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Research Article

Structural Determinants of Organizational Effectiveness

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Abstract

Increasing organizational effectiveness is one of the most important organizational goals for almost all organizations in every industry. This study reviews the function of organizational structure for increasing organizational effectiveness especially by focusing on software industry organizations. The structural variables considered in this research are formalization, specialization, centralization, organizational age and size. The survey prepared according to the research model was responded by 120 software firms. The collected data were analyzed using statistical test techniques. The findings show that formalization and specialization increase organizational effectiveness. On the other hand, increasing the organizational size decreases the organizational effectiveness. The results indicate that software companies should stay at small scales in their organizational size while increasing their organizational performances with the help of specialization and formalization.

Keywords: Organizational structure, organizational effectiveness, formalization, specialization, centralization, organizational size

Introduction

It is obvious that the software industry is sustaining its continuous growth worldwide. Therefore, the growth and evolution of software industry has been the interest of theorists and practitioners in terms of strategic management, industrial economics, organization theory and psychology (Nambisan, 2002). There are various researches to evaluate internal and external environmental factors of software industry, such as organizational resources and qualifications, innovation, organizational learning and organizational structure (Lee et al., 2008; Nambisan, 2002; Koc, 2007; Mehra and Dhawan, 2003; Therin, 2003; Ajila, 2006). Besides, some studies have provided descriptive analysis of software services industry (Arora et al, 2001; Mohamed et al, 2009; Iyidogan et al, 2006). The Israeli and Irish software industries have major roles in the world wide software industry, together with the Indian software industry being a major competitor to them (Arora et al, 2001).

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Literature Review and Hypotheses

Organizational Effectiveness

Since organizational effectiveness is a complex concept, there are a number of approaches to explain what it means. Various organizational theories are structured based on the different conditions and organizational factors while effectiveness is one of the most used criteria (Baker et al., 1997; Ajila, 2006). The strategic-constituencies approach is a theory that evaluates the organizational effectiveness according to the identified common aims and strategies of organizations (Papadimitriou and Taylor, 2000). According to Kushner and Poole (1996) the effectiveness of an organization can be evaluated using four components which are resource acquisitions, efficiency, goal attainment, and customer satisfaction. Parhizgari and Gilbert (2004) assume that a domain including effective factors can be defined with its constraints due to feasibility considerations for each company, or each industry, or each sector and the measurement of organizational effectiveness could be done based on this domain of effective factors using the views of the employees and/or the customers.

Organizational structure has an important part in determining organizational effectiveness, and practices of organizational structure are context specific (Zheng et al., 2010). A successful organizational structure facilitates managerial issues, provides great potential for improving organization's competitive power, innovation capability and labor force relations while lowering expenses. McDermott and Stock (1999) analyze the relationship between organizational factors and innovation considering the operational benefits such as improvements in productivity and flexibility, advantages in business processes, information exchange, coordination of tasks, managerial control and competitive success characterized by increase in sales, market share and profits.
When the organization is a software firm, the organizational performance may also be evaluated using four impact items such as impact on software development, overall performance, cost and customer satisfaction (Ajila, 2006).

Organizational Structural Determinants

Age

Although there are a large number of studies for exploring the relationships between organizational context and various independent variables like innovativeness, organizational climate and organizational performance, organizational age has received less attention from scholars of organization theory (Nystrom et al, 2002).

Some arguments in support of a positive association between organizational age and organizational effectiveness can be developed by considering that older organizations tend to be larger and wealthier. However, Nystrom and Starbuck (1984) highlighted that not all organizations prolong to grow larger and healthier as they age. Only some of them can survive over time and others fail to adapt to rapidly changing environmental conditions. Besides, some researchers utilize age as the representative of the experience of a company in a specific industry. Audrestch (1995) explains organizational performance as positively related with the age of a company given that, the company is eligible based on the years of activity.

According to Durand and Coeurderoy (2001) the age of a company causes a decrease in company performance and therefore, young companies produce better results than older ones. Older organizations become isolated and slow down with the trap of repeated tasks, they do not try and learn new ways of doing things, they do not innovate and therefore, their effectiveness weakens and deteriorates (Dunne and Hughes, 1994).

