

MANAGEMENT INFORMATION IN ADMINISTRATION SYSTEMS

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Abstract: Management information is the basis for decision making. The essential meaning of the management information is noticed in the administrative systems, through the analysis of the character and usefulness of the management information, as legal information that is published in the form of internal and external legal acts. Specification of the legal acts, connected with the activities of the administrative unit, requires undertaking of certain methodology of the conduct. Process approach, based on the specification of the processes realized in the administrative unit and related legal acts, is suggested. Case study related to a faculty at the University is an example of the use of presented proposal.

Keywords: data, information, decision making, management system, administrative system, management information.

1 Introduction

Organizational functioning (i.e. industrial organizations, service companies, public administration units), requires making decisions:

- within short time,
- taking into account multi-dimensional character of decision area,
- on the basis of management information, required as a result of data analysis.

Management information, as any other information, is a result of data interpretation and belongs to one of categories of information resources (p. 2). Management information, being a basis for decision-making, must have particular features, such as i.e. (p. 3): topicality, reliability, content usefulness, diversified level of detail, completeness and selectivity. Because of the character of management information use, its presentation form and distribution become highly relevant.

Gathering the analyzed data and obtaining management information from it requires using management information systems, viewed as set of methods, techniques and tools which support making business decisions (p. 4). Data for the analyses may be stored in spreadsheets, databases and data warehouses. Spreadsheets enable simple reporting. Data gathered in databases and data warehouses are subject to, apart from reporting, analytical processing and exploration.

When analyzing the usefulness and character of management information in administration systems (p. 5), a relevant meaning of management information in this field is observed with regard to legal information, pub-

lished as external (p. 5.1) and internal (p. 5.2) legal acts.

Specification of legal acts connected with organizational activity requires adopting a pre-determined action methodology. A process approach is suggested (p. 6) which consists in specification of processes realized within the unit and legal acts connected with them. Process description should include such elements as: process name and ID, process realization goal, legal basis (specification of internal and external acts), additional sources of information, process owner, process participants, process initiation, process realization procedure, commentary (including know-how with regard to the process), accompanying documents and information on data actualization.

An illustration of the presented proposal is the case study (p. 7) related to a university faculty.

2 Information resources

Information resources¹ include: data, information and knowledge. These notions lack unambiguous descriptions.

¹ "Resource – this concept is used especially often to generally describe means necessary for obtaining a goal. Resource (fr. resources), may refer to money or time in terms of availability. Resources play vital role in just-in-time production systems. Notion of resource – similarly to the notion of system – is also used as synonym (or mental abbreviation) for precisely enough described realities, which may be used for the purpose of goal realization. Resources are used to build up systems. In systems, also, the resources are processed." (Krupa T.: Elementy organizacji. Zasoby i zadania, p. 14, Warszawa WNT 2006). A special kind of resources are the information resources.

Data is defined, among others, as:

- observable features (characteristics) of real and abstract objects or phenomena,
- external stimuli perceived by living organisms through senses: sight, hearing, smell, taste or touch,
- ordered series of symbols, saved on a storing device, representing text, numbers, images and sounds,
- bitstreams saved on electronic storing device,
- data name and value.

Among the issues connected with information resources processing, one of the following definitions is assumed, according to which data are an ordered series of symbols, saved on a storing device, representing text, numbers, images and sounds.

Data sets are not equal to possessing information. Data acquires useful value, in the sense of information value, after its primary interpretation, result of which is information. This new information also takes form of data.

In many cases data sets have considerable volumes (mega- or even terabytes), contain detailed data, which, prior to interpretation, require processing and complex analyses. In this case, subject to interpretation will be the data processing results and not the source data.

Interpretation is influenced by:

- available dataset,
- interpretation ability, resulting:
 - in case of technical devices, from data interpretation algorithms ascribed to them,
 - in case of people – from such factors as, i.e.: knowledge and the already possessed information concerning the problem described by data, experience and interpretation skills of person or team who carry out the interpretation,
- type of interpreting object:
 - in case of technical device, interpretation of different datasets is performed in accordance with the same algorithm. Therefore, it is a repetitive process and it can be assumed, that interpretation result is objective,
 - in case of interpretation performed by human, the interpretation results may be influenced by personal features, beliefs, moral and ethical values.

Results of interpretation, that is information, are saved to data storage devices. A set of saved information may be treated as data interpreted for obtaining further in-

formation. It may be assumed, then, that data and information are not distinguished by the way they are saved to storage devices, but by their usefulness and way they are used by the recipient. If the record is understandable for the recipient, decreased his unawareness, does not require further processing and analyses and is useful for making decision, that means information was obtained. In the opposite case, record has to be treated as data, which should be further processed, analyzed and interpreted in order to acquire use value.

Knowledge is the ability to use information. Knowledge is a combination of experience, information, expert insight, which ensure fundamentals for developing and implementing new experiences and information. It comes from and is used by the minds of people who have this knowledge. In organizations it is often placed in documents or data repositories, but also in methods and models of conduct, processes and norms.²

In case of business activity or organizational units functioning, knowledge is the ability to use information and make decisions concerning purposeful tasks realization (Fig. 1).

Currently, with the use of available information technologies, the problem is not data and information gathering, but their proper selection, analysis and transformation into knowledge, which supports taking right decisions. Issues of decision making are related, among others, to the availability of information referred to as management information.

3 Management information

There is no single unambiguous definition of management information. The area of its use, purposefulness of obtaining, attributes, sources and forms of processing are, however, pointed to.

Management information is usually information useful for managers in running a company, making decisions concerning company functioning which enable maximum profits and minimum costs, the best, fixed position in the market, winning new and keeping old clients. It is information on current status and prognoses concerning the company and its environment. At present, management information is given most attention in industrial and service companies.

² Davenport T. H., Prusak L.: Working Knowledge: How Organizations Manage What They Know. Harvard Business School Press, Boston 1998.



