

# Evaluation of opportunity for managerial technologies effective transfer: researches review

## Evaluación de oportunidades para la transferencia efectiva de tecnologías gerenciales: Revisión de investigaciones

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#### ABSTRACT:

The research identifies the specific properties of managerial technologies, determining the opportunity and success of transfer outside the companies in which they were originally applied; the algorithm of the complex analysis of managerial technologies properties is offered. The proposed methodology can be used in the practice of companies to evaluate the effectiveness of technologies transfer in international projects.

**Keywords:** management technology, transfer of managerial technologies, adaptation of managerial technologies, conditions for transfer of managerial technologies

#### RESUMEN:

Esta investigación identifica las propiedades específicas de las tecnologías gerenciales, determinando la oportunidad y el éxito de ellas fuera de las empresas en las que se aplicaron originalmente; se ofrece el algoritmo del análisis complejo de las propiedades de las tecnologías gerenciales. La metodología propuesta se puede utilizar en la práctica de las empresas para evaluar la efectividad de la transferencia de tecnologías en proyectos internacionales.

**Palabras clave:** tecnología de gestión, transferencia de tecnologías de gestión, adaptación de tecnologías de gestión, condiciones para la transferencia de tecnologías de gestión

## 1. Introduction

The framework of the research, first of all, covers the very concept of "managerial technology"

and approaches to its definition. The sections following the introduction single out existing approaches to the research of the managerial technologies transfer existing in the modern scientific literature and systematize groups of indicators for evaluation the technologies transfer effect. Based on the identified properties, the authors attempted to determine the management technology properties in terms of the opportunity and complexity of its transfer. The discussion offers practical recommendations. The last part contains conclusions.

The purpose of the research is to identify the specific managerial technologies properties, determining the opportunity and success of the transfer.

The purpose may be achieved by the following objectives:

1. Analyzing the existing literature on the transfer of knowledge and managerial technologies.
2. Identifying the conditions and opportunity characteristics of the managerial technologies transfer.
3. Offering the algorithm for analyzing managerial technologies properties and determining the limitations on its application.

In their papers, researchers traditionally focus on one aspect when considering the managerial technologies transfer - either clarification of terminology, or characteristics of the process, or a discussion of the approach to the transfer. For that reason, the novelty of this paper is to determine the necessary and sufficient conditions for the managerial technologies transfer, along with the advantages and disadvantages of using parameters to determine the opportunity and efficiency of the transfer (U.S. Department of Commerce, 2016; OECD, 2012).

The next section systematizes the approaches existing in the modern scientific literature to the research of the managerial technologies transfer.

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## **2. Literature review**

The "managerial technology" term has recently become a subject of discussion not only among Russian researchers, but also in foreign scientific literature. The concept of technology in the organizational environment appeared in the 1960s. It was seen as information (Woodward, 1965), an activity (Thompson, 1967) and a process of search (Perrow, 1967). The next step in developing the concept of managerial technologies was the introduction of the "knowledge transfer" term (Argote & Ingram, 2000).

In our opinion, approaches to transfer and adaptation of product and process technologies are applicable to managerial technologies. There are five core approaches to the research of technologies transfer. Supporters of the first approach, the so-called "universalists" (Meyer, K., Estrin, S., Bhaumik, S., Peng, M., 2009), adhere to the idea of the management knowledge transparency: American universities and companies were not asked about adaptation issues and features of the recipient markets.

The second approach unites a group of researchers who emphasize on technologies recipients. It is believed that "even if the personnel management technology is transferable, the implementation costs and the risks of return to the starting position are so high that they can overlap all the potential benefits of such a transfer" (Huo & Von Glinow, 1995; Arregle, 2013; Choi, Beamish, 2004; Dhanaraj, 2005).

Representatives of the third approach note the need for adapting managerial technologies, especially in the field of international technologies transfer (Ronen, 1986; Westney, 1989; Yan, F., 2011). The fourth approach to technology transfer combines the basic concepts of organizational development and organizational change (Feldman & Rafaeli, 2002; Truss, 2001; Tyre & Orlikowski, 1993; Cox, 2014).

The fifth approach in many ways unites elements of the approaches described above. This approach seems to be the most promising for the authors of this article, since it avoids asymmetry in evaluating various factors, considers the specifics of the internal and external environment of the participating organizations, as well as the features of the transferred technology (Spielman, 1983, Kim, Yen, Kang, and Lee, 2016).

This article refers managerial technology to a certain actions sequence of the management system subjects on collecting information, developing management solutions using special methods and procedures, and implementing managerial impacts to achieve the set purposes.

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### 3. Methodology

The main method of research is the analysis and classification of modern researches on the knowledge and managerial technologies transfer.

