THE MANAGEMENT INFORMATION SYSTEMS REENGINEERING THROUGH ECONOMIC APPLICATIONS

Emilia VASILE, PhD Professor
Athenaeum University, Bucharest, Romania
rector@univath.ro

Dănuţ-Octavian SIMION, PhD Associate Professor
Athenaeum University, Bucharest, Romania
danut_so@yahoo.com

Abstract: *The paper presents the management information systems reengineering through economic applications. Engineering information software establishes a centralized, secure, scalable, highly accessible repository for all engineering software. It Provides configurable, standard, and repeatable workflows for mission-critical softwares, captures comments and approvals electronically, builds an audit trail to support regulatory compliance, delivers advanced search capabilities to quickly find relevant engineering documentation, enhances efficiency by providing multiple integrations to EAM, ERP Microsoft Office, and CAD authoring applications and manages exchange of engineering information with the external economic environment. the conduct of any economic, financial or banking activity can not be imagined without the use of strong informational support that would provide competitive advantage over other competitors on the market. To acquire knowledge through the information obtained is the role of Information Technology that means hardware, software, communications, networks, databases, office automation as well as all other software and software components necessary for the processing of information. Information Technology today offers not only the informational support needed to run the business in terms of efficiency but also solutions for rethinking how to organize your business in order to maintain competitiveness.*

Keywords: *Management information systems, systems engineering, programing algorithms, informational support, mission-critical softwares, business efficiency*
JEL Classification: *C23, C26, C38, C55, C81, C87*

1. Introduction

Business Reengineering. Reengineering means the fundamental rethinking and radical redesign of business processes to achieve substantial improvements in cost, quality, and response speed of decision makers. This rethinking of how to do business is influenced and finds answers in new IT solutions. The way of doing business in any one company changes the following actions of the following factors and their list remains open:

- Globalization
- High level competition
- Information became a key resource
- Virtual work space and even running the business under the conditions of the virtual company
- Electronic commerce
- The existence of personnel specialized in data processing and analysis (knowledge worker)
- A new type of relationship with the bank through which new services and products are obtained as a result of the promotion of new IT solutions, etc.

The impact of IT on the firm is not only felt from the outside environment but also from within the firm. Any organization (firm, bank, etc.) assumes the existence of five interdependent elements (components):

- The organizational structure
- Business management and processes - Information technology
- The organization's strategy
- Employees and organization culture.

These components must be in a state of equilibrium and this condition will be maintained as long as no significant changes occur in the external environment or in any of the components (Coleman 2015; Orman 2014).

2. Information system and computer system

A system is a set of interdependent elements (components) between which a dynamic interaction is established based on predetermined rules in order to achieve a certain objective. The dynamic interaction between elements

materializes in the flows established between them, flows involving the existing resources.

According to system theory, any economic body is a system because:

1. It presents its own structure consisting of a set of constituent elements that interact with each other on functional principles;

2. The flows between the organizational components involve the resources of the economic body. Inside any economic organization: - material flows (raw materials, semi-finished products, finished products, etc.) - financial flows - information flows

3. The multitude of the organizational components and the interaction between them aim to achieve an overall objective: the operation of the company in optimum conditions or the achievement of some objectives. The work in the field of system has led to the definition of a model that promotes the systemic vision of the enterprise that it considers to consist of the following three subsystems :

• The decision subsystem uses the information provided by the information subsystem to substantiate the decisions.

• The information subsystem plays a dual role: it provides all the necessary information to make decisions at all levels of responsibility, leadership and control and, on the other hand, provides the means of communication between the other subsystems because the decisions made by the management subsystem are passed on to the factors execution through the information subsystem (downstream).

• Operational subsystem (where the economic processes specific to the economic activity domain are carried out) the data collection is then collected and then transmitted to the information subsystem (upstream) in order to store and process the data necessary to obtain the information used in substantiating the decisions at the level of the decision subsystem (driving)) (Clarke, Elliman & Lehaney 2000; Murray 2014).