Figure 1. Information resources and purposeful actions

When information is treated as basic resource, necessary in the decision making process, the management information should be available in the right time and place and should possess particular attributes, among which the most important are: (a) topicality, (b) reliability, (c) content usefulness, (d) diversified level of detail, (e) completeness, (f) selectivity and (g) non-standard character. The meaning of these attributes was described below.

(a) Topicality

Management information is a result of interpretation of data, which, in business reality, undergo constant changes. It is necessary to ensure current data actualization. This criterion is often not met due to:

- dispersion of data among different data sources,
- data redundancy³,
- lack of procedures of data actualization or lack of their realization.

Together with data actualization, management information actualization is necessary, which is a result of the former.

(b) Reliability

Data which undergo interpretation must reflect the facts, which they describe. Incorrect data distort the reality and may lead to wrong decisions.

(c) Content usefulness

Scope of the passed on information should suit the scope of competences and responsibility of information recipient.

(d) Diversified level of detail

Managers usually make use of information prepared on the basis of data of given aggregation level. In justified cases information of higher level of detail should

also be available, in order to determine the causes of situations that occurred or suggested prognoses.

(e) Completeness

Management information, dedicated to a given post, should completely characterize the problem related to the decisions to be taken. It should also contain historic information, current status and prognoses.

(f) Selectivity

Management information selectivity refers to following the rule, according to which this should be information necessary for taking decision with regard to a problem that is currently being solved. It should refer to a particular problem area. Both lack of and excess information are harmful.

(g) Non-standard character of management information

Business activity is characterized by competitiveness, which requires non-standard actions and non standard decisions and, subsequently, also non-standard management information. There might be a case, when two competing units have to make decision based on the same data. Competitive advantage may be the management information derived from data. The fact it could be different in both cases may result from using different data analysis tools and adopting different analysis algorithms.

If both units have the same applications for data processing and data analysis, which takes place in situations when commercial software is used, the following elements may be used for competing:

- different specification of information needs,
- defining different enquiries to the data analyzing system,
- ability to use the obtained information.

These three elements are independent from the information technologies which are used, depending only on human skills.

³ Redundancy – excess, multiple repetition of the same data value in a database. It is unwanted, because: (a) additional memory is occupied by repeating data, (b) in case data value should be changed, the actualization would have to be carried out multiple times.

Important meaning for management information have:
 (a) form of presentation of management information,
 (b) standardized presentation, (c) distribution of management information and (d) form of communication of management information.

(a) Form of presentation

Management information is usually presented in form of reports which include tables and charts and, in justified cases, also supplemented by commentary. The usefulness of report is influenced to high extent by its editing: table structures, types of charts and their colors, legible commentaries and structure of report elements. Report elements are viewed here as single pages of a printed report, screens or presentation slides.

(b) Standardized presentation

Standardized presentation gains importance in case of repetitive decision problem. Repetitive decision problem does not imply identical information within the report. Usually they are different, but their identical structure enables comparison of phenomena which take place and provides additional information, which result from observation of changes in time and under influence of previously made decisions. Set of reports, information about the decisions made and observation of decision results enable gathering knowledge about the analyzed problem area and constitute a case study for future decision processes.

(c) Distribution of management information

Distribution of management information requires determining its users and pointing to forms of communication of information. Recipients of management information may be the people directly responsible for taking decisions in the problem area, which the information concerns, or persons, for whom it may serve as a supplementary information.

(d) Form of communication of management information

Information may be passed to the interested people in paper or electronic form. Each form is useful in different conditions. Printed form is advisable in two situations.

First of all, when discussion about the information included in the report is expected. Printed form enables precise analysis of the report, making remarks and corrections even before the discussion. During discussion this form enables each person to have individual

access to particular report elements and simultaneous observation and analysis of a few report elements.

Secondly, paper form is used for archiving paper reports, which makes access to them independent from access to IT system or possibility to read from electronic storage devices. Usually, for the purpose of archiving, both printed and electronic version of report are kept.

Electronic recording enables structuring and ordering reports according to the adopted criterion, which could be i.e. date of issue, problem area, information recipient. With electronic recording it is easier to manage the set of management information, flexible information access (i.e. through internet) is assured, the possibility exists to set information access rights for particular recipients or groups of recipients.

In order to gather and process data as well as to perform its interpretation, in the course of which management information is obtained, due to considerable volumes of data and complex interpretation algorithms, management information systems are used.

4 Management Information Systems

Management information Systems (Business Intelligence) are described as set of methods, techniques and tools for supporting business decisions with the use of available information resources.

Tools which support elaboration of management information include, among others:

- spreadsheets,
- reporting and analysis systems in transactional databases,
- reporting and data analysis systems in data warehouses.

Spreadsheets are one of the simplest tools, which enable obtaining management information. For example:

- with the use of possibility to define formulas and their free parameterization as well as rich set of standard functions, spreadsheets enable construction of behavior models for the researched problem fields. Management information will be obtained through observation of chosen values, after performing in spreadsheet calculations for following sets of parameters,
- second form of spreadsheet use is data reporting. In this case, for the data saved in two-dimensional tables, reports may be constructed with the use of:

- simple and advanced filtering,
- summary reports,
- pivot table reports.

Currently, most data is saved in databases⁴, which constitute an integral part of IT systems. Databases usually have character of relational databases⁵. Their management systems are equipped with tools which enable data analysis through construction of reports, definition of queries in SQL⁶ language, construction of additional data structures and their analysis.

