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The potential of network Internet technologies in the field of management

Abstract
The article reveals the main features of network Internet technologies as a significant management tool for information and network economy. The author depicts the most promising areas of network Internet technologies application, provides examples of successful implementation of projects based on network technologies, and underlines the most significant social effects of management practices in the area. Building of knowledge in expert networks, and transformation of the very actor of management are among these effects. Based on the author's empirical research conducted in 2016 among 100 leaders and administrators of big Russian Internet-communities, the main managerial advantages and possibilities of applying network technologies have been revealed. The forecast of their further development has been provided.
Keywords: Management; Network Internet Technologies; Social Networks; Crowdsourcing; Knowledge
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Потенціал мережевих Інтернет-технологій у сфері управління
Анотація
У статті розкрито основні особливості мережевих Інтернет-технологій, що є значущим інструментом управління, важливість якого зростає в добу становлення інформаційної та мережевої економіки. Автор розкриває найбільш перспективні напрями застосування мережевих Інтернет-технологій, наводить приклади успішної реалізації проектів, які побудовано на мережевих технологіях, а також демонструє найбільш вагомі соціальні ефекти практик управління, серед яких виокремлено накопичення знання в експертних мережах і тарансформацію самого суб'єкта управління. На базі авторського емпіричного дослідження виявлено основні управлінські переваги й можливості застосування мережевих технологій. Здійснено прогноз динаміки їх подальшого розвитку.
Ключові слова: управління; мережеві Інтернет-технології; соціальні мережі; краудсорсинг; знання.

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Потенциал сетевых Интернет-технологий в сфере управления
Аннотация
В статье раскрываются основные особенности сетевых Интернет-технологий, важность которых как инструмента управления в эпоху становления информационно-сетевой экономики возрастает. Автор показывает наиболее перспективные направления применения сетевых Интернет-технологий, приводит примеры успешной реализации проектов, построенных на сетевых технологиях, а также раскрывает наиболее значимые социальные эффекты связанных с ними управленческих практик, в том числе формирование знаний в экспертных сетях, трансформацию самого субъекта управления. На основе авторского эмпирического исследования выявлены основные управленческие преимущества и возможности применения сетевых технологий, осуществлён прогноз динамики дальнейшего их развития.
Ключевые слова: управление; сетевые Интернет-технологии; социальные сети; краудсорсинг; знания.

1. Introduction

The emergence of a new type of society described by the concepts of «information», «postindustrial», «programmable», and «knowledge» society has been promoted by the increased role of information and knowledge in the social life and economy. This new type of society is determined by the growth of information production, development of innovations, spread of information instruments in the economy, development of new employment structure, dominated by the services sector. We witness the formation of the information and network economy, which develops new patterns and strategies of economic behaviour and activities both at the personal level and at the institutional one. This phenomenon is determined both by socio-cultural changes and active introduction of management practices related to network Internet technologies into economic sphere. As a result, new forms of organisation have emerged, as well as core information technology industries, and the markets are under restructuring.

While the concept of information technologies strikes with its breadth and ambiguity, one of its applied aspects turns to be factor of modern management. These technologies are based upon the application of electronic and Internet communication tools, thus, transforming conventional management practices with new socio-cultural, socio-political, and socio-economic effects. The article is devoted to the study of this issue. ***Research hypothesis*** is that network Internet technologies are important tools of modern management in the spheres of economy and science, social sphere and politics; the development of new network forms in the process of management practices has fundamental importance.

2. Brief Literature Review

Many scholars turn to the study of modern network Internet technologies, in particular those based on the use of social media and social networks. O. Zorkociova and L. Vankova (2016) consider the phenomenon of modern social networks, and the effectiveness of their research in Slovakia. J. Thornley (2008) [2] analyses the main

traits of social media technologies. Economic behaviour of Internet users in social networks is studied by L. Kapinus, N. Skryhun, and K. Semenenko (2015). O. Padała, M. Podgórniak, M. Putowski, J. Zawiślak, M. Siembida, and B. Jędrzejewska (2014) [3] consider social networks as an important factor of modern lifestyle. Mark Granovetter (1973) and Ronald Burt (2001) substantiate the relevance of network forms of economic relations in the new social realities of the information society in their classical works [4-5]. Modern forms of new economic practices and realities caused by the establishment of the information and network economy are investigated in [6-7].

The works by J. Howe (2008), L. Shan, X. Fan, Zh. Jinlong, and W. Lin (2016) [8-9] are devoted to the potential and risks of crowdsourcing as one of the leading network technologies.

