

# IT Influence on Organizational Structure: Empirical Studies Among Polish Organizations

Katarzyna Tworek

Wroclaw University of Technology, Wroclaw, Poland

The paper describes information technologies (IT) role in organization—especially its influence on organizational structure. Article concerns the importance of analyzing IT acceptance, while describing IT in organization and points out that inadequate variable choice may influence validity of IT analysis. First part of the article describes both variables analyzed in presented research—IT dissemination and IT acceptance. It also presents how in theory IT can influence organizational structure. The main part of the article describes empirical studies conducted in order to verify if the influence of IT on the organizational structure exists. First, the main goal and methodology of the empirical studies are presented. Variables used to assess IT and organizational structure in organizations are discussed. Then, there is a description of research results—statistical correlation between analyzed variables and regression models is shown. Conclusion of the article is that IT can influence organizational structure, but the most important factor ensuring this influence is the actual use of IT by employees of the organization—their access to IT is not enough.

*Keywords:* information technology (IT), IT acceptance, IT dissemination, organizational structure

## Introduction

Information technologies (IT) are defined as application of computers and telecommunications equipment to store, retrieve, transmit, and manipulate data (Daintith, 2009). In today's world, with emerging economy, the increase of importance of information technology use in organizations is caused primarily by the need of knowledge and information management. Along with the changes in the world at the turn of the century, it almost became a necessity to have the knowledge and skills that allow the use of information technology for the company benefits. Jones and Dewett (2001) pointed out that IT can be seen as a source of competitive advantage of the organization only in a situation in which it is actually used by the employees in the organization. Because, what is worth noting, among others advantages, is that IT facilitates the change of communication channels in organization (Crowston, 2000). The problem arises when the IT in organization is analyzed and its influence on other organizational aspects is discussed. The issue of IT impact on organizational structures appeared in the literature as early as the 60's. Over the last 50 years, there have been many empirical studies about this issue—the earliest ones made by Galbraith (1977) and Whisler (1970). Then new facts were discussed by Orlikowski and Robey (1991) and Currie (1996). Recent studies were carried out

---

Katarzyna Tworek, Ph.D., Eng., Wrocław University of Technology, Wrocław, Poland.

Correspondence concerning this article should be addressed to Katarzyna Tworek, wyb. Wyspiańskiego 27, 50-370 Wrocław, Poland. E-mail: katarzyna.tworek@pwr.edu.pl.

by Spanos, Prastacos, and Poulymenakou (2000) and Bresnahan, Hitta, and Brynjolfsson (2002). Results of these empirical studies, however, are not clear—different variables to describe IT are used and different methodologies of research are adopted; therefore, there is no certainty as to the direction of changes in the organizational structure caused by IT.

The aim of this article is to present a new research conducted in 2012 in Poland, made using not one (as in most available studies), but two different variables describing IT in organization and to determine if IT can influence organizational structure. First part of the article describes variables analyzed in presented research—IT dissemination and IT acceptance. It also presents how in theory IT can influence organizational structure. The second and main part of the article describes empirical studies conducted in order to verify if the influence of IT on the organizational structure exists.

### **IT in Organization**

IT in organization is considered as a group of IT systems (available for the employees in organization) with implemented set of IT functions. The most approved method of characterizing IT in organization is the analysis of its dissemination. In the context of IT, dissemination will be understood as the extent in which they are available in the organization (a number of employees of the organization having access to these technologies) and it will be the first variable used in this publication to characterize IT in organization. It is worth noting here that the count is the number of unique visitors—individuals with access to IT. Thus, regardless of what the frequency of technology use is (if they do not use it at all, use once a month or several times a day), each user is counted once and only once. Therefore, it considers members who have access to IT, but not necessarily use it.

It is important to analyze IT with a use of variables that allow to specify how many employees actually use IT in their work. That was the genesis of the concepts of IT acceptance. It has allowed to take into consideration the imbalance between the number of employees who have access to IT and the number of those actually using it. IT acceptance, understood as a demonstrable willingness within a user group to employ IT for the tasks it is designed to support (Dillon, 2005), will be a second variable used in this publication to characterize IT in organizations.