Confrontation of requirements connected with data analysis against possibilities offered by relational databases points to some limitations of their use for obtaining management information:

- there is a necessity to construct complex queries to databases in SQL language, which requires knowledge of language as well as database structure (tables and their content, relations),
- multi-criterion queries make use of data from many tables, which makes it necessary to perform operations on these tables, that require considerable number of data transmissions between external and operational memory, resulting in slower system functioning,
- relational databases are usually used for realization of current transactions⁷ (thus, are called transactional or operational). As a result, in order to run analyses it is often necessary to use a database copy or to run them in time when transactions are not being serviced,

- operational databases most often gather data from 60 to 90 days, whereas prognostic analyses require historical data dating back 5 to 10 years,
- transactional databases are used for storing detailed data, however, they lack aggregated data (i.e. sales in different periods: day, week, month, year – or with regard to particular regions or client groups, etc.).

The problem of data availability for analyses was solved by construction of so called data warehouses.

According to the definition by Bill Inmon⁸, warehouse is a subject-oriented, integrated, time-variant and non-volatile collection of data in support of management's decision making process. Interpretation of the above mentioned definition is as follows:

- subject orientation means that the warehouse gathers data that gives information about a particular business subject, on the contrary to process orientation used in case of transaction databases,
- integration means that data warehouse gathers data from various data sources and merges them into a coherent whole, i.e.: their names, formats and sizes,
- time-variance means that all data, which is entered into warehouse, is identified with a particular time period, from which the data comes (so called time marking), which enables sequencing data according to time and carrying out analyses from the historic point of view as well as determining trends and prognoses,
- non-volatility results from the fact, that data within data warehouse is not actualized, which means they are not changed after having been entered into warehouse (access to data is read-only and change may only refer to incorrect data); admission of warehouse with new data takes place periodically, which enables to gather them in practically any time period (i.e. 5-10 years).

Solution based on data warehouse:

- uses existing transactional databases, which are a basis for functioning of transaction processing systems (OLTP)⁹, spreadsheets and all other data sources required for running the analyses,
- gathers data in data warehouse,
- data in the warehouse is subject to analyses with use of tools for interactive analytical data processing.

⁴ Database is a physical record of data values - defined, together with their structure, within logic model. Data is stored in form of records (i.e. record with data of an employee), made of fields, each of which stores value of single piece of data (i.e. surname, name, date of birth). Depending on the relation, which may exist between records, relational, hierarchical, network and object database models are constructed. (Ostrowska T.: Relacyjne systemy bazodanowe. Podstawy projektowania i eksploatacji. OW PW, Warszawa 2002).

⁵ Relational database is a database, in which records containing data are stored in two-dimensional tables and there may exist 1:1, 1:n and n:m relations between records of different tables. Records are identified through unique, within a table, record ID, so called primary key (Ostrowska T., *ibid.*).

⁶ SQL (Structured Query Language) is a language, with the use of which it is possible to: define database model, update data values within the base (enter, change, delete), formulate queries in order to find in database the datasets implied in the query. (Ostrowska T., *ibid.*)

⁷ Transaction is a sequence of operations which modify data stored in database. Each time either all operations of a transaction must be carried out or none of them. (Ostrowska T., *ibid.*)

⁸ Inmon W.H.: Building the Data Warehouse, Fourth Edition, Wiley Publishing Inc., Canada 2005.

⁹ OLTP - OnLine Transaction Processing.

Main goal of establishing data warehouse is to separate transactional systems from analytical systems, which in practice means separating operational and analytical activities.

Information obtained from data warehouse arises as a result of performing: (a) exploration or (b) analysis of data gathered in it.

(a) Exploration of data

Exploration of data is based on use of statistical methods and AI methods, which enable revealing unknown dependencies between data gathered in the database. It is described as process of knowledge discovery from data (KDD)¹⁰, which may consist in:

- verification of hypotheses, which is applied in situations, when it is assumed that certain relationship between data exists and it is expected that this assumption will be verified during the analysis,
- discovering knowledge, which consists in data analysis and expectation of finding a relationship between data, which was not determined so far.

(b) Analysis of data

Data analysis takes place with use of software for interactive analytical data processing (OLAP)¹¹. Data is prepared for analysis by being submitted to aggregating operations. Next, depending on the required management information, datasets for analysis are defined. Interactive character of OLAP tools enables active participation in analysis through choice of analyzed data and formulation of queries.

5 Management information in administration systems

Discussion, polemics, projects and IT solutions with regard to management information usually refer to obtaining and using it in industrial and service companies for making business decisions. It has to be pointed out that:

- apart from production and service companies there is also public administration¹²,

- in organizations¹³ (i.e. companies, public administration units), apart from organizational units¹⁴ which directly contribute to production of good or service, there are also administrative units.

In Poland the structure and functioning of public administration¹⁵ is determined by Code of Administrative Proceedings¹⁶, which regulates proceedings in cases solved on the basis of administrative decisions. Code of Administrative Proceedings determines proceedings in such fields as, i.e.: solving cases, serving of a decision, summons, initiation of proceedings, presentation of evidence in proceedings, organizing proceedings, suspending proceedings, passing decisions and resolutions, reaching compromise, lodging complaint, appeal, complaints and motions.

Administrative units in different kinds of organizations deal with i.e.:

- employee matters, regulated by Labour Code¹⁷, in which rights and obligations of employees and employers are described; this regulations define among others: basic rules of labour law, forms of employment, control over compliance with labour law, labour relations (making labour contracts and their termination, contract expiry), employee remuneration, prizes, distinctions,
- financial statements of organization, which are regulated by rules referring to particular groups of organizations, i.e.: Act on Public Finance¹⁸ is aimed at organizations from public finance sec-

public administration which functions in accordance with arrangements of current political directorship is established.

¹³ „... what is understood under the term organization is, depending on the context, the activity of organizing, a system resulting from such activity (or even a spontaneous formation), configuration of its inner relationships, or, lastly, the object organized in such a way itself.” (Kotarbiński T.: *Traktat o dobrej robocie*. p. 107, Ossolineum 1973).

¹⁴ Organizational unit – separate part of an object, that is the organization.