In the context of this study, organizational age is tested to see whether or not it affects

the organizational effectiveness in the software industry:

Hypothesis 1: The Organizational age affects the organizational effectiveness of a software company.

Size

There is a long-standing research area for the relationship between organizational size and organizational structure (Pfeffer and Leblebici, 1973; Scott, 1975; Mileti et al, 1977; Hsu et al, 1983). The size of a software company can be a good evidence of an achieved reputation (Ajila, 2006). Blau (1970) proposed generalizations and propositions about the influence of size on structural differentiation in organizations. Besides, Hsu et al. (1983) made an analysis to discover the linkages among organizational context, organizational complexity and bureaucratic control and found that specialization, organizational size and formalization are interrelated. Additionally, it is emphasized that there are positive correlations between the size and the number of departments, the number of hierarchical positions and the financial resources, that department managers are allowed to use without taking approval of their super ordinates (Pfeffer and Leblebici, 1973).

Although the size is an essential variable for organization theory, there are not enough findings at empirical level. Hal et al. (1967) claimed that no consistent linkage exists between size and other structural variables, and the findings indicated the irrelevance of size in determining organizational structure. These claims suggest that organization size does not have a close relation with formalization and complexity. Therefore, the organization size should be taken as a questionable variable about its deterministic role on organizational structure. Additionally, there is no significant connection between size and decision making, and reporting procedures (Pfeffer and Leblebici, 1973). Although the general perception for large organizations is connected to high goal achievement and performance, it is reported that small software companies have higher performances (Alija, 2006). According to Hal et al. (1967) larger organizations have a slight tendency for being more formalized even though the relationship between organizational size and formalization is very weak.

In the context of this study, organization size is represented with the number of employees in the company and the following hypotheses were developed:

Hypothesis 2: Organization size affects the organizational effectiveness of a software company.

Hypothesis 3: As software company gets larger in size, its degree of formalization increases.

Hypothesis 4: A relationship exists between the organization size and the degree of centralization of a software company

Formalization

The “formalization” indicates the amount of written principles, policies, procedures, rules for managing business processes and relations among employees (Pertusa-Ortega et al., 2010). In other words, when the degree of formalization is high in an organization, the duties and rights of labor force, ways of doing things at all levels are clearly described and written (Willem and Buelens, 2009).

If an organization has a formalized structure, the attitudes of its employees are organized, frequent and effective (Pertusa-Ortega et al., 2010). Besides, formalization improves and facilitates the cooperation and collaboration among the members of the organization. These advantages will increase the quality of all activities in the firm. Beckmann et al. (2007) claim that formalization has a positive correlation with the quality of the products and services which is an essential part of the organizational performance.

Schminke et al. (2002) emphasizes that the broad rules and procedures can increase

the individuals' confidence for acting similarly in equivalent situations. Employees can be anticipated to carry out the same input in exactly the same way, and finalize the task with a consistent and uniform output. Dunford et al (2007) investigated the coexistence of "old organizational forms" and "new organizational forms" in dynamic business environments like formalization together with speed, flexibility and innovation. The study explains that formalization may have advantages for some business processes. When routine tasks are highly formalized and non-routine tasks are not, it is possible to observe rising organizational performances (Baum and Wally, 2003). Nahm et al. (2003) analyzed the interactions between organizational structure, production time and manufacturing performance and concluded that formalization and the degree of hierarchy influences decision making and communication significantly and positively in the firm. Based on these literature findings the following hypothesis was developed:

Hypothesis 5: As the degree of formalization increases in a software company, its organizational effectiveness increases.

