

An Analysis of the Impact of Information Technology (IT) on Human Resources' Productivity

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Received: December 1, 2016

Accepted: January 10, 2017

Online Published: January 16, 2017

Abstract

This article has been extracted from a dissertation entitled "*The Impact of Information Technology (IT) on Human Resources' Productivity*": a case study of teachers in the Education Administration of Aran and Bidgol City in 2016. The total number of teachers teaching in the schools of this city was 1500, among whom 306 teachers were selected as the sample using stratified random sampling method based on Morgan's (1972) Table. We used the Information technology Questionnaire containing 25 questions and 5 sub-indices in order to assess information technology, and used Human Resources' Productivity Indices Questionnaire consisting of 17 questions and 4 sub-indices. We also used linear regression test by help of SPSS Software in order to analyze the collected data. The results showed IT has a significant effect on human resource productivity (the main hypothesis). As for the sub-hypotheses, it was also shown that IT infrastructure, legal infrastructures, human resources and culture, and processes influence human resource productivity. However, IT strategies and policies had no impact on human resource productivity. Hence, we can say that IT plays an important role in teachers' productivity in Aran and Bidgol City.

Keywords: Organization, Technology, Human Resource Productivity, Information Technology

1. Introduction

One of the important approaches in organizations is the management science approach which seeks the best way to solve the problem. This approach seeks to analyze the complex problems of organizations with quantitative techniques and optimize the organizational performance. Some of the techniques used in this approach are: system analysis and design, operations research, review and evaluation of the program, Critical Path Method, game theory, budgeting system, planning and design, line and staff theory, transportation method, Simulation techniques, linear programming, production and operations management, Moghim's support systems and Decision-making Theory (Gannon, 1983: 3-4). Management in organizations means achieving the objectives by means of individuals and workgroups, so that theories on organization, organizational management and organizational behavior have increased in recent decades and have been used by organizations and managers to improve their organizational efficiency and effectiveness. One of the most important theories developed based on organizational activities and planning is decision-making theory according to which we should select the ideal solution out of various solutions to achieve the goal. Decision-making theory is of great importance in organizational management and can be regarded as the base and foundation of managers' activities in organizations. This theory is based on increasing the effectiveness and efficiency and achieving the

organizational objective(s). Therefore, to achieve this, an organization uses different models and approaches such as rational, organizational, political and process-based approaches.

IT is one of the most important concepts in various fields, particularly in management, which includes several concepts such as technology, information and communication. The term "technology" refers to a set of information, tools and methods derived from science and scientific experience and used in development, design, production and use of products, processes, systems and services (Ghazinoori & Mahdikhani, 2006). World Intellectual Property Organization (WIPO) and the Organization for Economic cooperation and Development (OECD) define technology as the experience knowledge used to produce goods or provide services. This knowledge and experience is manifested in inventions, industrial designs or utility models, or is reflected in the information, technical skills or services and contributions made by experts to design, establish, implement, maintain, manager or organize an industrial plant (Ameri, 2002).

IT generally refers to a wide range of equipment and computers, data storage devices, network communication tools, applications and services used by organizations to create data, information and knowledge. The use of IT in the contemporary world has been increasing so that it has revolutionized every aspect of our lives including the educational system. Development of information and communication technologies in educational programs is an effective and ever-lasting step which can lead to qualitative developments in objectives, programs, methods and practices, and thus effectiveness of the educational system. But what generally constitutes the missing link of educational thinking and needs to take into consideration is the great care that needs to be taken in the positive and negative use of information and communication technologies in the educational system. Information technology plays as a new approach different roles such as complementing the educational system, improving the quality of teaching - diversifying the teaching methods, transmitting knowledge using multimedia technology, providing continuous and automatic training, providing lifelong and ever-accessible training, shortening the training time, shortening the study period, considering the personal talents, individualizing the education, and coping with the group-teaching problems.