¹⁵ In accordance with article 5 § 2 point 3 and article 1 point 2 of Code of Administrative Proceedings, organs of public administration are: ministers, central organs of government administration, organs of local government units as well as other organs and subject brought to life ipso jure or based on agreements concerning settling cases solved on the basis of administrative decisions.

¹⁶ Statement of Prime Minister of October 9, 2000, with regard to consolidated text of Code of Administrative Proceedings (Journal of Law, 2000, No. 98, pos. 1071).

¹⁷ Act of June 26, 1974, Code of Labour (Journal of Law, 1974, No. 24, pos. 141).

¹⁸ Act of June 30, 2005, on public finance (Journal of Law, 2005, No. 249, pos. 2104).

¹⁰ KDD – Knowledge Discovery in Databases.

¹¹ OLAP – OnLine Analytical Processing.

¹² Public administration is formed by organs created in order to fulfill collective and individual needs of citizens, who function within the society. Role and scope of functions of public administration depend on the political system of a country. Public administration in democratic countries consists of government and local government administration. In totalitarian countries

tor¹⁹, which does not include companies, banks and partnerships following commercial law, which are regulated separately in this area,

- administrative-financial consumer service, with regard to clients who are recipients of products and services, which may be exemplified by services provided to students (who use the service during didactic process) by dean's offices; guidelines for this service are included, among others, in: university statute, byelaws of studies, Code of Administrative Law.

It is characteristic for administrative-type of units that:

- processes realized in them have the character of data processing,
- results of their activities are decisions and documents.

Processes realization and their results are determined by legal information, which has character of management information. This information causes that:

- the decisions taken are compliant with law in force,
- documents which are prepared are consistent with the standards set,
- processes are realized in accordance with legal acts which define them.

Legal information is edited in form of legal acts. Set of legal acts has hierarchic structure, in which the acts of lower level are subordinate to higher level acts. Subordination, which, at the same time, points to formal relations between acts, results from including in legal acts an obligation or right to issue a lower level legal act (so called delegation). Higher level act may precisely describe the content of a lower level act issued on its basis or describe this content in a more general way, by only suggesting the content or aim of issuing the act. Hierarchical structure obligates to actualize all lower-level legal acts in case of changes introduced to higher level act.

In case of Polish legal acts, hierarchical structure is formed (according to the importance in hierarchy) by: constitution, acts, ratified international contracts, ministers' decrees, followed by lower level acts, which

are a consequence of delegations included in higher level acts.

In case of organizations with hierarchical structure, internal legal acts may also build up hierarchical structures, if they include delegations for formation of lower level acts. An example may be the dispositions of university chancellor, which include delegations for issuance of legal acts by deans of particular faculties.

Taking into consideration the place, where legal acts are issued, they may be divided into:

- external legal acts (5.1), issued outside the organizational units (constitution, acts, ratified international contracts, ministers' decrees) and, with regard to given organizational unit, also legal acts issued by superior units,
- internal legal acts (5.2) issued within the organizational unit in form of dispositions, decisions, circulars and other, issued by persons authorized to issue legal acts in a given unit.

5.1 External legal acts

Use of external legal acts requires: (a) identification of external legal acts, (b) their appropriate popularization and distribution, (c) appropriate reaction to actualization of external legal acts and (d) evaluation of results of the introduced changes.

(a) Identification of external legal acts

Identification of external legal acts connected with all areas of organizational unit's activity is not an easy task and requires adoption of a specific methodology. It is suggested to use process approach²⁰, which is also used in other situations (i.e. while designing IT systems and databases). According to this approach, the basis for all design activities is the specification of processes realized within the organization. Next, for each of the processes legal acts connected with it should be identified and their metrics should be precisely described (metrics should contain data on legal act including: full name of the document, date of issuance, source of document content).

When searching for legal acts connected with a process, one should take into account they may:

- define the process,
- define documents used during process realization or documents, which are results of process realization,

¹⁹ Sector of public finance includes among others: government and local government administration, budgetary units, universities, independent public healthcare units, state and local government owned cultural institutions, Social Insurance, Polish Academy of Sciences and its subsidiaries, other state or local-government legal entities created on the basis of separate acts in order to perform public tasks.

²⁰ Reference models in business processes management. Collective work, edited by T. Kasprzak, Difin, Warsaw 2005.

- determine conditions for process realization,
- determine the method and form of decision-making, decision results or situations which accompany decision.

If legal acts form a hierarchical structure, which results from granting delegation in higher-level act for issuance of further lower-level acts, then it is recommended to specify the hierarchical dependence between legal acts, which enables to follow changes in case of actualization of higher-level acts and take adjusting actions.

(b) Distribution and access to external legal acts

Distribution of external legal acts most often takes one of the following forms:

- sending all new legal acts in electronic form directly to their potential recipients - in this case recipients are being informed about all new legal acts, may choose and store in their electronic archives those legal acts which directly concern them or make a print, which can stay in the internal archive or may be handed in to appropriate addressees, who are responsible for taking action resulting from the new legal act,
- sending internet addresses (links) to potential recipients, which grant access to content of documents; in this case the interested parties have access to content of documents, may read or copy them and attach them to their information resources, or print them and hand over to the interested people/parties,
- publishing legal acts on internet sites with limited or unlimited access to their content,
- printing legal acts and their distribution to interested parties,
- printing legal acts and making them available on sale (i.e. Journal of Law),
- letting legal acts to be printed in magazines, clients of which are also potential recipients of the legal acts which are printed.

In order to follow the rule concerning databases of not-allowing data redundancy, making multiple copies or prints of documents should be avoided. If documents are published on Internet sites²¹, then one suggested solution is to create a document metrics library and establish internet addresses to their content. Unfortu-

nately, this solution brings about some risk, source of which may be the lack of access to internet in some required times, malfunction of computers or network, change of documents' addresses (example of such situation is presented in the case study, p. 7).

(c) Actualization of legal information and its results

Polish legislation is unstable. This results from the necessity to adjust our law to the changing environment or the EU solutions.