Various dimensions of the information-network economy are analysed in [10-14]. For example, D. Y. Kenett and S. Havlin (2015) analyse the potential of the network approach in economy and finances [10]; L. Cheng, G. Jiao, and H. Tian (2010) [11], B. Meiseberg and T. Ehrmann (2013) [12] consider application of network models and approaches in the practice of economic planning and organisation management. J. Chunxiao, Ch. Yan, K. J. Ray Liu, and R. Yong (2015) [13] analyse the role of cognitive networks in network economy development. S. B. Germán, J. R. de Almeida Amazonas, and J. Sole-Pareta (2016) [14] study the processes of network economy optimizing.

3. Purpose of the research is to study the role of network Internet technologies in the practice of modern management, to assess their management potential, and to define the most promising areas of application.

4. Results

The most developed societies, defined as information or post-industrial, are characterised by a significant focus at scientific knowledge and technological innovations. Grasp of the very nature and structure of the post-industrial economy depends directly on perception of the nature and essence of network Internet technologies, which are the foundation of management in these societies.

Let us note that in this article we consider management in a broad institutional sense which covers a variety of management objects starting from single company or innovative project, to social institution or certain sphere of public life. Thus, regardless of the specific object of management, we are interested mostly in the system-wide characteristics of management which unfold while applying network Internet technologies. In this regard, we are keen to make special emphasis at social networks. Social networks are not only a widespread instrument for information dissemination and communication, but also provide socio-technological mean for business management. However, social networks duplicate the network morphology of the modern society, as well as an institutional structure of modern economy, especially in the advanced industries and knowledge economy. For example, A. Pyka, P. Ahrweiler, and N. Gilbert (2012) note that networks are the main way of coordination, which is especially important in such knowledge-intensive sectors of the market as biotechnology and information, and communication technologies. The need to create and transfer knowledge within industries is one of the main reasons for building networks [15, p. 328].

Corporate networking sites can be used as distributed system for producing knowledge (in its various forms: innovations, technologies, etc.), as research network, innovation site, educational environment, marketing network, etc. Application of network morphology while aligning organisation structure is an important tool for any successful modern company. Thus, Jhonson & Jhonson company, which has a highly distributed organisation, dispersed in 50 countries, is working to create practical communities for different product lines, which allows employees to successfully share knowledge and join forces for implementing common projects, etc. International companies such as Motorola, Reebok, and Dell are also the companies with multi-branch network structure.

Internet-based network technologies are widely used directly for management of organisations. It is impossible to imagine a successful, dynamic company without established information policy in social-networking web services for the sake of advertising, brand promotion, various PR actions, personnel recruiting, etc. Network Internet technologies can also be used in:

- social software development to provide effective personnel management;
- development and implementation of joint projects;
- launch of innovative sites;
- development of client environments.

Management potential of network Internet technologies is diverse, producing new capabilities for different application, for example, for municipal management, where optimisation of information management and automation lead to better time management and organisational costs reduction. Thus, in Russia a program of gradual transfer of all public services into electronic form was launched, with intent to facilitate exercise of the rights and duties by citizens, optimise information interaction between civil society and state, institutionalise civil control and monitoring of state institutions. Network Internet technologies are widely used in civil law enforcement for signing petitions, people's appeals, and legislative initiatives.

Many projects run with the means of network Internet technologies presume interaction between various elements of different nature: people, organisations, technologies and (software, computers, communications equipment, etc.). But for most management practices that preclude the expansion of social-personal representation (i.e., growth of social actors role), people are the key actors. In this case, while material objects are important elements of this networks, they are not as significant as people, interaction under same network principles. One of the most adequate tools describing such network interactions is the actor-network theory (ANT), which paradigm is grounded in methodological symmetry of actors of different nature involved in the network, interacting with each other, thus, producing new social artefacts [16].

Within heterogeneous socio-technical environment, actors of different nature and with different intellectual potentials participate in implementing network projects. New knowledge (among other things) is the result of their interaction. The development of knowledge is continuous, and has a networked nature.

