

Dr Wiesław Samitowski
POLINVEST Sp. z o.o.
samitowski@polinvest.pl

INFORNOMICS, THE RELATIVE VALUE OF INFORMATION AND METHODS OF BUILDING INFORMATION SYSTEM

Introduction

On the basis of many years of experience in providing business consulting services in the POLINVEST company based in Kraków (almost 2000 consultancy projects for over 750 clients) and the work at the Krakow University of Economics (including, among others, a PH.D. thesis on *The relativity of the informative value of financial result*¹, the author presents the following conclusions regarding the requirements and methods for building business information systems in a consistent way.

1. Informomics

Broader considerations on information systems that are applied in business will be referred to as **Informomics**, i.e. a field of study that deals mainly with the creation of information for the sake of decision making processes in business. The issue deserves a particular interest as the results of any business activity depend to a great extent on **the access of decision-makers to professionally prepared information** on current conditions. One can say that practically all decisions that are made result from the information accessible at the moment of the decision making process. That refers to specially prepared synthetic information concerning:

- phenomena and changes on markets (marketing information),
- accessible human resources and successful methods of personnel management (personnel information),
- financial facts and forecasts (financial information),
- successful and effective technical solutions (technical and technological information),
- organizational phenomena and changes (organizational information),
- interpretations and changes in legal provisions (legal information).

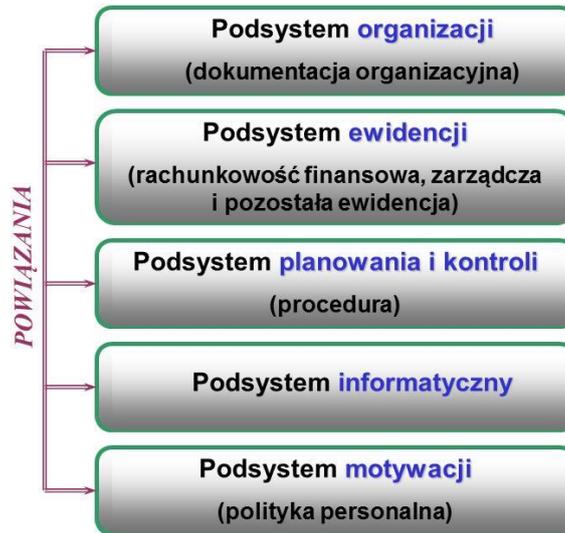
The living standards of societies depend largely on the rightness of economic decisions, and consequently, on the quality of information that the decision makers have access to at the moment of decision making.

For the sake of further considerations, the author assumes that the term *information system of a business organization* refers to a set of coherent, complete and mutually interconnected

¹ W. Samitowski, *Względność wartości informacyjnej wyniku finansowego*, Uniwersytet Ekonomiczny w Krakowie, 1986.

subsystems of organization, accounting, planning and monitoring, motivation and information tools that is given in Scheme 1.

Scheme 1. Structure of information system



Connections

Subsystem of organization (organizational files and documents)

Subsystem of accounting (financial accounting, managerial accounting and other records)

Subsystem of planning and monitoring (procedures)

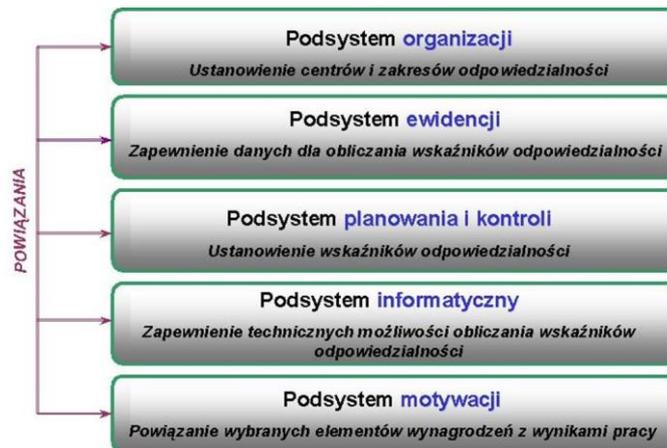
Subsystem of IT

Subsystem of motivation (personnel policy)

Source: author's research

Scheme 2 presents the recommended key **objectives** that should be reached when designing and implementing the above **subsystems**.

Scheme 2. Objectives of the subsystems of the information system



Source: author's research.