Although the development of information technology needs the cooperation of all sectors of education, no group assumes role as important as the teachers' roles in this respect. Teachers can not only play a key role in development, they can also play a central role in stopping or resisting the development. Therefore, considering the fact that most teachers are not well prepared to take advantage of information technology, it is predicted that this lack of readiness will lead them to resist the changes and innovation. This is why it is necessary to take the necessary measures to motivate teachers both materially and spiritually to make proper use of IT and participate in planning and implementing the programs. Nowadays, it is very important to have an education tailored to the needs of individuals and the society, because the world closely interwoven with information networks needs a workforce that understands how to use technology as a tool to increase the productivity and creativity. The question that the present study aims to answer is: What are the positive and negative effects of information technology on the development of the educational system? Thus, the looking seeks to provide an answer to the main question of the research which is: Does IT have an impact on the productivity of the teachers in Education Administration of Aran and Bidgol City?

2. Research objectives

Main Goals

Investigating the effect of information technology on human resource productivity

Sub-Goals

- Investigating the impact of IT strategies and policies on human resource productivity.
- Investigating the impact of IT infrastructure on human resource productivity.
- Investigating the impact of legal infrastructures on human resource productivity.
- Investigating the impact of human resources and culture on human resource productivity.

- Investigating the impact of processes on human resource productivity.

Research Hypotheses

The main hypothesis:

IT has an impact on human resource productivity.

Sub-Hypotheses

- IT strategies and policies affect human resource productivity.
- IT infrastructure affects human resource productivity.
- Legal infrastructures affect human resource productivity.
- Human resources (teachers) and culture affect human resource productivity.
- Processes affect human resource productivity.

Research Method

This is an applied research in terms of goal, and a descriptive-survey research in terms of method.

Population

The study population includes all of the 1500 teachers in the Education Administration of Aran and Bidgol City.

Sample

The total number of teachers teaching in the schools of Aran and Bidgol City was 1500, out of whom 306 teachers were selected as the sample using stratified random sampling method based on Morgan and Krejcie Table and among whom the Information Technology Questionnaire and Human Resources Productivity Indices Questionnaire were distributed.

Data Collection Tool

Both library and field methods have been used in this study for data collection.

Library study: In this study, we reviewed many resources such as articles and books in Persian and Latin, dissertations and online resources in order to collect information on information technology and human resource management.

Field study: Questionnaire is a tool used in this study for data collection. We used the following two questionnaires to do the field work:

Information Technology Questionnaire: We used the 25-item questionnaire of Information Technology which contained 5 sub-indices and was designed based on 5-point Likert Scale to assess the components IT strategies and policies, IT infrastructure, legal infrastructures, human resources (teachers) and culture, and processes.

Human Resources Productivity Questionnaire: the questionnaire has 17 questions and 4 sub-indices rated based on 5-point Likert Scale. It assesses the components productivity, effectiveness, commitment, and collaboration and problem-solving.

The Cronbach's alpha coefficients were obtained 0.893 and 0.975 for the 25 questions of Information Technology Questionnaire and for the 17 questions of Human Resources Productivity Indices Questionnaire respectively, which indicates the good validity of the two questionnaires.

3. Research Tools and Statistical Methods

The statistical methods used in this study included the descriptive statistical techniques (including frequency tables, Likert scale, ...) and inferential statistics techniques including linear regression techniques. The software used for data analysis was SPSS. We also used structural model in standard mode and structural model in significance mode to test (confirm or reject) the hypotheses.

Findings

The questionnaires were distributed among teachers of the Education Administration of Aran and Bidgol City. The results of descriptive statistics show that the male employees had the greatest frequency with 60.2; most of them (87.6%) were married and only 12.4% were single, who were between 30 and 45 years old (29.3%). 42.5 percent had work experience between 5 and 10 years and most of them (66.4) had bachelor's degree.

