 15 years, 33.8% had worked between 6 to 15 years, and 6.4% had worked for less than 5 years.

### Reliability Analysis and Intercorrelation Analysis for all Study Variables

In order to estimate the reliability of the scale for each factor, the Cronbach's coefficients alpha were computed for each identified factor. The means, standard deviations, Cronbach's alpha, and zero-order correlation of all studied variables are presented in Table 1. Mean values for all study variables are reported to be in the range of 3.83 to 5.57, while their standard deviations ranged from 1.01 to 1.39.

The results of the reliability analysis are shown in bold on the diagonal. The results showed that most of the dimensions attained reliability coefficients of above 0.60 Cronbach's alpha, with the exception of specialization that indicated a reliability coefficient of 0.56 and considered acceptable. In general, there is an adequate internal consistency reliability of the variables in the study. Nunally and Bernstein (1994) suggested coefficients alpha of value 0.70 to be considered as good, and a value exceeding 0.60 to be acceptable.

Table 1. Means, Standard Deviation, Cronbach's Alpha, and Zero-Order Correlation of all Study Variables

	1	2	3	4	5	6	7	8	9	10
<i>Technology</i>										
1. Work flow integration	<b>.60</b>									
2. Automation	.33**	<b>.61</b>								
<i>Structure</i>										
3. Specialization	.20**	.31**	<b>.56</b>							
4. Formalization	.16**	.17**	.43**	<b>.84</b>						
5. Centralization	.17**	.17**	.34**	.46**	<b>.75</b>					
<i>Climate</i>										
6. Decision making	.05	.04	.23**	.44**	.29**	<b>.90</b>				
7. Org. of work	.09	.05	.31**	.52**	.28**	.66**	<b>.83</b>			
8. Bureaucracy	.09	.02	.11**	.04	.11**	.18**	.50	<b>.83</b>		
9. Positive influence	.11*	.06	.26**	.45**	.28**	.69**	.55**	.31**	<b>.65</b>	
10. Job satisfaction	.09	.14**	.38**	.45**	.36**	.54**	.51**	.08	.46**	<b>.86</b>
Mean	5.34	5.07	5.57	4.73	4	4.26	4.48	4.71	3.83	5.16
Standard deviation	1.39	1.37	1.01	1.2	1.34	1.07	1.04	1.13	1.15	1.39
No. of items in questionnaire	3	3	7	5	3	9	7	3	3	10

\*  $p < 0.05$ ; \*\*  $p < 0.01$ .

## Regression Analysis

Hierarchical multiple regression analysis was used to test the interaction effects of each of the dimensions of technology, structure, and organizational climate. The first three steps of the hierarchical regression produced results on the main effects of each of the contextual factors on job satisfaction, while steps four, five, and six involved data analyses for the two-factor interaction variables.

The significance of each block of variables for steps 1 through 6, respectively, was based on the significance of  $R^2$  change for each step. The  $R^2$  change represents the percentage of variability in the dependent variable that was explained by the identified significant factors within the block. The corresponding standardized beta value for each of the identified significant variables within the block represents its respective predictive ability.

Table 2 shows the results of regression analysis for the interactions among technology, structure, and organizational climate on job satisfaction. Models 1, 2, and 3 show the main effects of technology, structure, and organizational climate on job satisfaction, whereas Models 4, 5, and 6 show the interaction effects of technology-structure, technology-climate, and structure-climate on job satisfaction, respectively.

In Model 1, automation was found to have a significant effect ( $p < 0.05$ ) on job satisfaction, while in Model 2, all of the structure factors revealed significant contributions to the variability in job satisfaction. In Model 3, organization of work and decision making, being two of the organizational-climate factors, were found to have significant ( $p < 0.01$ ) effect.

In Model 4, the interaction of technology and structure was not significant in predicting job satisfaction, indicating that the two independent variables did not have any interaction effect on job satisfaction. However, the interaction of technology and organizational climate in Model 5 revealed two significant interaction effects. They are automation and decision making interaction, and work flow integration and decision making interaction. Three significant interaction effects were revealed in Model 6, that is, the interactions of specialization-organization of work, centralization-organization of work, and specialization-decision making.

Table 2. Summary of Results of Hierarchical Regression Analysis, Regressing Job Satisfaction on Technology, Structure, and Climate, and Their Interactions

Model	1	2	3	4	5	6
<i>Technology</i>						
Automation	.13*	.02	.03	.43	.75	.24
Work flow integration	.05	-.02	-.02	-.39	-.37	-.07
<i>Structure</i>						
Specialization		.19**	.16**	-.14	-.11	.11
Formalization		.26**	.06	.46	-.02	.07
Centralization		.18**	.13**	.16	.17	-.12

Table 2 (continued)