### **IT Influence on Organizational Structure**

IT is considered by many authors as the main source and carrier of change in organizational structure (Jones & Dewett, 2001). Most common opinion among authors is that IT reorganizes the communication channels within the organization (making it easier for employers to communicate directly). IT contributes to several changes in organizational structure. Several of them are listed as conclusions in many papers analysing IT—those listed below can be considered as the most important ones (Jones & Dewett, 2001; Spanos et al., 2000):

- reduction of the number of administrative employees and middle management employees mainly caused by a more efficient exchange of information;
- increase of self-reliance due to better access to information among employees using IT, which contributes to the increase of the average span of management;
- increase of information synergy on the lower levels of management, which leads to the situation, in which employees are better equipped to make the right decisions in place, in which the problem arises;

- willingness among managers to delegate decisions to lower levels of the hierarchy, due to the fact that employees acquire additional skills and knowledge while using IT;
- emergence of intelligent formalization effect, which allows employers to communicate and exchange information in codified way, which at the end contributes to unification and organization of documents and procedures;
- reduction of negative effects of specialization due to work enrichment and increased self-reliance of employees.

It is worth noting that in most papers—in which the influence of IT on organizational structure is considered—IT is described and analysed only using IT dissemination as a characteristic.

### **Empirical Research Concerning IT Influence on Organizational Structure**

#### **Research Method**

Relations between IT and organizational structure were tested in studies conducted in Poland in 2012 (Tworek, 2014). One hundred and five organizations operating in Poland were examined (they were different in terms of size, industry, and ownership structure). All of these organizations have implemented IT systems (they were different in terms of dissemination, user acceptance, and type—construed as number and nature of implemented IT function) and claimed that IT is used, among others, to support communication of the employees.

Table 1

#### *Items of Organizational Structure Dimensions*

Hierarchy	Centralization	Formalization	Specialization
Organizational structure is complicated.	Decisions concerning response to environment change are made on highest hierarchy level.	Number of organizational documents is high.	Tasks are simple and repetitive.
Number of hierarchy levels is high.	Decisions concerning intellectual capital are made on highest hierarchy level.	Degree of documents details is high.	Number of production workers is high.
Number of direct subordinates of managers is high.	Decisions concerning manufacturing technologies are made on highest hierarchy level.	Number of regulations concerning ways of accomplishing tasks is high.	Number of non-production works is high.
Managers will not be able to manage more subordinates than they are managing now.	Operational decisions are made in place of the problem.	Regulations concerning employees' communication are formal and restricted.	Task rotation is common.

To investigate the results of the relation between IT and organizational structure, the key variables describing four organizational structure dimensions were defined: hierarchy, centralization, formalization, and specialization. Subjective level of each variable was calculated as the arithmetic mean of grades given to each item describing one of four variables. Items were put in form of statements and they were rated by the respondents with Likert scale (five items scale) (list of items—statements—for each variable is included in Table 1). It is worth noting that Cronbach's  $\alpha$  was 0.641 and higher for every variable, which indicates a high internal reliability of the scales and measurements.

IT was described by degree of IT dissemination and IT acceptance in organization. Subjective level of IT dissemination was calculated based on a set of statements included in Table 2. Cronbach's  $\alpha$  was calculated for this scale as 0.803 which indicates high internal reliability of a scale.

Subjective level of IT acceptance was calculated based on a set of statements prepared on basis of IT acceptance measuring method proposed by Davis—set of statements and detailed information were published by Tworek (2014). Additionally, Cronbach's  $\alpha$  was calculated for this scale—it came back as 0.905 which indicates very high internal reliability of scale.

Table 2

*Items of IT Dissemination*

Information technology dissemination			
Number of employees with access to IT is high.	The number of persons employed as maintenance for IT in the organization is high.	Number of computers in organization is high.	The number of tasks performed in the organization, supported by IT is high.

**Research Results**

After confirming internal reliability of each scale and normal distribution for each variable, correlation and regression analysis was done. Firstly, correlation analysis using Pearson coefficient was done (Table 3). Analysis has indicated that there is indeed a correlation between IT acceptance and hierarchy complexity and degree of centralization which may indicate that with increase of IT acceptance, the organizational structure changes into more organic-type one (hierarchy is less complex and centralization degree is smaller).