Many external legal acts are subject to amendments, new legal acts appear. In many cases it is justified to appoint in organizational unit a plenipotentiary for management information. One of his tasks will be to follow changes in external legislation and actualization of internal legal acts.

(d) Results of legal changes

One change of the law in force equals, in many cases, a hard-to-foresee chain of consequences. A result of changes may be i.e.:

- reorganization of process, if it is defined by the legal act,
- change of forms, reports, reviews and other documents,
- necessity to issue new internal legal act or their amendment and realization of resolutions included in them,
- changes in decision processes,
- changes in computer programs, which realize the guidelines included in legal act,
- necessity to establish procedures which will neutralize consequences resulting from new law,
- necessity to elaborate procedures of switching to the status defined by legal act.

5.2 Internal legal acts

Internal legal acts, which are created inside of organizational units, usually take form of decrees, decisions, circulars, which may be assisted by attachments, which are their integral part, containing: procedures, rules, regulations, instructions, forms, registers, etc.

In each organization, if this is justified, people should be appointed, authorized and obliged to issue internal legal acts and elaborate rules of: (a) creation, (b) archiving, (c) distribution of internal legal acts.

²¹ An exemplary system for publication and archiving of legal acts is the Internet System of Legal Information (<http://isip.sejm.gov.pl>), in which legal acts available in Journal of Law are published (their consolidated texts and bibliographical descriptions).

(a) Elaboration of internal legal acts²²

Rules of elaborating internal legal acts concern:

- process of document elaboration, i.e.:
 - appointment of coordinator of legal act elaboration and determination of his competences,
 - appointment of person or team for elaboration of legal act design,
 - appointment of people responsible for giving opinions about legal act's content, among whom there may be specialists from the field which the act concerns as well as representatives of social organizations and labour unions, if, because of the scope of matters covered by the regulation, it is justified from the point of view of their entitlements,
 - appointment of person responsible for reviewing the act from legislative and editorial point of view.
- rules determining document content and edition, i.e.:
 - document should contain particular title, legal basis, content-related regulations as well as changing, transitory, adaptation and closing regulations,
 - document content usually takes form of articles, paragraphs, sections, points and letter of law (in case of big legal acts, such as codes, also volumes, parts, sections and chapters are introduced),
 - document page structure may be determined (format, margins, fonts, space between lines),
 - it is advisable to define document symbols, document numbering and moments when the numbering is reset, i.e. with the beginning of each academic or calendar year.

(b) Archiving of internal legal acts

Internal legal acts should be subject to archiving in accordance with a procedure, which should point out:

- person responsible for running the archive,
- place for storing documents,
- form of archived document (paper, electronic),
- organization of electronic archive, including structure, nomenclature of folders, files with legal acts and their attachments,
- method of running internal legal acts' registers.

Place of storing a document, the content of which is constituted by legal act, should always be known. This is important in case of legal acts' amendment, which requires access to former legal act or its fragments. Access to former acts allows to determine the legal status which was in force in a given moment of time.

(c) Distribution of internal legal acts

Internal legal acts should be:

- handed to people, who they directly concern. Depending on the arrangements - in paper or electronic form, whereas in case of personal matters it may be paper form with necessity to confirm the receipt,
- made accessible for unit's employees. Which is most often realized through publishing their content on corporate-portal's sited, with limited access for people from outside the unit.

6 Process model and legal information

Process approach is used in many areas, i.e. connected with functioning of organizational units, design of IT systems and databases.

Analysis of processes enables to point out the processes of key meaning for the company, identifying so called 'bottlenecks' (process fragments in which, for example, delay in process realization occurs, costs rise or too high use of resources takes place) and fast adoption of corrective actions.

Analysis of information resources connected with processes and procedures of their processing allows informational integration of company through implementation of IT systems and databases, which support realization of many processes.

Orientation of company on processes leads to change in management: from functional, aimed at activity of functional areas (departments, organizational cells), to process management aimed at achieving goal. This allows concentration on activities, as a result of which a particular end-effect in form of a good, which may be a product or service, comes into existence.

In case of this approach the realization of goal, and not realization of particular units' tasks, is important. If the goal is defined by a set of measurable parameters, unambiguous evaluation of its achievement is possible.

When modeling and analyzing process, actions and resources are taken into consideration which take part in creation of end effect. Detailed analysis of organiza-

²² Prime minister's decree of June 20, 2002, Rules of Legislative Technique (Journal of Law, 2002, No. 100, pos. 908).

tion functional areas, its structures and other elements, which do not have direct influence on goal realization, is omitted. Process may be realized in many units of a given organization and should not be limited by its structure or organizational management structure. Key role in process approach is played by so called 'process owner', and not department directors. Process owner is responsible for the course of process, manages the whole team of people appointed to realize the process, who might be employed in many different units. In such case it is necessary to precisely define scope of responsibilities and competences of both units' directors and process owners.

Process approach is advisable also in administration units. This results from the following facts:

- administration units may be viewed as service providing units,
- clients of these organizations value product, which is a result of administrative activity, in form of a document, project or decision, and not the realization of tasks by internal administration cells,
- all products may be precisely described (excluding time parameter), which enables evaluation of services provided to clients,
- because vast majority of services in this area are connected with data processing, the process approach makes it easier to design IT systems which support functioning of administration units.

During process modeling, among others, the following items are taken into consideration:

- process structure, viewed as sequences of activities of operational and decision character, with process logics - which determines conjunctive and alternative dependencies between sequences of activities as well as cyclical series of activities - taken into consideration,
- resources engaged into realization of particular tasks (these resources may be classified as, i.e.: input and output resources, transforming and transformed resources);
- specification of information resources, which constitute basis for determining content of databases for IT systems that support process realization, is especially important,
- conditions for process initiation and its particular activities,
- time, cost characteristics of activities, etc.