The decisional subsystem requires specific information needed to substantiate strategic decisions on the one hand and tactical and operational decisions on the other hand.

The level of strategic and tactical management is characterized by the request for information:

- Ad hoc, unanticipated, determined by a certain context in which the manager is obliged to base his / her decision;
- Synthesized: as we climb the steps of the managerial hierarchy, a selection and a gradual synthesis of information take place;

- Forecasting, allowing anticipation of trend trends in the process led;
- External to define the economic, financial, competitive environment in which the firm will operate. In the case of operational management, characterized by structured decisions, the information provided is:
- Pre-established, their content covering the informational need determined by the derutin decisions taken at this level;
- Detailed because the manager needs to know in detail how to run the activity in his area of responsibility;
- Interior;
- Punctual;
- Presents historical character;
- Obtained at a certain frequency, the moment of providing the information being preset.

The information subsystem represents the technical and organizational assembly of data collection, transmission, storage and processing in order to obtain the information necessary for the decision-making process (Lee, Chu, & Tseng 2009; Malhotra 2016).

The information subsystem is interposed between the decision subsystem and the operational subsystem to provide the necessary information to the managerial staff, while being a means of communication between the other two subsystems. The informational subsystem should not only be seen as an interface between the operational system and the management system, but also as the link between the company's internal environment and its external environment (economic, financial, banking). The main purpose of the information system is to provide each user, according to his responsibilities and responsibilities, with all the necessary information (Coleman, Pigman & Pulak 2015; Malhotra 2016). The information system is part of the information system that enables the collection, transmission, storage, data processing and dissemination of the information thus obtained through the use of information technology (IT) means and the personnel specialized in automatic data processing.

The information system comprises:

- the set of internal and external information, formal or informal, used in the company, as well as the data on which they were obtained;
- the software needed to process data and disseminate information within the organization;
- procedures and techniques for obtaining (based on primary data) and disseminating information;
- the hardware platform required for data processing and dissipation of information;

- personnel specializing in collecting, transmitting, storing and processing data.

The IT system is structured to meet the needs of different user groups:

- strategic leadership, tactical and operational leadership; • personnel involved in the data collection and processing process;
- the staff involved in the scientific research process and the design of new defamation products and technologies.

Along with defining the business strategy it is necessary to define the strategy of the IT system because:

- The information system supports the managers, through the information provided, in the management and control of the activity in order to achieve the strategic objectives of the organization;
- IT systems are open and flexible, adapting the imposed environment to the dynamic environment in which the company operates;
- promoting IT solutions supports the organization in consolidating and developing the business (eg: electronic commerce, e-banking etc);
- the information system provides the information necessary to control the fulfillment and adaptation of the organization's operational and strategic plans;
- the organization needs to know and control the risks of implementing new technologies and adapting the IT system to the new requirements;
- Establishment of standards in the information system that are meant to specify the characteristics and the hard and soft performances of the components to be purchased and the methodologies to be used in the development of the system.

3. Approaches in the development of information systems

In the development of a computer system one can choose one of the following solutions:

- a centralized computer system
- a decentralized computer system

The centralized computer system is characterized by the fact that the whole process of data storage and processing, as well as the development of the system, takes place at a single location where there is a single computing system, usually a mainframe, which stores a base unique data as well as all application programs. Users interact with the system via terminals (which act as thin clients).

The advantages of centralization are represented by:

- effective control over the use and development of software;
- control over data security and integrity;
- sharing hard, soft and data resources among users;
- eliminating the risk of hard and soft incompatibility within the system;
- Easily promote standards (technical, design, procedural, etc.) at the level of the whole system;
- providing the services requested by the users through the power of the central system (mainframe).

Disadvantages of centralization are the following:

- the „fall" of the computing system blocks all users;
- Alteration of data and programs, whether void or accidental, affects all users;
- the system may prove slow and inflexible to users' needs, often insufficiently adapted to local or group needs of users;
- can achieve a long response time in case of simultaneous requests of multiple users.