Connections

- Subsystem of organization establish centers and ranges of responsibility
- Subsystem of accounting provide data to calculate responsibility ratios
- Subsystem of planning and monitoring establish responsibility indexes
- Subsystem of IT provide technical means for calculating responsibility ratios
- Subsystem of motivation connect selected remuneration elements with work results

It can be inferred from the above schemes that the **IT** subsystem is only one of the elements of the information system. Practical experience proves that the following factors are crucial for the effectiveness of the **information** system:

- a regular and consistent construction of its conceptual assumptions that are in line with the information needs of the management which is done before the implementation of the IT tools that are new to the company and
- the management's policy to develop among the staff the habit to design systematically the system, implement it and take advantage of its whole potential.

It is a common mistake that the decision on the implementation of a complex IT system is made without defining the precise assumptions of its functioning in a given company and without the analysis concerning the information scope and the form that would be indispensable from the point of view of the requirements in that area. That mistake is the reason of problems that appear in the course of implementing the new software as well as during its application by the users. It also creates problems to the providers of software, whose work is sometimes not accepted. Thus, the lack of definite assumptions regarding the **information system** may not bring any benefits from implementing an IT system or the advantages may be significantly below the expectations. The reason is that it is not enough to buy new hardware and software but it is essential that prior to that it is ensured that the software is fed with appropriate information and the reports that are generated afterwards provide the management with the necessary information.

2. Relative value of information

In order to emphasize the idea of effective construction of information systems, a following theorem on the relativity of the information value (given by Formula 1) can be presented: **the information value of a business entity (IVBE) equals the product of its information assets**

Formula 1. Relative value of information

$$IVBE = IA \times SGI^2$$

Source: author's research

The speed of gaining the access to synthetic information (SASI) that is developed for managers depends in turn on the **coherence of the information system elements**, which is decisive as regards its efficiency and effectiveness. It is more important to focus on the reduction of the time of access to the synthetic and professionally prepared information rather than to increase the amount of information. In fact, it can be often observed that despite generating an enormous amount of partial information, organizations – when key decisions have to be made - do not dispose of cross-sectional information sets or synthetic conclusions and recommendations that would result from the analysis of the information stored.

Formula 2 presents another theorem on the coherence of information system elements, according to which **company's economic potential (CEP) equals the product of the quality of its information system elements (QSE) and the mutual coherence of the elements (MCE) squared.**

Formula 2. Relativity of information system elements

$$CEP = QSE \times MCE$$

Source: author's research

Formula 2, whose purpose is to present the conclusions of a long-term observation of the practice of management, emphasizes the fact that the coherence of the elements of information systems is more important than the quality of every separate element. It is a common practice that particular elements of the systems are developed by different authors in different times and in the wrong order. They form an incoherent and consequently ineffective entity.

3. Method of building an information system

On the basis of the author's experience gained in his work in the POLINVEST consulting company, the following approach to **build effective information systems** is recommended below. Their purpose is to support the management of a company, i.e. to assist the decision making processes.

In order to maintain the quality of the decisions made, managers should constantly ensure their access to reliable, synthetic and possibly complete **information** that would suit their needs. The access to such information is crucial as regards the **effectiveness** of management.² To achieve that goal managers should constantly, among other things:

- coordinate the definitions of notions applied in the company,
- manage current documentation and effective filing of documents,
- implement databases,
- coordinate data processing methods,
- organize the preparation of synthetic reports.

In order to support the efficiency and effectiveness of managers, the author recommends a procedure referred to as the **ZSI-POLINVEST method** which defines the principles of a systematic **information system management**. The application of the method is particularly justified in organizations that are under the process of development or significant change.

The method, which is presented in Table 1, consists in a ten-stage process to support the creation of an effective, complex and coherent information system which meets the needs of managers.