Level of modeling detail depends on type of process, model purpose and form of use.

As a result of experiences with construction of process models in administration units and their usefulness in organizational functioning, it is recommended to complete the models with legal information and knowledge, especially tacit knowledge²³, connected with each process. In works carried out by the author the following model of process description was adopted:

<processId> Name of process

<processId> is a process tag/identifier used for processes structuring and identification of particular processes. *Name of process* should be communicative and unambiguously point to the process.

A. Process realization goal

Determining goal of process realization consists in defining end effect of all of its constituent activities. Effect might be a good in the form of product or service. Evaluation of end effect may consist in binary description (yes/no) or requires comparison with formerly given characteristic or product model, which in this case must be defined as process realization goal.

B. Legal basis

Each process requires specification of legal information source, content of which may be the base for determining process realization, form of accompanying documentation or process result.

Vast majority of legal acts are published on web pages and may be accessed only with the knowledge of their internet address. Due to the fact that certain number of documents (forms, instructions, some of internal legal acts) should only be located among organizational unit's resources, as well as in order to become independent from network accessibility, library of legal acts was created, in which files with all legal acts and documents connected with processes can be found. In order to grant access to legal act both in the web and in library of legal acts, specification of a single legal information source consists of three elements:

- document symbol, reflecting name of the file, in which legal act is saved in library of legal acts,
- full document name, for file content identification,
- hyperlink to the content of document.

²³ With regard to accessibility and codification possibilities explicit knowledge and tacit knowledge are distinguished. Explicit knowledge is codified, can be stored and processed, is rational and objective. Tacit knowledge is personal, stored in its owners' minds, hard to process and formalize, intuitive and subjective (Grudzewski W. M., Hejduk I. - Zarządzanie wiedzą w przedsiębiorstwie, DIFIN, Warszawa 2004).

C. Additional information sources

Additional information sources are sources in form of paper or electronic documents, excluding legal acts, content of which may influence process realization.

D. Process owner

Each process should have an owner. It is a person who controls process realization and is responsible for its appropriate effect. Owner may be an active process participant or only its owner.

E. Process participants

Process participants specification enables to point out human resources required for process realization or units participating in the process. It may be used for determining roles fulfilled by the participants, their competences and tasks within the process.

F. Process initiation

It is vital to determine what causes initiation of process realization. It may be a particular event, given moment in time.

G. Procedure

Process procedure should define method of process realization, that is: point out activities and their sequence, including decisive actions. Procedure may be presented, for example, in descriptive form or in form of a scheme.

H. Commentary

Commentary should be a record of knowledge, especially tacit knowledge concerning process realization. It should be an approach towards recording know-how²⁴. Its author may be the process owner or people who take active part in process realization. Commentary should derive from experience of people who realize given process.

I. Accompanying documents

Under the term 'accompanying documents' one should understand:

- forms, which are processed in course of the process,
- reports, which should be process realization results,
- documents which justify process realization.

J. Information on data actualization

Data should be actualized. Actualization date enables evaluation of up-to-date character of data previously taken from the system.

Illustration of the above mentioned remarks and proposals is the case study presented in point 7.

7 Case study

7.1 General Information

Design of legal information system was created for a faculty at university. The university is formed by a dozen or so faculties, each of which has from a few hundred to a few thousand students.

Faculty, as a basic organizational unit, consists of organizational units in form of institutes and departments.

In the university there functions a central administration and faculty administration at each of the faculties, which is formed by: faculty secretariat, dean's office for studies and students, economic department, administration and technical department.

At each faculty such processes are realized as: didactic processes, processes of student and employee service, technical processes related to maintenance of laboratories and conservation of faculty property, financial and accounting processes and a number of processes resulting from statutory responsibilities i.e.: realization of research works, reporting, internal quality processes (ensuring quality of teaching, ensuring quality of scientific research, employee evaluation system, quality management system in central and faculty administration, system of internal financial control and internal audit).

Appropriate course of processes requires obtaining legal information. Vast majority of external legal acts are legal acts created by Ministry of Science and Higher Education. Superior legal acts in the university are university statute and byelaws, including, above all, studies byelaw. These acts are approved by university senate by means of senate resolutions.

Bodies which have the right to issue internal legal acts are the university rector and chancellor (decrees, decisions, circulars) and directors of basic organizational units, that is – deans (decrees, decisions). Internal legal acts also include senate resolutions and resolutions of faculty councils.

²⁴ Know-how is viewed as the ability to perform something; it is the knowledge of particular persons and whole organizations; this knowledge never becomes completely public good, is hard to codify and pass on, usually constitutes competitive advantage of a person or organizational unit.

There is a considerable number of internal legal acts. Table 1 presents information about the number of decrees and decisions issued by rector and number of senate resolutions in years 2006 – 2007 – 2008.

Table 1. Number of internal legal acts

Internal legal acts	2006	2007	2008
Rector's decrees	34	49	58
Rector's decisions	61	116	176
Senate resolutions	140	266	391

All legal acts are available on university websites. The problem is to bind legal acts with processes realized in the university.

Analysis of IT program infrastructure of the university's organizational units enabled the author to formulate the following conclusions:

- university organizational units use a number of applications which mainly enable to gather or process factual type of data and information, i.e.: financial-accounting applications, employee data administration applications, applications which support dean's offices,
- applications support functioning of units in particular functional areas,
- legal information (acts, regulations, decrees, byelaws, etc.) which is basis for process realization, is stored in many dispersed information sources in both printed and electronic form,
- there is no system for legal support of units with regard to processes realized by them.

7.2 Scope of research

While assuming that process realization is based on legal information, which, for each process, should be available at the right place and time, and in form which enables reading it by process participants, the following works were carried out:

- processes realized at university faculty were identified; special attention was given to processes connected with didactic processes and employee and student service (economic-financial processes and reporting processes were not considered),
- legal acts connected with processes and sources of their content were specified,
- library of required legal acts was established,

- trial implementation of the project was carried out, creating:
 - prototype of database system for management information,
 - hypertext structure, the frame of which is constituted by processes specification.