In the researches of knowledge transfer, the authors distinguish three aspects of the transfer: strategy, process, and evaluation of transfer results. In order to understand the transfer strategy, F. Krogh (Von Krogh, Nonaka & Aben, 2001) identifies two main areas of knowledge in an organization: existing and new. There are two strategies for knowledge management in the organization: strategy of influence and strategy of appropriation (Bystrov, Klyukin, 2017). A similar approach can be found in the paper by K. Williams, who also singles out two strategies for the knowledge transfer: replication and adaptation strategies (Williams, 2007). In a model where companies copy knowledge, the latter is usually discrete, while adaptation models are characterized by transfer participants' understanding of the knowledge and technology individual elements.

A number of researches touch upon the technologies transfer process (Szulanski & Jensen, 2006). The authors put forward a process model of technologies transfer, which includes four stages: initiation, implementation, strengthening, and integration.

V. Albino and co-authors in their researches on the analysis of the production processes transfer, allocate more stages, allowing them to identify a certain hierarchy (Albino, Garavelli & Schiuma, 1999). Researchers distinguish two discrete sub processes, designated as pre-implementation and implementation.

Based on the concept's peculiarities, the two groups of core indicators are used to evaluate the managerial technologies transfer effect: changes in the company's innovation environment (the number of patents, the frequency of product upgrades, etc.) and overall performance indicators for the business (revenue, profit, staff productivity, etc.) (Aridi, 2017, Lindlof, 2011; Park, 2016, Sim, 2011).

Further, the authors outline the properties of management technology that determine the opportunities and scales of its adaptation:

- Life cycle of a managerial technology. Most researchers hold the viewpoint that the transfer opportunities and the chances of its success increase during the life cycle of the technology (OECD, 2012).
- Relative importance as a degree of principled novelty of managerial technology (Gosteva, Boyko, 2017). Accordingly, the more important the technology, the more difficult is its transfer.
- Specificity of the external and internal environment of the donor and recipient. These properties are interdependent: if the specificity level of external and intra-company specificity is high, then its transfer becomes more complicated (Gong, 2007; Meschi, 2007; Robson, 2008; Syed, 2009). This characteristic is similar in meaning to the category of "appropriateness" (fitness), led by E. Grant and M. Gregory in relation to industrial technologies (Grant & Gregory, 1997).
- Availability is the opportunity to purchase or transfer this technology. It is important who initiates the transfer of technology - the host party or the source of the transferred technology. If the donor is the initiator, then the availability level of technology is high, since not only explicit knowledge (documentation, instructions) is transferred, but also elements of implicit knowledge.
- Complexity is the level of qualification required for the transfer and use of this technology. High complexity level of technology reduces the chances of a successful transfer (Rogers, 1995; Makino, 2007; Meyer, 2009; Tong, 2007).
- Integrity is the relationship of specific management technology with other managerial technologies. Improvements in already implemented technologies are much easier (Dean & Bowen, 1994; Yan, 2007; Lim and Park, 2012).

In the next section, the authors present a classification of the examined researches in this

## 4. Results

Based on the literature review, the authors of this paper classify the main researches in the directions (Table 1).

**Table 1**  
Classification of researches on the management technologies transfer.

Author, year	Domain	Results
Woodward, 1965	Clarification of the "managerial technology"	information and means for its storage
Thompson, 1967		activity and knowledge of cause-effect relationships
Perrow, 1967		variability of the search process
Argote & Ingram, 2000		introduction of the "knowledge transfer" term
Meyer, K., Estrin, S., Bhaumik, S., Peng, M., 2009	Approaches to the technology transfer research	Justification of the management knowledge transparency
Huo & Von Glinow, 1995; Arregle, 2013; Choi, Beamish, 2004; Dhanaraj, 2005		Rationale for the transferability of human resources managerial technology, evaluation of implementation costs and return risks
Ronen, 1986; Westney, 1989; Yan. F., 2011		Justification of the need for adaptation
Feldman & Rafaeli, 2002; Truss, 2001; Tyre & Orlikowski, 1993; Cox, 2014		Identifying the need to change organizational culture
Spielman, 1983; Kim, Yen, Kang, and Lee, 2016		The rationale for determining the specifics of the internal and external environment of participating organizations, as well as the specific features of the transferred technology
Von Krogh, Nonaka & Aben, 2001 Bystrov, Klyukin, 2017 Williams, 2007	Methods and factors of transfer efficiency	Definition of transfer strategy
Szulanski & Jensen, 2006 Albino, Garavelli & Schiuma, 1999		Formation of the transfer process model and its stages
Lindlof, 2011		Evaluation of the transfer effect, formation of indicators list

<p>Gosteva, Boyko, 2017 Grant &amp; Gregory, 1997; Gong, 2007; Meschi, 2007; Robson, 2008  Rogers, 1995; Makino, 2007; Meyer, 2009; Tong, 2007  Dean &amp; Bowen, 1994; Yan, 2007; Lim and Park, 2012;  Syed, 2009; Park, 2016; Sim, 2011</p>	<p>Properties of the technologies</p>	<p>Consideration of certain properties of the technologies for determining the opportunity and adaptation scale</p>
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Previous researches, unfortunately, did not identify clear evaluation criteria of the effectiveness of managerial technologies transfer that would become operational criteria for recipient companies. The authors believe that such criteria should be the "opportunity" and "complexity" of the managerial technologies transfer, as necessary and sufficient conditions, respectively. For the practical application of operational criteria, the authors present in a tabular form a classification of the managerial technologies properties based on the features of the opportunity and complexity of the transfer (Table 2).