Table 1. Essential measures to be taken as regards the information system management

Stage	Measures
1	Agreement on the rules of managers' work in real time and development of a list of management models considered by the managing team
2	Graphic presentation of the condition of the elements of the management information system
3	Selection (by the managing team) of the organization management model (adequate to company's specific features and development stage)
4	Determination of the needs and directions of the organization management information system development adequate to the specific features of the organization
5	Organizing and completing the documents that concern organizational principles regarding, among other things, information suppliers/recipients and their powers
6	Organizing and completing the documents that cover the principles of personnel policy having an impact on the scope of information essential for managing the organization
7	Organizing and completing the documents that cover the rules of keeping records in

² See, e.g. Peter F. Drucker, *Praktyka zarządzania*, Wydawnictwo MT Biznes sp. z o.o., p. 525.

	accordance with the organization information needs
8	Organizing and completing the documents that cover the principles of planning and supervision in the organization
9	Implementation of rules covered by the above documents
10	Regular verification and update of the above rules

Source: author's research

Stage I - Agreement on the rules of **work in real time** and development of a list of company **management models** (concepts) taken into consideration by the managing team

Before starting the introduction of changes into the organization information system, it is recommended that the management team should define the principles that increase the effectiveness of developing and implementing the changes and management as such, i.e. the principles of **team work in real time** (in the course of a meeting and not in the indefinite future). Table 2 presents the recommended principles in all remaining stages of the method in question.

Table 2. Work rules in real time

a)	Determine the objectives and agendas of management meetings
b)	Prepare the analysis of conditions for making the decision that is to be made on the meeting
c)	Provide enough time for the meeting so that its objective is achieved
d)	All participants of the meeting should be prepared to participate actively and present a full set of conditions for making a particular decision
e)	The meeting should be chaired by a person responsible for achieving his/her objective
f)	Keep the staff updated about the results of joint projects (e.g. in the form of media presentations during the meetings)
g)	Make the minutes of the meetings while it lasts
h)	Focus only on the objective of the meeting (do not allow for distractions related to other purposes)
i)	Conclude the meeting by presenting its results and a formal acceptance of the decisions made
j)	Do not postpone any objectives of the meeting for the next time

Source: author's research

The identification and consideration of all possible options of management models is indispensable as choosing an incidental option of management model that does not suit the organization and is incoherent with previous changes may cause a failure of long-term and costly

operations that aimed at the increase of effectiveness but resulted in its decrease due to a wrong selection of the model.

The **options of management models or the combinations of their elements** may be selected from the list given in table 3.

Table 3. Examples of management model options

a)	Management by Objectives ³
b)	Management by Competencies ⁴
c)	Management by Processes ⁵
d)	Standard and Procedure Based Management (including e.g. the ISO standard) ⁶
e)	Standard Based Management
f)	Management by Responsibility ⁷
g)	Management by Mission ⁸
h)	Management by Delegation
i)	Management by Centralization
j)	Management by Projects ⁹
k)	Management without integrated IT system
l)	Management with integrated IT system

Source: author's research

At that moment it is worth considering the specific features and the consequences of choosing particular options, which -as such-, increases the chances of the successful implementation of the changes. This stage is also an opportunity for the necessary training of managers who will work in the information system development team so that they are all equally well prepared to carry out the project. It is crucial that all representatives of top management take part in this stage as they will be the main recipients of the work done. Thus, at the beginning they should set the direction of the change in the information system.

The work on **information system** should not be associated only with the implementation of the changes in the **IT system**. It often happens that organizations start work on the implementation of IT tools without the development of precise assumptions concerning the principles (the

³ See, e.g. R. Reinfuss, *MBO – prosta i skuteczna technika zarządzania Twoją firmą*, Helion SA.

⁴ See, e.g. T. Oleksyn, *Zarządzanie kompetencjami. Teoria i praktyka*, Warszawa 2010; S. Whiddett, S. Hollyforde, *Modele kompetencyjne w zarządzaniu zasobami ludzkimi*, Kraków 2003

⁵ See, e.g. E. Skrzypek, Mariusz Hofman, *Zarządzanie procesami w przedsiębiorstwie*, Wolters Kluwer

⁶ See, e.g. J. Łunarski, *Zarządzanie jakością. Standardy i zasady*, WNT, Warszawa 2008

⁷ See, e.g. A. Kisil, *Zarządzanie przez odpowiedzialność. Podstawa odpowiedzialnego biznesu*, Difin SA, Warszawa 2013

⁸ See, e.g. P. Cardona, C. Rey, *Zarządzanie przez misje*, Wolters Kluwer SA, Warszawa 2013; M. Bugdol, P. Jedynek, *Współczesne systemy zarządzania. Jakość, bezpieczeństwo, ryzyko*, Wydawnictwo Helion, Gliwice 2012

⁹ See, e.g. M. Pawlak, *Zarządzanie projektami*, Wydawnictwo naukowe PWN, Warszawa 2014

algorithms including) of information acquisition for the purposes of management. As a result, several misunderstandings and problems emerge in the course of the IT tools implementation.