The decentralized information system is characterized by the fact that the data, software and power of the calculations are dispersed in different locations (even geographically dispersed) of the organization. Processing takes place on independent personal computers or on local networks (Orman 1998; Lee, Chu, & Tseng 2009).

Advantages of decentralization:

- data is stored and processed locally;
- software is better suited to local needs;
- Hard, soft or database failures at a location do not affect other locations.
- the system configuration can be tailored to the needs of different departments within the organization or even local users;
- greater autonomy and motivation at the local user level.

Disadvantages of decentralization:

- high risks related to hard and soft incompatibilities between different locations;
- the inherent appearance of duplications of data and software in different locations;
- the difficulty of realizing complex projects at the local level;
- the risk of fragmentation of IT policy;
- higher costs than the centralized system.

The current trend is net-oriented towards decentralization that must be achieved in such a way that:

- All responsibility and authority for the decentralized functions of SI to belong to local management;
- Ensure alignment with the standards used at the organization's overall SI level;
- at central level to be achieved:

- elaboration of strategy at the whole SI of the organization;
- communication management within the organization's local network;
- data management;
- disaster recovery.

Today, the architecture promoted in decentralized systems is the client-server architecture characterized by the fact that the applications and the data available to the users are dispersed on the different hardware components according to the number of users to access and the required computing power.

Hardware components are represented by:

- workstations (personal computers) used by individual users;
- Shared server departments characterized by the same processing needs;
- central server shared by all users.

The software exploited within the organization is represented by:

- Client applications that:
  - runs on the workstation at the customer's disposal;
  - exploits data stored on client's computer;
  - are mainly represented by: table processors, word processors, databases exploiting applications.
- Departmental applications that:
  - runs on the departmental server;
  - exploits at department level data stored on its server;
  - are shared by users of the same department;
- Organizational apps that:

runs on the central server;

- exploits data of general interest stored on the central server;
- are shared by users of multiple departments;
- requires high processing power.

4. Principles of design and implementation of Management Information Systems

Conducting a rigorous and efficient design and implementation of management information systems requires the following principles to be observed:

1. The global approach to the problem solved;

2. Using a unitary methodology in the design and implementation of the information system;

3. Application of the most modern solutions and methods of designing and implementing the information system;

4. Structure of the IT system taking into account the organizational structure within the company.

5. Direct participation of the future beneficiary in the analysis, design and implementation of the information system. Such participation ensures that the design specifications and the gradual validation of the solutions proposed by the designer are clearly formulated, all of which ensure a product that fully complies with the user's requirements;

6. Compliance with the legal framework. In the case of management information systems, it is mandatory to record, compute the indicators and prepare the synthesis work in accordance with the regulations in force.

7. Developing computer systems for the resources available to the user;

8. Since the software is subject to change, this change must be anticipated and controlled;

9. Compromises are inherent in software development and must be explicit and documented.

Specialty studies have attempted to highlight the success factors in running the software projects (Murray 2014; Malhotra 2016).

The Standish report, for example, places as prime success factors:

- End user involvement
- Support of executive management
- Clarity of requirements
- Planning.

The following application program will manage the articles from an organized file:

```
#include<stdio.h>
#include<malloc.h>
#include<string.h>

// nr. total spaces in the file - no. physical articles
// I - the file, the size of a logical item
// E - no. physical items -1 if the file is not open
int NrSpaces (FILE* f, long dim)
{
```

```
      long p;
      int nr;
      nr=-1;
      if(f)
      { p=ftell(f);
        fseek(f,0,SEEK_END);
        nr=ftell(f)/(dim+1);
        fseek(f,p,SEEK_SET);
    }
      return nr;
}
```

// current position in file
// I - the file, the size of a logical item
// E - current position, no. of articles, -1 if the file is closed

```
int Position (FILE* f, long dim)
{
      int nr;
      nr=-1;
      if(f)
            nr=ftell(f)/(dim+1);
      return nr;
}
```

