

The Impact of Information and Communication Technologies on E-culture.

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Abstract: Management through culture is an important aspect of conducting an enterprise. Culture in modern organisations has undergone transformations as a result of constant changes. Nowadays, a virtual organisation is among some of the most popular forms of organisations that adapt to current changes. Information and communication technologies (ICT) constitute a key determinant of the very existence of virtual organisations. E-culture is a type of organisational culture specific to virtual organisations. The aim of this paper is to evaluate assumptions concerning the impact of ICT on the organisational culture. Tests were performed on a sample of 92 information technology (IT) companies operating in Poland to evaluate a research hypothesis. Based on a statistical analysis, partial hypotheses, and consequently the main hypothesis, were evaluated to be true. The paper describes those aspects of e-culture that are affected by ICT to the greatest extent.

Keywords: e-culture, virtual organization, management, IT technologies

INTRODUCTION

Economic changes result in transformation within the organisations themselves which have to adapt to become competitive on a quickly changing global market. Those changes include: globalization, ICT development and economic crisis (M. Castells, 2009, pp. 335-336.). Changes in technology create a platform for possible global cooperation, communication and implementation of new solutions (K. Fujiwara, K. Shimomura, K. Wong, 2008, pp. 130-148). ICT induces the following modifications in the current economy:

- technology orientated towards information processing,
- omnipresence of new technologies,
- a network of economic and social systems,

- flexibility of organisational relationships;
- the combination of existing technologies in mutually related and integrated systems (M. Castells, 2008, pp.78-84).

ICT has resulted in an increased significance of organisational non-material resources (J. Low, P.C. Kalafut, 2004, pp.14). This particularly refers to knowledge as the fundamental resource in the modern enterprise (A. Sopińska, 2008, p. 104).

Transformation of economy into e-economy has changed patterns of organisational management (W. Grudzewski, I. Hejduk, A. Sankowska, M. Wańtuchowicz, 2010, pp. 19). It is vital to know the patterns of this alterations in order to adjust management of modern organization to contemporary challenges. Understanding the way technology influ-

ences the human side of an organization allows one to increase the control of it and furthermore improve its functioning.

VIRTUAL ORGANISATION

A virtual organisation is an innovative organisational form aimed at its adaptation to new challenges (A. Mowshowitz, 1986, pp.335-404). In recent decades, the popularity of this type of organisation has been observed.

The virtual organisation is defined as a network of collaborating organisations which take advantage of market opportunities by combining their key competencies based on ICT (R. Bauer, S.T. Koeszegi, 2003, pp. 26-46). Collaboration and mutual relationship of geographically dispersed partners are joined by ICT (M. Farkas, L. Török, 2011, pp. 74.).

Two perspectives on understanding the virtual organisation as part of management science can be distinguished: institutional trend (structural approach) and functional one (process approach). The institutional trend emphasizes the structure of the organisation, methods of its planning, configuration and its properties. On the other hand, the functional trend focuses on behaviours and processes related to virtualisation (W. Grudzewski, I. Hejduk, A. Sankowska, M. Wańtuchowicz, 2011, pp.177).

Virtualisation is connected with ICT, spatial dispersion and limited by the duration of existence/collaboration. With the technology, a short-term collaboration and geographical dispersion of partners are feasible. To sum it up, ICT is a basis for the virtual organisation (J. F. Coates, pp. 7-8 W.M. Grudzewski, I. K. Hejduk, 2002, pp. 39.). Electronic communication and collaboration via electronic tools are key aspects of the virtual organisation (H. Jagers, W. Jansen, W. Steenbakkens, 1998, pp.74.). The aspects of distributing information via electronic tools constitute key elements in that type of organisation (C. Lo, Y. Chang, K. Chung, 2012, p. 353). Technology is also used to execute a business strategy (Ch. Scholz, 2000, pp. 371; D. Tapscott, 1996, pp.10.).

The virtual organisation life cycle model demonstrates that it is just information technology that serves as a common platform for all participants in the organisation (W. Saabeel, T.M. Verduijn, L. Hagdom, K. Kumar, 2002, pp.14).

Innovative solutions provide the application of ICT tools (R. Perkowski, 2009, pp. 52). The research on modern enterprises confirms the impact of technology on innovation (A. Sankowska, 2009).