The determination of assumptions concerning the information system should depend, among other things, on the accepted division of competencies between the employees, their responsibilities as regards information storage, the information flow rules, the methods of monitoring the market, the scope of the indispensable reports, staff motivational methods and the methods of purchasing and sales, etc.

Stage II – Graphic presentation of the condition of a management information system elements

Before starting the change process of the information system, it is necessary to make an inventory of its elements . A graphic presentation of the existing information system is helpful as it facilitates the identification of the missing elements and simplifies the communication in the team responsible for the change.

A special questionnaire for the analysis of the condition of the information system is useful as it facilitates the investigation of the adequacy, completeness and coherence of the system. At the beginning of the change implementation, having obtained the required data, it is advisable to develop a **map of the information system** which shows the system's initial "architecture", including the types of documents that belong to it. The development of such a map seems indispensable for the presentation of the system principles to its users, i.e. the staff of the organization. What is more, it is essential to visual **designing of the information system development** and it helps identify the relationships between particular operations aiming at the development of the organization. Such maps trigger the imagination of managers, which - apart from the knowledge of facts – is one of the fundamentals of management. The map should be updated in the course of the implementation of the changes to the information system.

Stage III – Selection of the organization management model by the managing team

Before starting the operations that aim at the implementation of changes to the information system but after analyzing a few possible management models, it is essential to make a formal choice of a management model to be used on the long-term. Such a rational choice is of key importance to the organization and the analysis made prior to that makes it easier to understand and plan the process of change.

The choice of a management model has an impact on, among other things, the scope of the information essential to the managers and the scope of reports that have to be made. For example:

- The decision of managers to choose the model of management by objectives requires the acquisition of information on the accepted targets, measures of their realization and the indexes achieved that inform about the level of the achievement of the targets.
- The selection of the management by processes model requires the information about processes, their effectiveness and the degree of optimization.

- The management by competencies model requires the information in the area of competency models and on the level of competencies achieved in comparison to the relevant requirements of the organization.
- In order to manage the effectiveness of investments it is essential to conduct feasibility studies of investment projects, to prepare - with the support of special calculation models - long-term financial forecasts for the selected projects and to develop multi-option simulations with the aim of choosing the optimal ones.
- The choice of the model of management by responsibility requires developing and publishing reports for the public, social audits including¹⁰.

Stage IV - Determination of the needs and **directions** of the organization management information system development

At this stage it is necessary to define the elements that are essential for the information system to be complete, coherent, effective and adequate to the organization. This can be done by the development of the system functional requirements and a graphic presentation of all the information system elements, which facilitates the recommended preparation of the **information system development strategy**. The objective of the development is to increase the effectiveness of the acquisition and implementation of the information that is essential in the management process. This is the stage when the information system is designed and consulting services are used in the development of the system change implementation plan, including the determination of a correct order of the changes.

It is important at this stage to determine the **patterns of reports to the management** that include marketing, technical, technological, financial, organizational and legal information. It is essential that the information first of all makes it possible to identify the risks faced by the organization in order to facilitate risk mitigation.

Stage V - Organizing and completing documents that concern **organizational** principles

The aim of this stage is to define precisely such factors in organizational documentation as :

- responsibility centers (the task scopes of particular company units, especially of their heads and the responsibility ranges of particular positions should be specified and a model of a responsibility center should be selected – investment, profit, revenue and cost centers),
- powers, which enable the employees to take responsibility for accomplishing the objectives set,
- information management and storage principles (including the rules of current record-keeping and task lists),
- procedures of information storage and processing as well as planning and supervising procedures.

¹⁰ Abt, *Peut-on appliquer les principes comptables au bilan social?* “Revue française de gestion”, XI – XII 1977, p. 54

Stage VI - Organizing and completing the documents that cover the principles of personnel policy having an impact on the scope of information indispensable for managing the organization

At this stage, first of all it is essential for the management to find the answers to the following questions:

- What are the long-term principles of motivating the staff on particular positions?
- How will the remuneration be related to work results?
- What information is essential for the assessment of the selected work results?
- What changes in the area of organizational culture are necessary for an effective functioning of the information system?