**Table 2**

Properties of managerial technology in terms of the opportunity and complexity of its transfer

<b>Transfer of technologies is possible</b>	<b>Transfer of technology is not possible</b>
<p>Technologies in the late stages of the life cycle (stages of standardization and universalization). Technologies are basic and radical (relatively important). The average level of intra-company specificity and specificity of the external environment. Accessible technology, the initiator of the transfer is the recipient. High complexity of managerial technology High integrity level of managerial technology</p>	<p>High intra-company specificity and external environment specificity Inaccessible managerial technology or technology in the early stages of the life cycle (discovery, research) Complex and not subject to reverse engineering technology</p>
<p>Technology transfer is relatively complicated</p>	<p>Technology transfer is relatively simple</p>
<p>Technologies at the middle stages of the life cycle (stages of commercialization, introduction to the market, modifications). Low integrity level of the technology.</p>	<p>Incremental, derivative and improving (in terms of relative importance) technologies. Accessible technology, the donor initiates the transfer. Relative simplicity of management technology</p>

Key properties of managerial technology distinguish into two classes: the first is the factors affecting the principle opportunity of technology transfer (from the total impossibility of transfer to its opportunity), the second is the factors of the transfer process in terms of its facilitation or complications. Within the framework of the discussion, an algorithm for analyzing the properties of technologies and limitations on its application is described.

## 5. Discussion

In order to predict the effectiveness of technologies transfer, a comprehensive analysis of the properties and characteristics of managerial technologies is required. The authors offer the following algorithm for such an analysis:

Evaluation of the technology availability is determined in willingness terms of the donor company to provide technology for the transfer, and the level of costs for the transfer.

Evaluation of the environment specificity level (external and intra-company). Country and cross-cultural factors, as well as peculiarities of legislation and taxation in the case of an international transfer, can be attributed to the parameters of the external environment. Intra-company specificity is evaluated in terms of differences in the organizational structure and culture of the company, as well as the organization of business processes.

Evaluation of the complexity and commitment to reverse engineering of technology can be carried out from the point of identifying production risks view (purchase of additional equipment, retraining of employees, changing production operations) and risks of resistance to changes on the part of the companies' employees. Evaluation of the technology integrity level is based on determining the opportunity of technology separation into sub processes to ensure adaptation in the recipient company.

Determining the stage of the life cycle of the technology. It is possible to subdivide the stages into late (standardization and universalization), medium (commercialization, modification) and early (development, implementation).

It is important to point out the importance of applying this algorithm in empirical research on management. The authors note that the step-by-step evaluation of the above algorithm seems to be quite complicated for a number of reasons:

1. Most of these properties have a qualitative character, which is difficult for quantitative interpretation.
2. The conditions for researching technologies from different countries allow us to give a fairly accurate description of the technology life cycle, but it is difficult to evaluate and compare the specificity of the external environments of such technologies (Kolasa, 2008).
3. Properties of the technology are largely interdependent, and the question arises as to whether it is possible to determine the influence degree of each factor (Kogut & Zander, 1992, Lim and Park, 2012).

Thus, the application of the algorithm is possible only if the investigator has researched the influence degree of each technology properties, the researcher has the opportunity to match potential technologies with the help of other properties, and otherwise this evaluation loses its meaning. In the next section, the authors present the main conclusions of the research.

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## 6. Conclusions

Summarizing, it should be said that the process of managerial technologies transfer has a number of key differences from the transfer of production or food technologies. In general, the transfer process itself carries certain risks, since the costs incurred when using the transfer technologies incorrectly can be higher than the expected profit. Simultaneously, the factor of cross-cultural interaction is an additional risk factor in the transfer of managerial technologies.

The research solves the following objectives:

1. The existing foreign literature has been analyzed, which deals with the processes of knowledge transfer and managerial technologies.
2. The necessary and sufficient conditions for the technologies transfer have been formulated, as well as limitations for their application.
3. Six basic characteristics of the opportunity to adapt various types of managerial technologies were revealed.

The significance of paper is determined by

- The list of parameters, the evaluation of which allows determining whether the necessary and sufficient condition for the management technologies transfer is being met;
- Characteristics of the various types of adaptation of managerial technologies.

The novelty of the paper is in identifying the characteristics of managerial technologies, the analysis of which allows assessing the opportunity and simplicity of the transfer. Recipient companies of managerial technologies can use the analysis algorithm in practice when implementing a transfer in international projects.

Limitations of this research include lack of the risk evaluation consideration in the transfer of managerial technologies, in particular when implementing international transfers (political, currency, cross-cultural risk factors).

Further researches on this topic can be carried out in the following areas: first, researches of the practical results of the transfer by the example of moving production units, mergers and acquisitions of companies and the interaction of transnational corporations; second, the knowledge transfer on the example of high-tech manufacturing companies.

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