In conclusion, ICT is considered as one of the fundamental determinants of the functioning of virtual organisations. It is just the application of technological tools and the Internet for communication and resource planning within the virtual organisation that provide the existence of such a specific form of collaboration. For that reason, ICT technology is often pointed out as a factor determining the formation of virtual organisations.

E-CULTURE

Management through culture is a significant trend in current management science (R.M. Griffin, 2004, pp. 178). The traditional concept of an organisational culture, following E. Schein's definition, is a pattern of shared basic assumptions (E. H. Schein, 2004, pp. 17). The cultural organisation is interpreted with regard to management science as values and beliefs significant for a particular organisation (F. Luthans, J. P. Doh, 2012, pp.169). It is the platform determining activities within the organisation (J. Freiling, H. Fichtner, 2010, pp. 158). Defined as the organisational concept, it describes the appropriate behaviour in the organisation (D. Holland, S. M. Shemwell, 2014, pp. 72). Culture can be assumed as social cement in the organisation which holds its elements together.

The organisational culture is often understood in terms of metaphors interpreting culture as an emotional controller, social glue or a compass (M. Alvesson, 2011, pp. 17-40.).

Culture is extremely important for an effective organisation (K. S. Cameron, R. E. Quinn, 2003, pp. 72). As culture plays a crucial role in the organisation, it is important to understand changes observed in the organisation and the factors affecting it.

E-culture is a specific form of culture in the virtual organisation. Its distinctive features are variability, flexibility and innovation. E-culture is connected with the virtual organisation. R.M. Kanter, the e-culture researcher, described it with the following features:

- Creative,
- Transparent,
- Communication and cooperation oriented,
- Focus on objectives allows one to avoid conflicts,
- Spontaneous,
- Paradoxical,
- Attractive for key talent (R.M. Kanter, 2001, pp.7).

In summary, e-culture is such a type of organisational culture whose functions relating to targeting and integrating the organisations have been adequately adjusted to the requirements of the virtual organisation. This is also based on e-culture using, to a large extent, ICT. This paper describes e-culture in terms of its adaptive function to provide collaboration of scattered and temporary cooperating elements of the virtual organisation. It attempted to understand the link between technology and e-culture.

THE IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGIES ON E-CULTURE

The aim of this paper is to evaluate the assumption that ICT is changing culture in the virtual organisation. E-culture has been conceptualized by means of seven principles:

1. **Sense of community** – related to trust to the organisation, identification with it, and readiness to share information with other workers;
2. **Strategic orientation** – refers to the vision of the future, achieving targets of the organization, strategy understood and accepted by workers in the organisation;
3. **Leadership** – describes a creative and open-minded leadership relating to leaders' innovation and creativity;
4. **Collaborative teamwork**– means cooperation in teams, common attitude of personnel towards collaboration, engagement and participation in performing tasks;
5. **Communication** – refers to methods and forms of communication in the organisation, highlights

a direct and non-formal type of communication; confirms the appropriateness of communication;

6. **Adaptable structure of teams** – determines flexibility and adaptive features of working groups and variability of job tasks;
7. **Direct relationships** – refer to non-formal relationships among workers, and mutual contacts in the organisation (H. Bulinska-Stangrecka, 2015).

The aforementioned measurements are the base for analysing such a phenomenon in the observed enterprises.

The application of ICT in the enterprises was conceptualised in two ways: as a tool for electronic communication, and a common platform for collaboration in the form of systems for resource planning in the enterprise. Communication via ICT is mostly based on media communication whose participants, instead of direct interactions, are connected by means of technological tools e.g.: phones, e-mail, and messaging (Z. Necki 2005, pp. 20).

ICT used within the virtual organisation for communication purposes was operationalised as: frequency of use of ICT at work, where the surveyed enterprises were divided into a group with a low level of technology use (few times a month or less), and with a high level of technology use (once a month or more often). Collaboration supported by technology and ICT systems includes a sequence of professional activities (A.H. Anderson, R. Mcewan, J. Bal, J. Carletta, 2007, pp. 2558-2580).

The research hypothesis was made for the purpose of evaluating the assumption of this paper, and answering the research question: *How does ICT shape e-culture?* The research hypothesis was developed.