7.3 Results

(a) Processes

Processes connected with didactic processes and employee and student service were identified. Processes were classified in eleven categories. Classification criteria was the object which the processes referred to. Overall 324 processes were identified (Table 2).

Table 2. Process classes in organizational unit – faculty

Class	Number of processes in given class
P1 – candidate service	32
P2 – individual student service	59
P3 – collective student service	13
P4 – Ph.D. student service	41
P5 – studies service	32
P6 – postgraduate studies service	10
P7 – employee service	35
P8 – employee accounts	28
P9 – technical processes	12
P10 – administrative processes	42
P11 – unit organization	20
total	324

(b) Exemplary process specification in P3 class:

P3. COLLECTIVE STUDENT SERVICE

P3.1. Organization of Occupational Health and Safety trainings for students

P3.2. Organization of medical examination

P3.3. Collective insurance of students

P3.4. Organization of choosing specialization

P3.5. Organization of choosing elective courses

P3.6. Registration process (per semester / annual)

P3.6.1. Management of semester protocols

P3.6.2. Management of semester grade lists and student credit books

- P3.7. Organization of interim projects and thesis projects
- P3.8. Organization of teaching of foreign languages
- P3.9. Alumni classification
- P3.10. Official/Ceremonial distribution of diplomas
- P3.11. Management of semi-annual fees
- P3.12. Byelaw of Student Culture and Education Fund

(c) Specification of legal acts for each process

In the next stage each process was ascribed legal acts connected with it. Exemplary specification of legal acts, connected with student deletion from the list of students:

- Byelaw of studies at WUT, § 24
Byelaw of studies defines situations, in which student can be crossed out from the list of students.
- Rector's decree (WUT) No. 28 of 7 September 2006 concerning model form of decision about deletion from the list of students:
 - attachment 1: decision form,
 - attachment 2: comment on the decision model form.

Rector's decree introduces a model document, in which decision concerning student deletion from the list of students is placed, as well as instruction on edition of the decision.
- Act of 27 July 2005, Law of Higher Education, article 190, Journal of Law, 2005, No. 164 pos. 1365
Law of Higher Education Act is a superior document with regard to the Byelaw of Studies.
- Prime Minister's statement of 9 October 2000, consolidated text of act – Code of Administrative Proceedings, Journal of Law, 2000, No. 98 pos. 1071
Quotation of Code of Administrative Proceedings results from the fact that decision about deletion of student from the list of students is an administrative one, which enforces specific way it should be delivered to the addressee.
- Resolution of Minister of National Education and Sport of 18 July 2005, concerning documentation of studies, Journal of Law, 2005, No. 149 pos. 1233.
Reference to this particular resolution results from the fact, that deletion from the list of students must be registered in the documentation concerning individual student's course of studies.

- (d) Specification of legal acts connected with the analyzed processes

During analysis of all the identified processes it was found that 227 legal acts are connected with them, such as: minister's decrees, internal acts issued by the rector, resolutions and stance of senate.

Full specification was made from the point of view of type of legal acts and year of publishing. For each document containing legal act, the following items were reported:

- document symbol, which is the name of file with document content, stored in the legal acts library (symbol was marked with bolded font),
- full name of document,
- parts of legal act (i.e. paragraph, point), which are vital for given process,
- hyperlink to the source of document content (hyperlink was underlined).

For example:

- **RM_2007.87.583**
- Decree of Minister of Science and Higher Education of 27 April 2007 on signing by the Bank Gospodarstwa Krajowego (state owned bank) with other banks contracts which determine rules of using means from the Student Loan and Credit Fund.
- Journal of Law, 2007, No. 87 pos. 583

Table 3 presents list of types and numbers of legal acts from a given category.

7.4 Exemplary process description

In accordance with the presented proposal of process model, an exemplary process model was placed below:

P2.9 Granting leave of absence

A. Process realization goal

Granting leave of absence, which includes: preparation of decision, actualization of documentation of student's course of education, informing student about the decision.

B. Legal basis

- the first document:
 - JL_2005.164.1365_act_law_of_higher_educ
 - Act of 27 July 2005, Law of Higher Education, article 172
 - Journal of Law, 2005, no. 164 pos. 1365

Table 3. List of legal acts' categories

Legal act category	Time period	Number
Minister's decree	2005 - 2008	42
Rector's decree	2000 - 2008	95
Rector's circular	2006 - 2007	8
Rector's decision	2005 - 2008	13
Senate resolution	2003 - 2008	39
Senate stance	2006 - 2007	4
Various documents, current	1997 - 2008	26
total:		227

- the second document

- D_byelaw_of_studies_wut
- Byelaw of studies at Warsaw University of Technology, § 17
- <http://www.pw.edu.pl/Uczelnia/Przepisy-i-zarzadzenia/Regulaminy/Regulamin-Studiow-w-Politechnice-Warszawskiej-obowiazujacy-od-01.10.2006-r.>

C. Additional information sources

Szypulska-Czkwianianc L., Utrysko B.: *Vademecum prodziekana ds. studiów. Przepisy i zasady dobrego postępowania.* Warszawa, OW PW 2008

D. Process owner

Head of dean's office

E. Process participants

Vice dean, dean's office employee, student

F. Process initiation

Student applies in written form for a leave of absence in dean's office

G. Procedure

- Student delivers the application for leave of absence to vice dean. Attached to the application are: credit book and documents which justify the application. These are, above all: statement of medical committee in case of sick leave, confirmation of being qualified for student internship or other studies – in case of circumstantial leave.
- Vice dean makes a decision within 2 weeks from lodging of application document (one week is advised); vice dean may ask student for an interview before making the decision.
- Dean puts the decision on student's application and in case of:
 - positive decision: dean's office employee puts appropriate note into student's file, credit book

and IT system, as well as informs the student about the decision (e-mail, telephone, word of mouth),

- negative decision: dean's office employee prepares notification about the decision in written form and passes it to the student against receipt or sends it by means of registered letter.
- Student has the right to appeal from the vice dean's decision to the vice rector within 14 days from decision receipt. This appeal is lodged in dean's office.
- Dean passes student's appeal and his stance with regard to the matter to vice rector's secretariat within 7 days from lodging of the appeal.