Centralization

The "centralization" is the degree which indicates the concentration of decision making authority by a person, department or a level in the organization (Schminke et al, 2002). When the degree of decentralization is high, authority is delegated to all levels, and employees have enough rights to execute their activities in a fast and competent manner without waiting the approval of an upper level manager (Andrews et al, 2008). Literature contains findings showing that organizational effectiveness is influenced positively by centralization (Ruekert et al, 1985). However, some other findings in the literature claim that organizational effectiveness may be influenced positively by decentralization (Burns and Stalker, 1961; Dewar and Werbel, 1979; Schminke et al, 2002). It is demonstrated that decentralization fosters communication in the organization and creates a workplace with more satisfied and motivated employees (Burns and Stalker, 1961; Dewar and Werbel, 1979). Free flow of communication is conducive, decision-making heavily depends on the specialists rather than the managers (Burns and Stalker, 1961) and faster response to changing market requirements is possible (Schminke et al, 2002). Contrary to many studies that claimed existence of a negative correlation between formalization and centralization, a higher degree of formalization cannot mean being more decentralized because of two reasons: a well-combined, advanced information system and an intend to be more defensive in uncertain environments (Wang, 2003). Besides, when the organizational environment is not stable, the top level of an organization may prefer to arrange decision making processes with a centralized approach while decentralizing operational level. Another important point for software companies is that there is a negative relationship between centralization and innovation.

Wang (2003) emphasizes that although formalization and centralization are usually considered as solid structural characteristics which can restrain the firm effectiveness, the rigid organizational structures classically defined in the organizational literature may in fact enhance the organizational effectiveness. Therefore, the following hypotheses will be tested:

Hypothesis 6: Centralization affects organizational effectiveness of a software company.

Hypothesis 7: A relationship exists between the degree of formalization and centralization in a software company.

Specialization

The "specialization" is the degree of dividing organizational assignments into smaller pieces of work, and employees are

held responsible for only one or a small number of these tiny tasks (Mintzberg, 1989). Therefore, only one person or a group of people gain special expertise on a specified part of a job (Grant, 1996). Specialization is extended to knowledge complexity, unit differences, interdependency and different specialties found in an organization (Willem and Buelens, 2009). In order to evaluate knowledge complexity there are two variables taken into consideration: One of them is occupational specialty, and the other variable is the time necessary to acquire a special skill or expertise (Hal et al, 1967). Interdependency is another concept explaining the degree of necessity for departments to work together. Interdependency and differences among units can both be developed in the decentralized organizations. While studying the impact of formalization, centralization, and specialization on knowledge sharing among the departments of an organization, Willem and Buelens (2009) found that specialization has an essential effect on the organizational communication especially considering interdependency and knowledge complexity. However, it is suggested that an optimum in the formalization should be an advantage to enhance the knowledge sharing and organizational performance. The following hypotheses will test two of the relationships mentioned in the literature for the software industry:

Hypothesis 8: As the degree of specialization increases in a software company, its organizational effectiveness increases.

Hypothesis 9: A relationship exists between specialization and formalization in a software company.

Hypothesis 10: The influence of age, size, formalization, centralization and specialization on determining organizational effectiveness level can be expressed with a linear equation.

Methodology

The research model consists of six dimensions which are organizational age, organizational size, formalization, centralization, specialization and organizational effectiveness. As shown in Figure 1 organizational effectiveness is dependent dimension of the model. The variables used in determination of organizational effectiveness level are customer satisfaction, quality, time management, employee resources management, employee satisfaction, internal communication, management ability, long-term support after project releases and additional employee assignment during the project releases. Organizational structure factors such as organizational age, organizational size, formalization, centralization and specialization are the independent dimensions of the model. The model aims to investigate the impact of organizational structure dimensions on organizational effectiveness. The relationships of organizational structure dimensions among each other will be second degree findings of the research.

As the survey instrument, a web-based questionnaire has been designed based on the literature study. The survey aims to capture all essential key points of organizational structure variables, and organizational effectiveness of software firms in the sample.

The draft questionnaire has been applied to some employees working in the software industry and then, the survey questions have been revised considering the feedback obtained from the participants. The questionnaire has been finalized by adding questions about organizational age, organizational size, and firm services for comparing the sample with those of previous works focusing on the software industry.