Table 1. Description of variables in the test.

	Variable	Operationalisation
Dependent variable	e-culture	Measurements: 1. community, 2. strategic orientation, 3. creative leadership, 4. collaborative teamwork 5. communication, 6. adaptable structures, 7. direct relationships
Independent variable 1	electronic communication	1. low level of ICT use for communication 2. high level of ICT use for communication
Independent variable 2	ERP systems	1. use of ERP systems in organisation 2. lack of use of ERP systems in organisation

Source: own elaboration.

The research hypothesis subject to evaluation is:

H1: ICT affects culture in the organisation.

Partial hypotheses were put forward as well:

H1a: ICT used for communication influences culture in the virtual organisation

H1b: ICT used for enterprise resource planning (ERP) influences culture in the virtual organisation

E-culture is a dependent variable, whereas ICT is an independent one.

LOGIC OF SAMPLING.

The performed test covered 92 IT companies operating in Poland in 2014. Selecting units for study was based on test results obtained by R.M. Kanter (R.M. Kanter, 2001) indicating that e-culture was most often observed in just IT enterprises.

The tests were conducted in the form of a survey questionnaire.

EVALUATION OF H1A PARTIAL HYPOTHESIS

For the purpose of evaluating hypothesis H1a: **ICT used for communication influences culture in the virtual organisation**, the analysis with Student's t-test was conducted during which the effect of used technology on individual e-culture measurements was evaluated: 1. community, 2. strategic orientation, 3. creative leadership, 4. collaborative teamwork 5. communication, 6. adaptable structures, 7. direct relationships.

The Student's t-test for independent samples confirmed the impact of technology on the sense of community - $t(80) = 2.83$; $p < 0.01$. It turned out that organisations with a higher level of technology use for communication had a stronger sense of community ($M = 0.31$; $SD = 1.13$) than those with a lower level of electronic communication ($M = -0.29$, $SD = 0.77$).

A series of the Student's t-tests for independent samples demonstrated that organisations with a lower level of technology use, i.e. using various tools for their work less often than few times a week, had a higher level of collaborated team work ($M = 0.20$; $SD = 1.06$) than those with a higher level of technology use ($M = -0.21$; $SD = 0.90$).

Diagram 1. Sense of community depending on technology level.

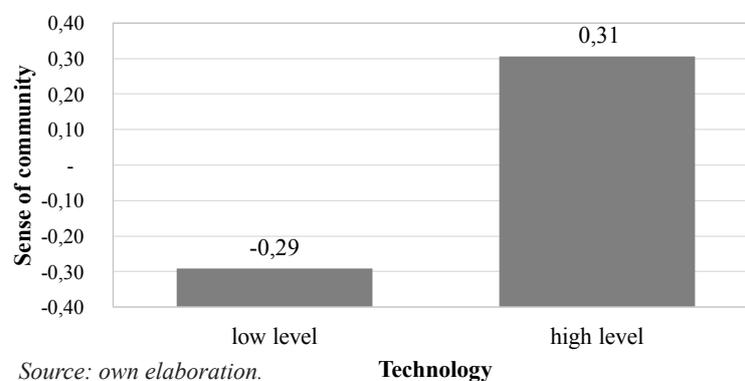


Diagram 2. Collaborative teamwork depending on technology level.

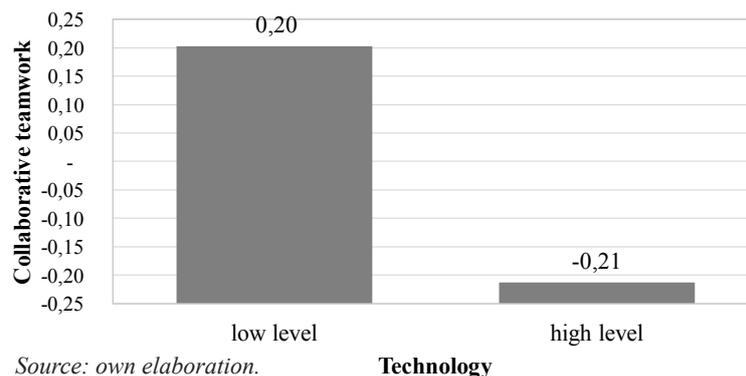
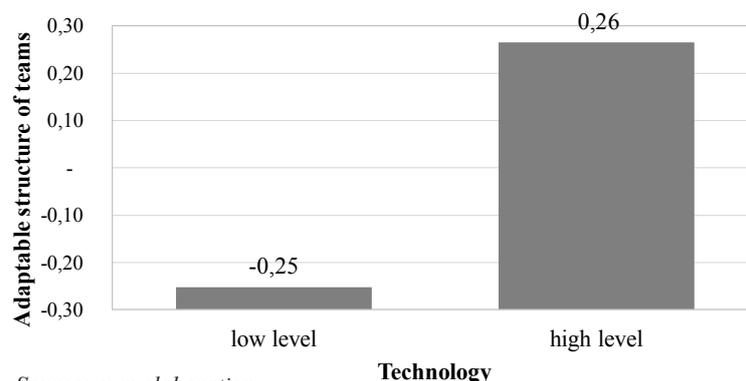