Table 3

*Correlation Between Organizational Structure and IT*

		Hierarchy	Centralization	Formalization	Specialization
IT acceptance	<i>Pearson correlation</i>	-0.299	-0.295	-0.126	-0.037
	<i>Bilateral significance</i>	0.002	0.002	0.204	0.707
	<i>Number of organizations</i>	104	104	104	104
IT dissemination	<i>Pearson correlation</i>	0.347	-0.006	0.137	0.445
	<i>Bilateral significance</i>	0.011	0.949	0.165	0.001
	<i>Number of organizations</i>	104	104	104	104

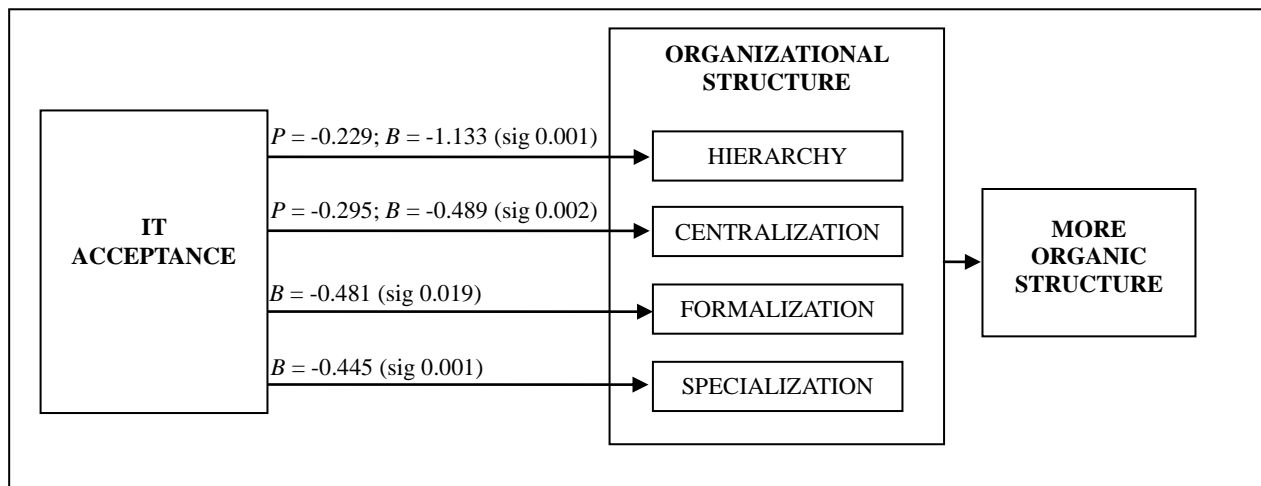
Secondly, stepwise regression analysis was performed. Fitting models were obtained for hierarchy ( $F(4, 99) = 14.585, p < 0.001$ ), formalization ( $F(3, 100) = 8.357, p < 0.001$ ), and specialization ( $F(4, 99) = 23.145, p < 0.001$ ). Only IT acceptance proved to be a significant independent variable with every obtained model (Table 4). IT acceptance proved to be the only significant independent variable in model obtained for centralization ( $F(1, 102) = 9.690, p < 0.05$ ). Although this model cannot be characterized as fitting, obtained predictors explained only 7.8% of the variance of the dependent variable. Regression analysis has shown that with increase of IT acceptance, there is a significant change in each variable characterizing organizational structure. Hierarchy complexity declines, as the degree of centralization and formalization does. It confirms that organizational structure becomes more organic-type one.

It is worth underlining that IT dissemination was not proven to be a significant independent variable in any obtained model. Therefore, even though in Table 3, there is a confirmation that there is also a correlation between IT dissemination and hierarchy complexity and degree of specialization—regression analysis did not support that IT dissemination explains in a statistically significant way the variance of this organizational structure variable.