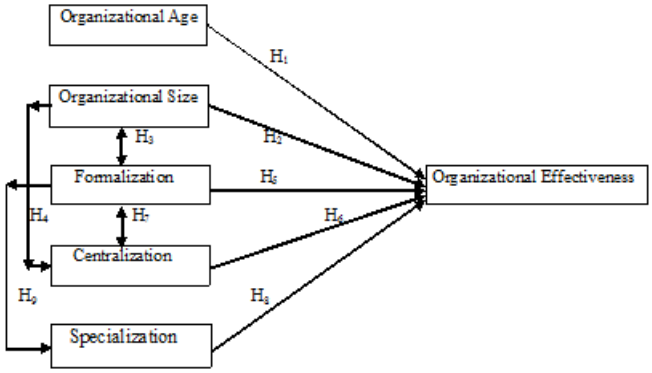

Figure 1: Research Model

The questionnaire and/or survey link has been sent to employees working for software industry. From the electronic version and face-to-face visits, 127 responses were collected. The rule was "one survey for each software company". Duplicate responses detected by IP address controls and by reviewing specific questions in the questionnaire and then, the average values of the duplicate answers were used as of one questionnaire in data entry. After the elimination of 5 invalid responses the sample included 120 responses of which 117 fully and 3 partially are completed. The data are checked and transformed to the appropriate format and then, analyzed by using SPSS 18.0.

Table 1: Organizational size of the companies

Employee Number	Frequency	Percent	Cumulative Percent
1-5	15	12.5	12.5
6-10	13	10.8	23.3
11-30	20	16.7	40.0
31-50	10	8.3	48.3
51-100	21	17.5	65.8
101-200	8	6.7	72.5
201-300	5	4.2	76.7
+300	28	23.3	100.0
Total	120	100.0	

Table 2: Establishment dates of the companies

Establishment Date	Frequency	Percent	Cumulative Percent
Before 1980	14	11.7	11.7
1980-1985	3	2.5	14.2
1986-1990	7	5.8	20.0
1991-1995	19	15.8	35.8
1996-2000	19	15.8	51.7
2001-2005	29	24.2	75.8
2006-2010	29	24.2	100.0
Total	120	100.0	

Table 3: Hierarchy levels in the companies

Hierarchy Level	Frequency	Percent	Cumulative Percent
2 or less	31	25.8	25.8
3	39	32.5	58.3
4	22	18.3	76.7
5 or more	28	23.3	100.0
Total	120	100.0	

Results

In the sample 51.7% of the companies have more than 50 employees as it can be seen in Table 1. Table 2, illustrates that 64.2% of the companies are established after 1996. 41.7% of the organizations in the sample have 4 or more hierarchy levels. Mean values for all variables can be seen in Table 4.

Software companies provide services on software, hardware and consultancy. 85% of the companies in the sample offer software services by more than 50% of their activities. In the sample, 54 % of the software companies are subject to regular audit for a certificate. In the study done by Iyidogan (2006), it is seen that the ratio of software companies having regular audit is 48% for a similar sample. When two ratios are compared although there is an increase, the tendency for having regular audit is still low. Low audit ratio indicates that formalization is not high. The high costs of application and evaluation phases, insufficient attention to apply a certificate and "no need" perception are the main reasons of not having a quality certificate (Iyidogan, 2006).

