

# Informatization of enterprises in the light of transaction costs

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## Abstract

The subject of the publication are contracts concluded by enterprises, regarding the implementation and operation of information systems, which support various functional areas. The implementation and operation of IT systems in enterprises is presented as a mechanism of permanent transactions entered in two contracts: the selection and purchase of an IT system, and the operation and service of the system.

*Keywords:* Enterprise Resource Planning; transactional costs; New Institutional Economy; IT systems

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## 1 Introduction

The paradigm of New Institutional Economics elevates institutions to the rank of economic growth factors. Their role is to provide limitations, operational principles and stimuli coordinating activities in the private and public fields. According to O. E. Williamson, the main representative of scientists analysing behaviour of large corporations, all relations between individuals and organisations can be taken in the form of a contract [Williamson O. E., 1998, pp. 43–90]. In the world of contracts, relations between people and organisations are oriented towards cooperation, and the role of institutions and organisations, including the state, is to coordinate such activities, which can contribute to transaction cost savings that perform the role of a criterion applied in the assessment of institutional solutions and formulas of agreements in New Institutional Economics.

New Institutional Economics has introduced a category of transaction costs into the effectiveness calculation; however, sometimes such costs are impossible to be expressed in monetary value; in orthodox Neoclassical Economics, they are unnoticed, they appear next to production costs and are omitted in economic decisions.

The aim of the study is to indicate the essence of transaction costs with regard to the specificity of the implementation of IT systems in enterprises.

## 2 The role of IT systems in contemporary business management

In literature, the notion of an information system is defined in various ways. The suggested definition approaches information systems in the aspect of cybernetics. It states that an information system is a spatially distinguishable and temporally systematised set of information, information senders, information receivers, information channels,

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technical means of transmitting and processing information, the functioning of which is used for controlling an economic object (A. Nowicki, 1999, p. 17).

Information systems perform a significant role in the success achieved by each enterprise. They are the sources that satisfy information needs of managers who make decisions. An information system for management involves numerous resources: human, information, procedural, technical and financial resources. Their characteristics is presented in Table 1.

Table 1. The structure of resources in an information system

NAME OF THE RESOURCE TYPE	SPECIFIC RESOURCES
Human resources	<ul style="list-style-type: none"> <li>- users of the system</li> <li>- system operation</li> <li>- research and project teams, consulting teams</li> </ul>
Information resources	<ul style="list-style-type: none"> <li>- data bases</li> <li>- method bases</li> <li>- model bases</li> <li>- knowledge bases</li> </ul>
Procedural resources	<ul style="list-style-type: none"> <li>- algorithms</li> <li>- procedures</li> <li>- software</li> </ul>
Technical resources	<ul style="list-style-type: none"> <li>- hardware</li> <li>- telecommunication networks</li> <li>- data storage devices</li> </ul>
Financial resources	<ul style="list-style-type: none"> <li>- cash</li> <li>- non-cash transactions</li> </ul>