Considering the research goals which were investigating the effects of information technology on human resource productivity in the form of the main hypothesis of the research and investigating the effect of the IT components on teachers' productivity as the sub-hypotheses, we analyzed the research data after collecting the questionnaires and obtained the following results using the Kolmogorov-Smirnov test considering the normality of the data.

Table 1. Normal distribution of IT variables (Kolmogorov-Smirnov test)

Research variables	Kolmogorov-Smirnov Z-test	Level of significance
IT strategies and policies	0.772	0.590
IT infrastructure	0.826	0.530
Legal infrastructures	1.171	0.129
human resources	0.852	0.462
processes	0.629	0.824
productivity	0.453	0.128

Since the variables assessed in this study were interval – ordinal types of variables, and the level of significance obtained for the independent and dependent variables were higher than 0.50 which showed normal distribution of the data, we used linear regression test to analyze the relationship among the variables.

Descriptive statistics of the variables

The research variables are assessed by the indices (questions) of the questionnaire designed based on 5-point Likert scale. To measure each of these variables, we first consider a score between 1 and 5 for each question based on the selected option. Then, the mean score of each variable is calculated by adding the scores given to the questions of that component and dividing by the number of scores. The values of these variables will be numbers between 1 and 5 and the average number will be 3. The descriptive statistics of the research variables are reported in the following table.

Table 2. Descriptive indices of information technology

components	number	mean	Minimum score	Maximum score	Standard deviation
IT strategies and policies	306	1.2	0.1	0.4	0.6

IT infrastructure	306	0.3	0.1	0.5	0.1
Legal infrastructures	306	8.1	0.1	5.3	0.6
human resources	306	5.2	0.1	0.5	0.9
processes	306	5.1	0.1	5.3	0.5

The results presented in the above table show that the highest mean among the research variables belongs to IT infrastructure with the value of 0.3, while the lowest score belongs to the value of the variable processes with the value of 1.5. The results of descriptive statistics for productivity and its components are presented in the table below.

Table 3. Descriptive indices of productivity

components	number	mean	Minimum score	Maximum score	Standard deviation
productivity	306	2.13	0.1	3.5	0.5
effectiveness	306	2.72	0.1	4.46	0.6
commitment	306	5.2	0.1	0.5	0.9
Collaboration and problem-solving	306	2.3	0.1	5.01	0.6

4. Results and Discussion

Considering the research goals which were investigating the effects of information technology on human resource productivity in the form of the main hypothesis of the research and investigating the effect of the IT components on teachers' productivity as the sub-hypotheses, we analyzed the research data after collecting the questionnaires and obtained the following results using the Kolmogorov-Smirnov test:

Table 4. Statistical results of the linear regression test

Main hypothesis	Independent variable	Dependent variable	Level of significance	Coefficient of determination	Test result
Main hypothesis	information technology	productivity	0.000	0.501	confirmed
sub-hypotheses	Independent variable	Dependent variable	Level of significance	Beta coefficient	Test result
Sub-hypothesis 1	IT strategies and policies	productivity	0.059	0.269	rejected
Sub-hypothesis 2	IT's infrastructure	productivity	0.001	0.447	confirmed
Sub-hypothesis 3	Legal infrastructures	productivity	0.009	0.366	confirmed
Sub-hypothesis 4	Human resources and culture	productivity	0.016	0.339	confirmed

Sub-hypothesis 5	Readiness of the processes	productivity	0.000	0.539	confirmed
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The results of the linear regression test about the main hypotheses and sub-hypotheses show that the main hypothesis has the level of significance of 0.000 and the coefficient of determination of 0.501, indicating that IT has had 50% significant effect on the teachers' productivity. Sharifabadi (1999) showed that information technology helps teachers to have more enthusiasm for their jobs. In another study, Ghaedi (2007) concluded that IT training increases the pace and amount of work done by teachers. Also, Hanzaei (2006) came to the conclusion that the IT training courses improve the accuracy and quality of work, and increase the teachers' ability to do different jobs.