Diagram 3. Adaptable structure of teams depending on technology level.

Source: own elaboration.

Another analysis conducted by the Student's t-test for independent samples showed that the organisations with a lower level of technology use, i.e. using various tools for their work at least once a week had a higher level of adaptable structure of teams ($M = -0.25$; $SD = 0.94$) than those with a lower level of technology use ($M = 0.26$; $SD = 1.00$).

To sum it up, ICT used for communication had a significant impact on the following measurements of e-culture: sense of community, collaborative teamwork, and adaptable structures.

EVALUATION OF H1B PARTIAL HYPOTHESIS

For the purpose of determining the effect of using ERP systems on e-culture, a series of comparisons was made regarding various aspects of e-culture among enterprises using such systems or not. The analysis demonstrated that taking into account ERP use, the enterprises differed in terms of three e-culture areas – creativity and open-mindedness, teamwork and open communication. Each time, ERP use was related to a lower level of a particular e-culture aspect.

Table 4. Average level of rates for various aspects of e-culture among enterprises using ERP or not.

Aspects of e-culture	Does your organization work with ERP systems?	Average	Standard deviation
Sense of community	yes	-0.03	1.04
	no	0.20	1.01
Strategic orientation	yes	0.12	0.97
	no	-0.12	0.86
Leadership	yes	-0.08	1.09
	no	0.33	0.84
Collaborative teamwork	yes	-0.17	1.06
	no	0.23	0.80
Communication	yes	-0.33	0.81
	no	0.84	0.87
Adaptable structure of teams	yes	0.12	1.03
	no	0.00	0.95
Direct relationships	yes	-0.02	0.98
	no	0.09	1.12

Source: own elaboration.

Table 5. Summary of comparison test results for enterprises using ERP or not.

Aspects of e-culture	F	Istotność	t	df	Istotność
Sense of community	0.01	0.93	-0.87	71	0.39
Strategic orientation	0.89	0.35	0.99	71	0.33
Leadership	0.446	0.506	-1.56	71	0.12
Collaborative teamwork	3.293	0.074	-1.59	71	0.12
Communication	0.062	0.805	-5.52	71	0.00
Adaptable structure of teams	0.746	0.391	0.44	71	0.66
Direct relationships	0.25	0.619	-0.40	71	0.69

Source: own elaboration.

EVALUATION OF MAIN HYPOTHESIS

On the basis of analysing the partial hypotheses, ICT was assumed to have an impact on culture. Technology had a statistically significant impact on the collaborative teamwork, sense of community and adaptable structures. Technology use for enterprise resource planning also affected e-culture. Therefore, the research hypothesis presented in this paper has been regarded as confirmed.

CONCLUSION

The obtained results confirm the assumption that ICT shapes the culture. They present a wide scope of consequences from implementing technological solutions of communication and enterprise resource planning for functioning of the organisation. In terms of planning, awareness of consequences resulting from technology implementation is extremely crucial. The conducted tests have shown which measurements of e-culture are the most vulnerable to the impact of technology. Knowing that we can be more conscious while planning the implementation of ICT, particularly in the discussed areas. Additional tests indicate that e-culture is determined by technology.

Prospects for further tests include effects of technology on culture in enterprises from other sectors. It also seems appropriate to study the impact of other virtual aspects on e-culture.

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