Table4: Mean values of responses for variables

Variable	N	Minimum	Maximum	Mean	Std. Dev.
Organizational Age	120	1	7	3.09	1.93
Organizational Size	120	1	8	4.61	2.44
Services-Software Ratio	120	1	4	3.51	0.79
Services-Hardware Ratio	120	0	4	0.63	0.90
Services-Other Ratios	120	0	4	0.76	1.06
Regular Audit	120	0	1	0.54	0.50
Certification Tendency	51	1	3	1.59	0.61
Number of Hierarchy Levels	120	1	4	2.39	1.11
Number of Departments	120	0	8	4.41	2.42
Formalization	120	1.13	5.00	3.42	0.72
Centralization	120	1.10	4.20	2.66	0.53
Specialization	120	1.00	5.00	3.49	0.76
Organizational Effectiveness	117	1.83	4.67	3.48	0.59
Long-term Support	120	1	5	2.71	1.08
Additional Employee Assignment	120	1	5	3.22	1.16
Customer Complaints	120	1	5	3.59	0.93
Project Cost Management	120	1	5	3.28	1.01
Customer Satisfaction	119	1	5	3.87	0.82
Quality	120	1	5	3.94	0.81
Time Management	120	1	5	3.45	1.04
Employee Resources' Man.	120	1	5	3.52	1.07
New Customer Capability	119	1	5	3.47	1.13
Employee Satisfaction	119	1	5	3.48	1.07
Communication in the Firm	120	1	5	3.78	1.06
Management Ability	120	1	5	3.45	1.19

Reliabilities of each scale of the survey instrument were tested using Cronbach's alpha coefficient. Higher Cronbach's alpha coefficients indicate greater reliability among the indicators (Zhu et al., 2002) which is true for *organizational effectiveness*, *formalization* and *centralization.* As shown in Table 5, *specialization* has a relatively moderate level of reliability indicating lower internal

consistency among the questions of this dimension. Age and size are not in Table 5 due to the nature of these questions, and the related data can be seen in Table 1 and Table 2.

Table 5: Scale Reliabilities

Scale	No. of items	Cronbach's alpha
Organizational effectiveness	10	0.814
Formalization	8	0.756
Centralization	10	0.701
Specialization	3	0.615

Table 6 shows correlation analyses among dimensions. Pearson correlation coefficients indicate that *organizational age* has significant positive correlations with *organizational size* and *centralization*. However, a negative significant correlation with a low Pearson coefficient of -0.277 exists between *organizational age* and *organizational effectiveness* which supports H_1 just like the literature does. *Organizational size* also has a significant negative correlation with organizational effectiveness (-0.390) which proves H_2. There is no significant correlation between *organizational size* and *formalization*, so H_3 is not supported. The significant Pearson correlation coefficient of 0.318 indicates that *organizational size* and *centralization* are correlated and H_4 has a proof.

Formalization has a moderate and significant Pearson correlation coefficient of (0.435) with *organizational effectiveness* and H_5 is supported. The significant correlation coefficient of -0.39 between centralization and organizational effectiveness suggests the same as H_6. Formalization and centralization are related with a negative Pearson correlation coefficient 0f -0.229 which displays H_7 may be right. Specialization is correlated with organizational effectiveness which strengthens H_8 with a Pearson correlation coefficient of 0.298(sign≤0.01). The significant Pearson correlation coefficient of 0.234 between specialization and formalization proves H_9.

Table 6: Correlation Analysis of Variables (N=120)

Organization Age	**Org. Size**	**Centralization**	***Org. Effectiveness***	
	.556(**)	.332(**)	-.277(**)	
Organization Size	Org. Age	Centralization	*Org. Effectiveness*	
	.556(**)	.318(**)	-.390 (**)	
Formalization	Centralization	Specialization	*Org. Effectiveness*	
	-.229(*)	.234(*)	.435 (**)	
Centralization	Org. Age	Org. Size	Formalization	*Org. Effectiveness*
	.332(**)	.318(**)	-.229(*)	-.390 (**)
Specialization	Formalization .234(*)	*Org. Effectiveness* .298 (**)		

*** Correlation is significant at the 0.01 level (2-tailed).*
**Correlation is significant at the 0.05 level (2-tailed).*