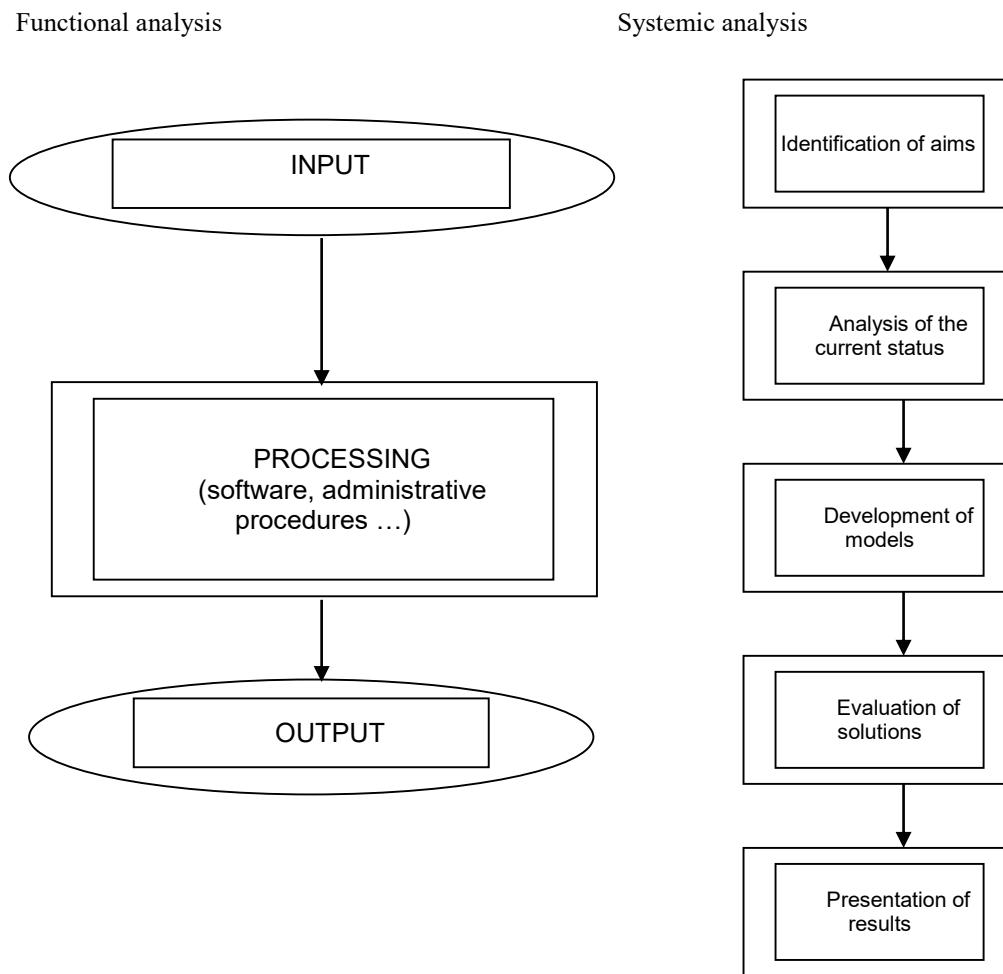
Source: A. Nowicki, *Strategia doskonalenia systemu informacyjnego w zarządzaniu przedsiębiorstwem*. Wrocław Wydawnictwo Akademii Ekonomicznej im. Oskara Langego in Wrocław 1999, p. 30

The basics of designing information systems involve two types of analysis (A. Chauvet, 1999, p. 5):

- 1 Functional analysis, which allows designers to define functions of the process related to transformation of accessible information into information that can be used by a company
- 2 Systemic analysis, which leads to the development of a model that implements the functions of the process and to the connection of operations indispensable for obtaining output information with the description

The scheme of the approach towards designing of information systems is presented in Figure 1.

Figure 1. The basic stages of information system designing



Source: the Authors' own study based on A. Chauvet, *Metody zarządzania. Przewodnik*. Poznań Poltext 1999, p. 31

An information system must be favourable for the management of large data sets, their processing (which is often very complex) in such a way that they should be transformed into an outcome that is practically applicable. The discussed problems have led us to the application of IT science in automatic information processing.

In order to implement a computerised information system efficiently, a project should be developed first in the form of a document that defines the future form, the scope and operation of the system. If the current information system is supported by computer technology, the modifications that are designed in line with new information requirements may also refer to the implementation of major or minor changes in the currently operated hardware and software, and such changes must be considered in the project. The system designer should also consider future system users' ways of reasoning, and such ways may differ fundamentally from the way of reasoning assumed by designers or producers. Hence, designing such a system requires active cooperation between designers and users. The cooperation should be manifested in the answers to the following questions:

- Is it possible to obtain the required information from the system for the efficient operation of the economic system?
- How fast is it possible to obtain such information?
- Is the access to the data collected in the system easy?
- How many people must enter data to the system?

At the stage of designing, the problems of technical and technological nature become significant too. Such aspects can be presented in the form of the following questions:

- How much disk storage should be planned?
- How many lines of code will be included into the installed software?

- How to store data in the system?
- What system of data management should be applied in the system?

The following factors should be also taken into consideration:

- support for the new information system provided by the management staff
- complexity of the system and the level of risk that the system might turn out to be inadequate to the requirements
- a proper implementation method for the designed system (W. Flakiewicz, 2002, p. 206)

While designing an information system for an enterprise, it is advisable to pay special attention to an element that has underlain the BPR concept (*business, process, reengineering*), that is, a set of processes that form the operation of the company. Organisational processes do not consider any structural limitations, and they may integrate more than one management function, they can be combined with the auxiliary processes of an enterprise, and they can interact with the market environment. A project of an information system for an enterprise is based on organisational processes related to the market environment. Processes take place in time and space, cooperating with each other and all the changes in such processes in time result from the changes that take place inside the enterprise as well as in its environment. The current processes come as a starting point to their next restructuring, which is implemented in order to improve the flexibility of a response provided by an enterprise to the requirements and expectations of the market and to increase customers' satisfaction.