H. Commentary

- Sick leave

Basis for granting of a sick leave is statement of authorized medical committee. Student has the responsibility to deliver this statement within 7 days from its date of issuance. Granting of leave of absence should take place (including actualization of student's file and credit book) within 14 days from delivery of medical committee's statement. Leave of absence is granted for the whole registration period concerned by committee statement. Dean's office should inform about granting leave of absence the teachers of courses attended by the student. Credits obtained in the period covered by the statement of incapacity for studying, before the decision about granting leave of absence, remain valid. Subjects studied in this period, which were not passed, may be re-sat without paying fee. If student attended classes or took part in examinations after the leave was granted and did not pass, taking particular course once again requires paying a fee for re-attending the course.

- Random leave

This leave is granted by vice dean on basis of student's application justified by serious circumstances, which make the attendance in classes impossible in such

a long period, that obtaining a pass becomes impossible. Student should apply for such a leave as soon as random reason occurs. Leave is granted till the end of registration period. If student attended classes or took part in examinations after the leave was granted and did not pass, taking particular course once again requires paying a fee for re-attending the course.

- Circumstantial leave

This type of leave is connected with student's absence at the University because he is doing studies in another unit or takes part in an internship. Leave is granted on basis of student's application, if vice dean considers the studies or internship purposeful from the point of view of student's development. The application should be made by student not later than one month after beginning of the semester. Leave is granted for the registration period. Within this period student does not take part in classes or examinations at faculty.

In the same category the bylaw names also "other justified causes". This should be understood as causes, which do not result from random reasons, but from burdening the student with activities in the amount which makes it extremely hard to meet the responsibilities connected with studying. This may be, for example, fulfilling elective functions in student organizations. When granted such a leave, student maintains the right to enroll for and attend classes. Not passing the registered classes, however, requires paying for re-attending them.

- Unconditioned leave

Each student who passed at least 2 years of bachelor studies or at least one year of master studies has the right to suspend studies for a period of one year (or twice for one semester). In order to do this, student lodges an application to vice dean not later than in the last day before start of classes in the semester of the planned leave. Granting of leave is automatic, if the student obtained registration for the period of leave. Participation in classes during unconditioned leave requires vice dean's agreement and should be allowed only in exceptional cases.

Commentary

No other leave than sick leave should be granted from the date which is earlier than the date of lodging of application by student. In particular, granting of random leaves at the end of semester should be avoided.

Circumstantial and unconditioned leaves are only granted at the beginning of semester.

Participation in classes and obtaining passes during leave: from definition, leave is a period of absence at university. However, the bylaw states that only in case of unconditioned leave starting-point is the lack of possibility to participate in classes during the leave. As, when student is on the leave, donation for education costs is not obtained, it is suggested that re-attending classes should be payable.

I. Accompanying documents

- student application for leave of absence – form: forP2.9_studentLeave.doc,
- documents which justify the application, i.e.: statement of medical committee in case of sick leave, confirmation of qualification for studies or internship in case of circumstantial leave.

J. Information on data actualization: 28 III 2009

8 Summary

The carried-out analyses proved non-standard character of management information with regard to such units as university. In this case, it does not result from the necessity to make non-standard decisions, but from the necessity to make decisions based on non-standard legal information.

Almost each process is connected with one or many internal legal acts – acts which are issued by university rector or department director (dean). Therefore results the difficulty of introducing a single standard system for supporting university functioning for many universities. The research allowed conceptualization of system which combines organizational unit's processes with legal information and knowledge about processes.

The obtained result, which constitutes basis for the system, requires further supplements and being re-adjusted in order to be useful for its users. Implementation trials were carried out, creating:

- prototype of database system of management information, with particular consideration given to legal information,
- hypertext²⁵, frame of which is the process specification.

²⁵ Hypertext is organization of data in form of independent nodes connected by hyperlinks. Node is an element of hypertext and

When comparing the solutions, the following facts were taken into account:

- system must be user friendly and easy to use,
- process owners should be able to edit commentaries, which are viewed as sources of tacit knowledge,
- continuous actualization of all system elements is required.

Solution based on database system is a much formalized solution. It requires using specific database management system, defining data structures, preparing user application for operating the system.

Associations, which exist in the structure (many-to-many, i.e.: between processes and legal acts, between processes and participants) require professional operating of system.

Use of hypertext is the easiest technique of connecting process models with appropriate legal acts.

Assuming that each process model and each legal act are saved in separate files, use of hyperlinks enables us to indicate mutual connections. Also, internet addresses of legal acts may be used.

This solution, however, is connected with the threat of lack of access to network, liquidation of document source or change of address.

Preparation of hypertext is treated as prototype of legal information system for the analyzed area, in which specification and ordering of processes and legal information were carried out.

Within further works an approach will be made to apply Content Management System (CMS)²⁶, which would enable obtaining an internet-based solution, giving access possibility to many users, mainly to all process owners and participants.

Independently from the adopted technical solution, system usefulness depends on the up-to-date character of its constituent information resources, which requires their constant actualization.

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contains hyperlinks to other nodes. This enables connecting nodes and creation of network structure.

²⁶ CMS – Content Management System – content management systems are used for management of Internet sites' content. Usually they consist of an application for content management and application for content presentation. Information presented on a site is stored in a database. When referred to, information is collected from database and presented in accordance with the prepared graphical template.