In regression analysis, *organizational effectiveness* is taken as dependent variable by evaluating the mean value of ten effectiveness variables which are *Long-term support, Additional employee, Customer complaints, Customer satisfaction, Quality, Time management, Employee resource management, Employee satisfaction, Communication in firm* and *Management ability*. *Organization Age, Organization Size, Formalization, Centralization* and *Specialization* are

considered as independent variables. The regression model is estimated as below:

$$Y = X_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5$$

$R^2$of the regression model is 0.427 (adjusted R^2= 0.402), indicating that 43 % of the variance in the dependent variable can be explained by the independent variables of the model. The level of significance of the equation for F test is 0.000, demonstrating that the model is meaningful. However, only coefficients of *organization size*, *formalization* and *specialization* have been calculated statistically significant at 0.05 level, while *organization age* and *centralization* are not found to be statistically significant for influencing organizational effectiveness linearly. A stepwise regression has been applied in order to consider only the significant variables in the regression model. Revised model is the following:

$$Y = X_0 + \beta_2 X_2 + \beta_3 X_3 + \beta_5 X_5$$

$R^2$of the revised regression is 0.413 (adjusted R^2= 0.398). This model explains that 41% of the variance in the dependent variable. The level of significance of the equation for F test is 0.004 which is significant at 0.05 level. Besides, Durbin Watson is calculated as 1.874 indicating that multicollinearity statistics for the second regression are within the acceptable limits. T test values for coefficients indicate that coefficients for all variables including constant are statistically significant at 0.05 level. Therefore, the final model can be explained as below:

$$Y = 2.233 - 0.127X_2 + 0.362X_3 + 0.179X_5$$

Y = organizational effectiveness
X_2= organizational size
X_3= formalization
X_5= specialization

The regression analysis brought a significant model of a linear relationship although, H_{10} is not fully supported. The regression model proves that *organizational size*, *formalization* and *specialization* are the factors influencing *organizational effectiveness*. However, *organizational size* has a negative impact on *organizational effectiveness*. The regression model explains that while *formalization* and *specialization* increase the *organizational effectiveness* of a software company, higher company size decreases the company effectiveness. *Formalization* is the most dominant determinant among organizational structural factors. Even though *centralization* is subject to various literature searches, the affect of *centralization* on organizational performance is not distinctive for software organizations in the sample.

Conclusion

The main goal of this research was to determine the structural determinants of the organizational effectiveness in the software companies. The research points out the most influential structural dimensions so that, software companies may focus on them for increasing their organizational success. Having the right priorities when controlling the structural issues, may bring higher organizational effectiveness levels.

The organizational structure dimensions such as age, size, formalization, centralization and specialization are included in the study. Among these dimensions, an organization has no control on age. Therefore, a decrease in organizational effectiveness due to the increasing age of organization is unavoidable. Additionally, as the company finds or creates new business opportunities, new employees will be hired, which will increase the size of the organization while decreasing the organizational effectiveness level. However, an organization's levels of formalization, centralization and specialization depend on managerial decisions. Therefore, having priorities and controlling the degrees of formalization,

centralization and specialization contributes to managerial control of organizational effectiveness.

The research clarifies that when a software company gets more formalized, its organizational effectiveness increases. As a company establishes formal rules, standard policies and procedures and improves them for reaching excellence in time, the quality of all activities increase together with organizational performance (Bechmann et al., 2007).

While controlling specialization dimension for increasing organizational effectiveness, managers have to keep in mind that some individuals or groups will become the sole owner of some specific knowledge. As the knowledge complexity increases, the organization will need better communication processes to keep the positive effect on the organizational effectiveness. Improved communication may refer to more policies, procedures and rules which in turn will increase for formalization.
Since centralization has a negative correlation to organizational effectiveness, software companies need to avoid centralization. However, it may be difficult for companies not to get more centralized while they continuously hire new employees.
As a company gets older, if it keeps its size and if it does not centralize, it may better stand the drop in organizational effectiveness. However, as years go by and the organization hires more and more employees, it should focus on holding centralization at minimum level in order to keep its level of organizational effectiveness. If the organization gets more formalized it can decrease its degree of centralization.

The negative impact of organizational size, the positive influences of formalization and specialization on organizational effectiveness have been verified when all factors are tested together with a regression analysis.

This study can serve managers of software organizations for reaching higher organizational effectiveness levels while they make various decisions concerning size, formalization, specialization and centralization. Findings of the study will also serve researchers of organizational issues, although its sample is small and limited to software industry.

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