The results on the IT components also show that IT strategies and policies with the Beta coefficient of 0.269 and the level of significance of 0.059 has had no significant effect on the teachers' productivity.

However, the IT infrastructure with the beta coefficient 0.447 and the level of significance of 0.001 has had 40% significant effect on the teachers' productivity. Information and Communication Technology (ICT) can enhance human resource productivity, but if the required infrastructures are already provided. Lak et al. conducted a study entitled "Information Technology Foundations in Police Staff Empowerment" and showed that the information technology foundations influenced the police staff empowerment in factors such as speed, increased precision, and decreased physical size of information sources, removing some of the additional administrative processes, remote collaboration and reducing police organizational expenses (Lak et al., 2011).

The results also show that the component *legal infrastructures* has the beta coefficient of 0.366 and the level of significance of 0.009, indicating that this component has had 36% significant effect on the teachers' productivity.

The results also show that the component *human resources and culture* has the beta coefficient of 0.339 and the level of significance of 0.016, indicating that this component has had 33% significant effect on the teachers' productivity. Experience shows that we cannot expect the organization to achieve its predetermined goals if we have good policies and goals, but poor human resources.

Regarding the component *preparation of processes*, the results show that it has the beta coefficient of 0.539 and the level of significance of 0.000, indicating that this component has had 53% significant effect on the teachers' productivity. Teachers use IT systems in the face of the challenges in their changing environment so that they can be protected against the changes due to their improved performance resulting from their use. However, the successful implementation of these systems requires their compliance with various social, technical and economic factors, and response to environmental changes and adaptation to the environment gives rise to a challenge called organizational change degree.

Table 5. Statistical results of the linear regression model on the relationship between the indices of human resources productivity and IT

model	t-value	Standard coefficients	Non-standard coefficients		Level of significance	
		Beta	Standard error	B		
fixed	4.075	-	8.874	36.165	0.000	1
productivity	0.484	0.285	0.108	0.052	0.012	
effectiveness	0.287	0.334	0.398	0.114	0.001	
commitment	1.768	0.218	0.141	0.249	0.024	
Collaboration and problem-	3.870	0.420	0.427	0.371	0.000	

solving						
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The results of the linear regression test regarding the impact of the human resource productivity indices and information technology showed that the index collaboration and problem-solving, with the beta coefficient of 0.420 and the level of significance of 0.000, can predict 42% of information technology. In the second rank, the index effectiveness, with the beta coefficient of 0.334 and the level of significance of 0.001, can predict 33% of information technology, and in the third rank, the index productivity, with the beta coefficient of 0.218 and the level of significance of 0.024, can predict 21% of information technology.

5. Conclusion

Obviously, the twenty-first century world will actually be the world of IT domination, and this technology has become one of the key elements of the modern societies within a short time so that it understanding ICT and mastering the basic skills and concepts of information technology have been considered as a core part of the educational system of these communities to be worked on in parallel with the basic skills of reading, writing and calculation.

In today's world, IT has affected the educational systems of many countries more than any economic, cultural and social issue, and the changes having occurred by it are so fast and significant that we cannot ignore it even for a moment. To put it simply, we can say that ICT, as one of the newest man-made technologies, can help us collect, organize, store and reflect the information audio-visually or within texts, realized via computer tools and Telecommunication systems.

Considering the above-mentioned points and the importance of ICT in improving the human resource productivity, measures are to be taken to increase investment on training the ICT skills to the teachers of the industry sector, and to employ the people with higher education levels and higher ICT skills as the workforce. In addition, increasing the potential for the further use of ICT in the corporate sector can prove useful in enhancing the human resource productivity.

Considering the fact that human resources are the engine of growth and help increase productivity in organizations, training can generally play a critical role in this regard. However, organizations should consider not only IT training, but also other factors and components that affect productivity, since information technology is not the only factor influencing productivity. In this regard, directors and managers of organizations are more responsible, as they are required to take effective measures to improve productivity by recognizing the complex needs of organizations in the contemporary era.

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