The development of network Internet technologies come directly from the evolution of information technology paradigms. In wake of computer technologies development, the Internet increasingly epitomises all means of communication and, as a consequence, contributes to uniting individuals into communities. Early communities were built on the basis of Internet WEB 1.0, with chats and forums with minor functional potential as a main vehicle of interaction. Modern communities emerged in early 2000s, and are determined by upgraded Internet social function and WEB 2.0 services. Social networks and blogs are backbones of these communities, providing broad opportunities for interpersonal and group communication. In terms of communication techniques WEB 2.0 is build around social networking, blogging, and other instruments to involve users to content production. As information and technological paradigm, WEB 2.0 is one of the foundations for management, and is widely acclaimed due to such properties as open content, freedom of access to Internet resources, decentralisation, training of large social groups, control by users, massive and diverse audience, certain degree of anonymity, users' involvement into development of resources and services, etc [17, p. 511].

However, to cope with really complicated tasks of corporate management, it is necessary to develop expert networks. To meet business or public administration needs to address complex tasks (for example, environmental issues) of contemporary management, potential of WEB 2.0 is often turns insufficient. Therefore, the information technology paradigm WEB 3.0 has been steadily replacing WEB 2.0.

Social effect of interactions under WEB 3.0 is achieved through the voluntary cooperation of users (often, experts or professionals) in order to create highly intelligent information product. The very successful example of such an approach is Wikipedia, an online encyclopaedia, developed by the Internet users on a voluntary basis. When studying users' interaction within WEB 3.0, one can note a new phenomenon of collective creativity: network community itself is the subject of creative and intellectual activity. This fact is crucial as we are approaching task of the development of management technologies, based on the involvement of community into solution of important task. Use of human potential and users' intellectual resources transmits personal creativity, activity and readiness into collective interaction.

Among of the most important characteristics of network Internet technologies are their open nature and focus on innovation. For example, H. Chesbrough (2003) points out that many corporations turn to a system of open innovation, where organisation and its structural divisions seek to draw innovative resources from external sources, involving wide public, etc. One of the reasons for this is the fact that share of patents received by individual inventors and small companies increased from 5% in 1970 to 20% in 1992 [18]. For example, the company Threadless.com offers its customers special financial incentives. The website of this company invites all users to propose their own design of the t-shirts pattern and to send it by e-mail. The company chooses best designs, promotes them on the market, and the authors receive their royalties. However, the involvement of external sources for innovation activities by the corporation can also be associated with considerable problems with intellectual property rights, motivation of the users within such network project, and with management of the collective creativity process.

Crowdsourcing is one of the most popular network Internet technologies under WEB 3.0. It is an open network technology that is aimed to engage volunteers into collective solution of socially significant issue, when traditional institutions are proving inefficient or failing to solve it. The potential of crowdsourcing social networking technologies is significant in addressing such issues as fighting the effects of technological or natural disasters. In February 2010, when tsunami hit the Hawaiian Islands, officials of the local emergency management office were able to use the mobilisation potential of social networks by posting information with detailed instructions on how to behave in emergency on Twitter and Facebook, which launched massive citizens' network campaign, and, as a result, swift and smooth evacuation of a significant part of citizens from the zone of disaster [19]. This example reflects the development of so-called civil journalism, or Internet journalism, which accumulates free, independent information flows in the civil self-organizing sphere, and in part is replacing traditional media as a source of urgent information. The trend of development of network organisation, non-hierarchical structures based on horizontal links between actors, their relative autonomy and equality, and their active communication produces the basis of new type of management.

Complex nature of distributed agency determines the emergent social effect of network technologies, producing the growth of intellectual potential within these information environments. In other words, network projects generate new knowledge which is not equal to the sum of intellectual efforts and resources of its participants, bringing in synergetic effect. N. V. Basov (2012) indicates network nature of knowledge, and claims that «knowledge can be defined as a dynamic recurrent self-reproducing network of individually and objectively rooted **«appraesentatio»** correlations, conjugated within common environment by interaction of mental systems of individuals with material objects, thus, making social community to act as integral entity, in conformity with the environment, while keeping its structural stability. From the standpoint of individual actor, knowledge is network involvement» [20, p. 72].

Management strategies and network projects based on the principles of WEB 3.0 preclude production of expert knowledge, thus especially in demand for scientific and education applications. An example of such a network project is the Polidoxa web service (running on the Twitter social networking platform). One of its authors, Manuel Mazzara, noted that it was created to exchange only reliable information between small numbers of users [21]. In fact, this type of community is perfect foundation for expert network. The main objective of such services is to accelerate information exchange among scholars, thus contributing to the upgrade of science management. Another example is SciPeople.ru portal. It provides significant opportunities for information exchange, and creates network communities for scientific projects management; in other words, this is social network for scientists.