### 3 Classification of costs and benefits of IT undertakings

The key problem related to economic analysis of IT undertakings is a proper classification of costs and benefits resulting from the implementation of an IT system. The classification should consider the relation to the economic performance of an organisation. Therefore, in expert literature, they are divided into direct and indirect ones (M. Niedźwiedziński, 1989, p. 126).

Direct benefits appear when as a result of the implementation of an IT system, an improvement in the company's economic performance takes place because of such implementation. Indirect benefits can be observed when an IT system positively affects the operation of the company; however, there isn't any direct relation between the application of the IT system and the improvement in the economic performance of the company. Indirect benefits appear due to informative, transformative, organising and prestigious roles of IT systems performed to support business management. An improvement in the economic performance of an organisation is implemented through the chains of causative interdependencies.

Considering costs, they undergo a similar division into direct and indirect costs, depending on their relations to information technology. A direct cost will be in the case when economic performance of an organisation is being worsened as a result of the use of the IT system. Indirect costs will involve any negative effects of using an IT system, when it is difficult to define their explicit influence exerted on a decrease in economic performance of an organisation.

Both costs and benefits can be divided into measurable and non-measurable, depending on whether or not there is a possibility to measure them (B. Kubiak, 1994, p. 150). Measurable benefits/costs are those to which financial or physical measures can be explicitly assigned, whereas it is impossible or economically unjustified to define any objective measure for non-measurable benefits/costs. Considering such a context, J. Kisielnicki (J. Kisielnicki, 2001, p. 275) refers respectively to the notions of quantitative and qualitative effects.

Costs and benefits can be divided into financial and non-financial, depending on whether there is a possibility to express the outcome in monetary units.

It should be observed that direct benefits and costs are usually of measurable nature, and considering their direct influence on economic performance, they have a financial character. Indirect benefits and costs can be both of measurable and non-measurable nature, and they can have a financial and non-financial character.

Another criterion that allows us to classify costs and benefits is the organisational level at which they appear. Considering the organisational level of their occurrence, it is possible to distinguish operational and strategical costs and benefits. The occurrence of operational or strategical benefits results from the influence of an IT solution on the relevant level of management.

The final criterion that allows us to classify benefits only is the function of an IT system, which has generated such benefits. Benefits can be divided according to the function of an IT system:

- benefits from automation

- benefits from information
- benefits from transformation (innovation)
- benefits from organisation
- prestige benefits (qualitative)

#### **4 Transaction costs in the implementation of IT contracts**

Transaction costs can be observed in all the phenomena and processes of economic nature. As it has been presented in Chapter 2, IT undertakings can be assigned economic efficiency, understood as a relation between the total expenditures and results expressed in financial units. The pursuit of minimisation of the total sum of production costs and transaction costs comes as one of the fundamental measures of efficiency of institutional solutions (Z. Stanek, 2017, p. 161).

The difficulty in the measurement of implementation costs and costs related to the functioning of an IT system comes as a significant problem. Furthermore, the measurement of outcomes turns out to be troublesome as well, especially in the field of indirect outcomes and outcomes that are more of qualitative rather than quantitative in nature. In practice, a comparative approach is applied to both production costs (indirect and direct) and to transaction costs. The comparative approach involves comparison of various ways of contracting IT systems and their related costs.

The level of transaction costs depends on six fundamental factors:

- the number of the participants in a transaction
- market structure
- the uniqueness of resources and assets
- the type of a contract
- the scope of uncertainty with regard to the behaviour of the contract parties – related to the level of the social capital
- the system of property rights and efficiency in the enforcement of possible liabilities (Z. Stanek, 2017, p. 161)

Considering IT systems, the most important fields where transaction costs are generated refer to the unique character of resources and assets, and to the system of property rights. In terms of the number of transaction participants, the market is dominated by contracts entered by two entities, namely a supplier of the system and a company that has decided to implement that IT solution. Contrary to, for example, the construction market, where forming a whole chain of sub-contractors starting from a general contractor has become a standard. During the implementation of IT systems, a contract is usually performed entirely by one supplier, who does not fall back on any sub-contractors or cooperates with them to a very limited extent, for example, to perform pre-implementation analysis. The limited number of contract participants positively affects the decrease in transaction costs, and it limits the risk of business failure. It also allows the parties to respond better to any problems that have not been predicted before the implementation.