Table 4

*Regression Analysis Confirming Correlation Between Organizational Structure and IT*

Independent variable in regression models		Dependent variable in regression model			
		1st model: hierarchy	2nd model: centralization	3rd model: formalization	4th model: specialization
IT acceptance	<i>B</i>	-1.133	-0.489	-0.481	-0.426
	Standardized error	0.193	0.150	0.201	0.129
	Beta	-0.538	-0.356	-0.248	0.277
	<i>T</i> -student test	-5.884	-3.262	-2.396	-3.303
	Significance	0.001	0.002	0.019	0.001
	Significant element of regression model	Yes	Yes	Yes	Yes
IT dissemination	<i>B</i>	0.189	0.044	0.072	0.183
	<i>T</i> -student test significance	0.220	0.762	0.711	0.146
	Significant element of regression model	No	No	No	No

*Figure 1.* IT acceptance influence on organizational structure. Source: Author's own work.

Conducted research has shown that IT (Figure 1) indeed impacts organizational structure and contributes to reorganizing to structure less complex, with lower degree of centralization and formalization. It is worth noting that IT acceptance, not its dissemination, was proven to be a significant factor in regression models explaining the variance of each organizational structure variable—it confirms that IT acceptance influence on organizational structure is statistically significant and can be an important factor contributing to organizational structure reorganization.

### Conclusions

Research has shown that IT indeed can influence organizational structure, but not exactly in the way predicted by most authors (Jones & Dewett, 2001; Spanos et al., 2000). The most important variable is IT acceptance, not its dissemination. Therefore, it can be concluded that IT can influence communication channels within the organization, which leads to changes in structure hierarchy complexity, degree of centralization, formalization, but it can happen only when IT in organization is actually used by employees to perform their tasks, not only available to them. In that case, IT indeed impacts organizational structure and contributes to reorganizing it to a less complex one, with lower degree of centralization, formalization, and specialization. It

can be concluded that the research provides evidence that in fact there is an increase of self-reliance among employees using IT, which contributes to the increase of the average span of management and results as lower centralization level and less complex structural hierarchy in organizations with highest IT acceptance. However, centralization, which is getting lower with increasing IT acceptance, can be primarily the evidence of incensement of information synergy on the lower levels of management. This increasing of IT acceptance leads to the situation, in which employees are in fact better equipped to make the right decisions in place, in which the problem arises and results with lower degree of centralization. Therefore, it can be concluded that IT acceptance in fact influences organizational structure.

It is also worth noting that conducted research confirmed that IT acceptance is a significant variable describing IT use in organization and should not be omitted during analysis of IT. It appears to be an important conclusion, because many papers postulating lack of IT influence on organizational structure are focused on analysis of IT dissemination in organization. Lack of IT influence concluded by them, may be caused by omitting the analysis of variable which allows to assess the actual use of IT in organization, not only its theoretical dissemination.

### References

- Bresnahan, T. F., Brynjolfsson, E., & Hitt, L. M. (2002). Information technology, workplace organization and the demand for skilled labor: Firm-level evidence. *Quarterly Journal of Economics*, 117(1), 339-376.
- Crowston, K. (2000). Processes as theory in information systems research. Proceedings from *International Working Conference on the Social and Organizational Perspective on Research and Practice in Information Technology*.
- Currie, W. L. (1996). Organizational structure and the use of information technology. *International Journal of Information Management*, 1(16), 51-64.
- Daintith, J. (2009). *"IT"—A dictionary of physics*. Oxford: Oxford University Press.
- Dillon, A. (2005). User acceptance of information technology. In W. Karwowski (Ed.), *Encyclopedia of human factors and ergonomics*. London: Taylor and Francis.
- Galbraith, J. R. (1977). *Organization design*. Miami: Addison-Wesley.
- Jones, G. R., & Dewett, T. (2001). The role of information technology in the organization: A review, model, and assessment. *Journal of Management*, 27, 313-346.
- Orlikowski, W. J., & Robey, D. (1991). Information technology and the structuring of organizations. *Information Systems Research*, 2(2), 143-169.
- Spanos, Y., Prastacos, G. P., & Poulymenakou, A. (2000). The impact of information and communication technologies on firm structure: Evidence from an economy in transition. *Management of Innovation and Technology*, 2, 573-579.
- Tworek, K. (2014). *Wpływ technologii informacyjnych na struktury organizacyjne przedsiębiorstw* (Ph.D. thesis, Wrocław University of Technology, Wrocław).
- Whisler, T. L. (1970). *The impact of computers on organizations*. New York: Praeger Publishers.