The answers to the above questions should be followed by an adequate correction and supplementation of documents that define the organization personnel policy.

Stage VII - Organizing and completing the documents that cover the rules of **keeping records** in accordance with the organization information needs

At this stage it is essential to organize and supplement the rules of keeping records adequately to the results of previous operations so that proper conditions are created for the development of information needed by the managers. First of all this refers to the policy of financial accounting and the methods of keeping records for the purposes of managerial accounting. Accounting, as a coherent and the most advanced information system element of business organization, makes it possible to acquire information that is verifiable and informative as regards several aspects of doing business. Financial accounting is first of all an information source on financial effectiveness, while managerial accounting can be developed with the aim to provide essential information (non-financial data including) on issues that are significant to business decision-makers.

Stage VIII - Organizing and completing the documents that cover the principles of **planning and supervision** in the organization

In the course of that stage, the correction of principles of planning and supervision should be performed as regards:

- the definitions of notions applied in planning and supervision (in that way the managers influence the language and organizational culture),
- regular information storage,
- processing (developing) the information for the purposes of decision making (together with the determination of, e.g. calculation formulas of selected indexes),
- the supervision of work results on the basis of accessible information,
- the development of summary reports for the management.

Stage IX - **Implementation** of rules covered by the above documents

It is recommended to set up an implementation team already at the first stage, which should—having participated in the introduction of the method in question, e.g. by co-operating with an external adviser – successfully implement the system that was designed in the previous stages. It is usually essential that for the purposes of the implementation of positive changes some effort should be made to introduce new habits in the staff, without which a successful functioning of the information system is impossible.

Stage X - Regular verification and **update** of the above rules

When applying the method in question, it is recommended that the implementation team should regularly verify and update the organization information system so that it is adequate to the needs of managers, coherent and effective. To achieve that goal regular information system audits are recommended.

Conclusion

On the basis of the author's practical experience in the area of the implementation and optimization of information systems, it is justified to:

- to introduce the notion of **Infornomics** that refers to a field of study on information development for business decision-making purposes,
- to assume the relativity of information value and express it by the formula that the information value of a business entity equals the product of its information assets and the speed of gaining synthetic information squared,
- to assume the **relativity of information system elements** and express it by the formula that company's economic potential equals the product of the quality of its information system elements and the mutual coherence of the elements squared.
- to apply the **ZSI-POLINVEST method**, which concerns a systematic **information system management** to support the development of an effective, complex and coherent information system satisfying the needs of managers.

Further research is required to develop the rules of functioning of information systems in business entities and to describe in a more precise way the tools used by the ZSI-POLINVEST method on the basis of its practical application .

Bibliography

- [1] Abt, *Peut-on appliquer les principes comptables au bilan social?* Revue française de gestion, XI – XII 1977

- [2] Cardona P., Rey C., *Zarządzanie przez misje*, Wolters Kluwer SA, Warszawa 2013; Bugdol M., Jedynek P., *Współczesne systemy zarządzania. Jakość, bezpieczeństwo, ryzyko*, Wydawnictwo Helion, Gliwice 2012
- [3] Drucker P. F., *Praktyka zarządzania*, Wydawnictwo MT Biznes sp. z o.o.
- [4] Kisil A., *Zarządzanie przez odpowiedzialność. Podstawa odpowiedzialnego biznesu*, Difin SA, Warszawa 2013
- [5] Łunarski J., *Zarządzanie jakością. Standardy i zasady*, WNT, Warszawa 2008
- [6] Oleksyn T., *Zarządzanie kompetencjami. Teoria i praktyka*, Warszawa 2010; Whiddett S., Hollyforde S., *Modele kompetencyjne w zarządzaniu zasobami ludzkimi*, Kraków 2003
- [7] Pawlak M., *Zarządzanie projektami*, Wydawnictwo naukowe PWN, Warszawa 2014
- [8] Reinfuss R., *MBO – prosta i skuteczna technika zarządzania Twoją firmą*, Helion SA
- [9] Samitowski W., *Względność wartości informacyjnej wyniku finansowego*, Uniwersytet Ekonomiczny w Krakowie, 1986
- [10] Skrzypek E., Mariusz Hofman, *Zarządzanie procesami w przedsiębiorstwie*, Wolters Kluwer