Model	1	2	3	4	5	6
<i>Climate</i>						
Organization of work			.21**	.20**	.77**	.09
Bureaucracy			-.07	-.06	-.45	.45
Positive influence			-.06	-.05	.45	-.29
Decision making			.29**	.29**	.30	1.56**
<i>Technology by Structure Interaction</i>						
Automation by specialization				.47	.29	.63
Work flow integration by specialization				.06	.17	-.23
Automation by formalization				-.71	-.36	-.01
Work flow integration by formalization				.10	.49	.43
Automation by centralization				-.09	.10	.07
Work flow integration by centralization				.05	-.13	.23
<i>Technology by Climate Interaction</i>						
Automation by organization of work					-.06	-.40
Work flow integration by organization of work					-.72	-.90
Automation by bureaucracy					.21	.19
Work flow integration by bureaucracy					.25	.38
Automation by positive influence					.42	.24
Work flow integration by positive influence					-.93	-1.22*
Automation by decision making					1.17*	.81
Work flow integration by decision making					1.14*	1.78*
<i>Structure by Climate Interaction</i>						
Specialization by organization of work						.99*
Formalization by organization of work						-.05
Centralization by organization of work						.97*
Specialization by bureaucracy						.21
Formalization by bureaucracy						-.74
Centralization by bureaucracy						.26
Specialization by positive influence						1.22*
Formalization by positive influence						.34
Centralization by positive influence						.25
Specialization by decision making						2.80**
Formalization by decision making						.61
Centralization by decision making						-.86
$R^2$	.02	.26	.41	.42	.45	.53
$\Delta R^2$	.02	.23	.15	.01	.03	.08
Sig. $F$ Change	.02	.00	.00	.43	.06	.00

\*  $p < 0.05$ ; \*\*  $p < 0.01$ .

## **DISCUSSION AND CONCLUSION**

The study revealed some significant findings derived from the interactions among the three independent variables (technology, structure, and organizational climate). The results partially support the effects of technology and organizational climate, and substantially support the effect of structure, on job satisfaction. As for the interactions, technology-structure interaction hypothesis was not supported, while technology-climate and structure-climate interactions were partially supported. The results also showed the effects of the independent variables on job satisfaction. The interaction of technology and structure did not contribute to any significant outcome. However, in the technology and organizational climate interaction, two interaction effects were found significant for job satisfaction. The interaction of structure and organizational climate variables revealed a higher number of significant effects.

In examining the effect of technology on job satisfaction, automation was found significantly predictive of job satisfaction. Technology was indicated to have influenced employees' job satisfaction when its variable, specialization, indicated higher scores along with job satisfaction. A study by Sharma and Bhaskar (1991) in determining job satisfaction among engineers in India revealed similar results where they found work technology to be positively and significantly related to job satisfaction. The findings are consistent with the literature on organization theory (Thompson, 1967), citing technology as an organizational context that has great influence on organizational effectiveness.

In examining the effects of structure on job satisfaction, the results showed a marked consistency in the effects of specialization, formalization and centralization on job satisfaction. Structure's significant effect on job satisfaction was consistent with Hage's proposition (Hage, 1965). Some of the organizational-climate factors were found significantly predictive of organizational effectiveness. The significant effect of decision making on job satisfaction supports the notion that employees allowed to participate in decision making will be likely to have higher job satisfaction. The finding was also in line with the empowerment model of management, whereby a participative workplace climate is created to provide opportunity for employees in decision making (Spritzer, 1996). The empowerment model generally assumes that organizational performance improves when hierarchy is reduced and delayering disposes power to workers (Miles and Snow, 1995).

The zero-order correlation coefficients also suggest that job satisfaction and the four organizational-climate dimensions, for the most part, were significantly related. The results of the study are consistent with the previous findings (e.g. Muchinsky, 1979; Pritchard and Karasick, 1973; Schneider, 1973). As expected, bureaucracy was not significantly related to job satisfaction. This finding is in line with the result obtained by Sharma and Bhaskar (1991).

Employees have higher job satisfaction when they are given the opportunity in some form of decision making. Employees working in highly automated plants showed higher job satisfaction level compared to those working with lower automation technology.

Two factors of structure, specialization and centralization, were found significant in their interactions with organizational climate. The interactions showed the importance of work to be organized in an organization practicing high specialization and centralization. Organization of work is important in a situation where control is with the centralized



authority and work is specialized. Employees, thus, interact and communicate efficiently through a structure of well-defined rules and procedures.

Specialization and decision-making climate also revealed a significant interaction on job satisfaction. Variation in job satisfaction indicated by employees of high and low specialization is depicted by the difference in means of the two levels, given less opportunity in decision making (indicated by low decision making). As employees were given more opportunity to participate in decision making, the situation changed—employees of both levels of specialization did not show any variation in job satisfaction.

The findings of the current study provide some insights into plant managers on improving their technology in meeting organizational goals. Job satisfaction was found to be significantly correlated to the three organizational contexts—technology, structure, and organizational climate—denoting the presence of the three variables as organizational mechanisms that are imperative to achieving organizational effectiveness. Employees working in plants of high technology showed high job satisfaction, where opportunities to learn new skills and new technology were available within the power-generation industry. Plant managers may consider organizational climate for better performance of their organizations.

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