Also, the structure of the IT business market fosters the decrease in transaction costs, considering an average number of entities that offer implementation of IT systems; consequently, it fosters market operation based on the model of monopolistic competition. A large number of entities operating in the IT sector largely results from the young age of that sector and relatively low market entry costs. Low market entry costs result from the fact that the product offer is mainly based on software solutions; therefore, companies do not have to apply any sophisticated and expensive equipment to provide interesting products. It has been confirmed by a large number of start-ups, which are companies started by beginners who often do not have large capital resources at their disposal. On the other hand, on the consumer market, it is possible to observe a tendency towards its consolidation, which results from the growing maturity of the IT sector. Observed in the consumer market, the domination of solutions offered by single companies (e.g., Microsoft in the market of operational systems) hardly ever refers to solutions offered to corporations, where it is common practice to use systems based on free licensing (Linux) or solutions from the public domain (HTLM, Free BSD system).

Costs related to the uniqueness of resources and assets are much more significant than the two above-mentioned cost categories. Considering the selection of an IT system based on their intellectual capital, which is mainly based on human capital, the implementation of the whole IT contract depends on the participation of particular people who hold specified competences. It should be mentioned that the discussed uniqueness refers not

only to the resources of enterprises offering IT systems but also to the resources of enterprises that are potential buyers of such systems. It results from the importance that should be attached to the selection of a system at the stage of pre-implementation analysis and the assessment of the functioning of that IT solution after its implementation. At this stage of transaction cost occurrence, it is necessary to mention costs related to after-sale service of hardware and software. It is advisable to consider the institutional sustainability of the system supplier and its willingness to supply all the necessary parts for the hardware and new versions of the software. A very good example of a broad approach towards cost accounting is the TCO model (Total Cost of Ownership), which is frequently applied. At the stage of making a decision about which IT system should be chosen, the price of hardware and service is often the only factor taken into consideration. Other expenses related to the purchase, such as installation costs, operation and modernisation costs, are rarely considered. In order to establish profitability of IT investment, TCO (Total Cost of Ownership) can be applied as a measure.

TCO includes all the costs that are related to the particular hardware or service, incurred during its whole operational lifetime. These are costs directly and indirectly related to internal customers who use that particular IT solution. During the analysis of the total cost of ownership of a particular IT system, it is important to differentiate costs into current operational costs and investment expenditure. Another important requirement is the consideration of direct costs (equipment expenditure, administration costs, etc.) and indirect costs (e.g., stoppages). The method of cost measurement with the use of TCO allows the interested parties to calculate the total cost of a particular IT system and to analyse the total cost of ownership with some modifications of the particular system components.

Considering investment in IT systems, one of the most important elements of transaction costs is a formal institution of property rights. To the largest extent, such costs refer to software and broadly understood protection of intellectual property. The question of property rights with regard to hardware is considered to a lesser extent in IT investment. In the latter case, the choice refers to the purchase of hardware or a form of leasing. As far as the purchase or the use of software is concerned, there are several purchase or leasing models. In our considerations, it is worth mentioning the problem of cyber-piracy, which means free-of-charge and unauthorised use of someone else's intellectual property. At present, however, it is possible to assume that this phenomenon has been in decline, especially on the business-to-business market, and it is related to more efficient law enforcement exercised by the institutions of justice, higher awareness and new models of software distribution and sale. Recently, it has been possible to observe a trend in which one-time installation of the purchased software on users' hardware is being commonly abandoned in favour of various subscription models (as, e.g., Adobe Creative Cloud) and a model of providing software in cloud computing, or reaching even further, Software as a Service, namely: services that are purchased and paid during the use or providing the required computer performance upon request.

### Conclusions

It should be emphasized that there are no contracts without transaction costs. In practice, companies make savings on transaction costs relating them to the management structures, with the use of such managerial operations as controlling or internal control. Reduction of transaction costs requires proper selection of a contract for the particular type and size of a company. Undoubtedly, the more functions are performed by the company itself, the lower its transaction costs become.

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