Thus, the use of network Internet technologies, regardless of the sphere of management, contribute to its «intellectualisation», growth of organisation efficiency, and increase in the effectiveness. Network nature of the Internet technologies used in the field of management promotes the development of knowledge products for these network structures, transforming information and communication space into an innovative environment.

Under conditions of openness, decentralisation, and branched structure of network projects, emergence of special kind of agency - true collective actor, surpassing sum of individual efforts by its m. It can be assumed that as an actor network projects is simultaneously single (integral), since the network community act as an organism, and plural, since it is determined by the abundance of individuals involved in the process of cognitive network formation.

The results of our sociological survey conducted in 2016 prove the above stated. We conducted survey among the leaders and administrators of the Russian online communities in the social network VKontakte (N = 100), who are focused on the development and promotion of the brand, use of social network for commercial purposes, or as an instrument for permanent social interaction. The sample included leaders (administrators) of communities with more than 10,000 participants, equally dispersed between such areas as commercial activities, socio-political and civic activity, PR and brand management.

The objective of the study was to determine the potential of network online communities as a technology for social and economic management, as well as to study the content of real management practices using network technologies.

Hence, we identified the main goals of network technologies application (see Table 1).

Tab. 1: **Distribution of the answers to the question «What goals do network technologies allow you to achieve?» (Up to 2 answers)**

Increase in sales and profit	68
Corporate management efficiency	42
Involvement of the public in solving important corporate tasks	37
Other	8

Source: Author's own research

As it can be seen from Table 1, apart from the main goal of using network technologies, i.e. increasing sales and profit (this option was chosen by 68% of the respondents), the managerial aspects of network Internet technologies are of great importance. They increase corporate management efficiency (42%), and allow involving the public in solving important corporate tasks (37%). These functions become evident when applying crowdsourcing technologies and use network non-hierarchical management model.

Formation of expert networks (37%), establishment of a broad social communication system (29%), and application of users' self-management practices (24%) are among the most significant management tools and practices that are used by community leaders.

We also studied the opinion of respondents concerning the potential of applying network technologies in various fields. It was found that, according to more than half of the experts, the most effective use of network technologies is in the sphere of economy and business (59%), which can be explained by their significant opportunities to achieve commercial effect (see Figure 1).

5. Conclusion

Use of network Internet technologies is one of the most significant trends in modern management. Due to the introduction of new management practices, the very paradigm of management shifts: management becomes more «subject-subject» oriented, especially in the social sphere; the actor of management is transforming, now obtaining network structure. We can conclude that our hypothesis was confirmed.

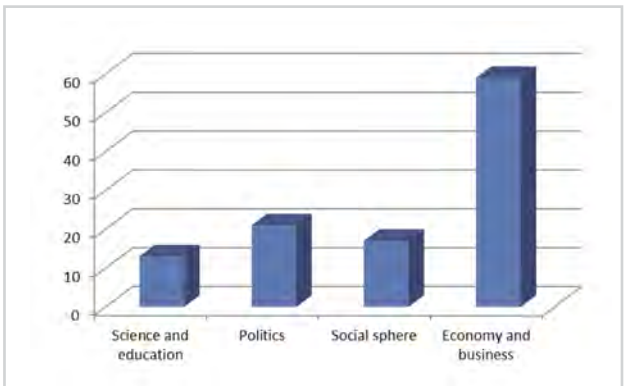

Fig. 1: **Distribution of the answers to the question «In which sphere, in your opinion, is the application of network technologies the most effective?»**
Source: Author's own research

It is of crucial importance that the mechanisms of applying network Internet technologies are equally adapted to all industries and institutions, and are largely determined by identical institutional factors, influencing directly produced products (technologies, goods, etc.), and producing dramatic changes in social and moral domains. Considering the prospects of network Internet technologies development and escalation of their application in the sphere of management, we assume that their further development will be carried out towards their complication, very high growth rates, and creation of new intellectual socio-technical environments [22], where social and engineering components will be unalienable. Thus, the future of management is directly related to the development of computer technologies, including those within interdisciplinary projects. Flexibility and mobility of management structures, high speed and convenience of management operations, and irrelevance of space-time boundaries can be referred to the positive consequences of the development according to such scenario. The total replacement of a human being by technological equipment, which threatens the first degradation, the complexity of forecasting super-complex systems and actors of management, the growth of technological risks are the negative consequences. In our opinion, further transformations related to the evolution of the actor of management (caused by the development of WEB 4.0 technologies, the so-called Internet of Things, etc.) are still debatable. These issues are not only in the sphere of the socio-economic assessment, but also are philosophical and anthropological challenges.

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