// preforming the file
// I - the file, dim. art., no. art. for preform / extension
// E - error code: 0 - successful, 1- file was closed

```
int Preforming (FILE* f, long dim, int nr)
{
      int i,er;
      char *art;
      er=1;
      if(f)
      { fseek(f,0,SEEK_END);
        art=(char*)malloc(dim+1);
        art[0]=0;
        for(i=0;i<nr;i++)
              fwrite(art,dim+1,1,f);
            er=0;
              free(art);
```

```
      }
      return er;
}
```

// positioning
// I - the file, dim. art, the desired position in nr. relative article
// E - error code, 0 - successful, 1 - too much position, 2 - file. closed

```
int Positioning  (FILE* f, long dim, int p)
{ int er;
  er=2;
  if(f)
        if(p<NrSpatii(f,dim))
        { fseek(f,p*(dim+1),SEEK_SET);
         er=0;
      }
        else
              er=1;
  return er;
}
```

// read in sequential access, the following article
// I - the file, dim. art, the address to which the read article is submitted
// E - error code, 0 - art. read, 1- file. closed, 2 - end file

```
int ReadNext (FILE* f, long dim, void* adresa)
{
      char* art;
      int er=1;
      if(f)
      { art=(char*)malloc(dim+1);
      fread(art,dim+1,1,f);
      while ((!feof(f)) && (er==1))
      { if(art[0])
        { er=0;
          memcpy(adresa,art+1,dim);
        }
        else
              fread(art,dim+1,1,f);
      }
      if(er==1) er=2;
```

```
        free(art);
        }
        return er;
}
```

// citire in acces direct
// I - fisierul, dim. art., cheia art., adresa unde se depune articolul
// E - cod eroare, 0 - art. citit, 1 - fis. inchis sau poz. prea mare, 2 - cheie invalida

```
int ReadPosition(FILE* f, long dim, int poz, void* adresa)
{
        char *art;
        int er;
        er=Positioning (f, dim, poz);
        if(!er)
        { art=(char*)malloc(dim+1);
          fread(art,dim+1,1,f);
          if(art[0]==0)
                er=2;
          else
          { er=0;
            memcpy(adresa,art+1, dim);
          }
          free(art);
        }
        return er;
}
```

// write article in direct access
// I - the file, dim. art, article address, article key
// E - error code, 0 - successful, 1 - file. closed, 2 - invalid key

```
int WritePosition (FILE* f, long dim, void* adresa, int poz)
{ char* art;
  int n,er=1;

  if(f)
  { n=NrSpaces(f,dim);
    if(poz>=n)
            Preforming(f,dim,poz-n+1);
      art=(char*)malloc(dim+1);
```

```
      Positioning (f,dim,poz);
      fread(art,dim+1,1,f);
      if(art[0]==1)
            er=2;
      else
      { er=0;
        memcpy(art+1,adresa,dim);
        art[0]=1;
        Positioning (f,dim,poz);
        fwrite(art,dim+1,1,f);
      }
      free(art);
  }
  return er;
}
```

// Overwrite article for change, in direct access
// I - the file, dim. art, article address, article key
// E - error code: 0 - successful, 1 - file. closed, 2 - the position is too big

```
int RewritePosition (FILE* f, long dim, void* adresa, int poz)
{ char* art;
  int n,er=1;

  if(f)
  { n=NrSpatii(f,dim);
    if(poz>=n)
            er=2;
      else
      { art=(char*)malloc(dim+1);
      Positioning (f,dim,poz);
      er=0;
      memcpy(art+1,adresa,dim);
      fwrite(art,dim+1,1,f);
      }
      free(art);
  }
  return er;
}
```

// delete the article with the known key
// I - the file, the size of an item, the key of the item to be deleted
// E - error code, 0 - successful, 1 - file. closed or too high position, 2 - invalid

key (empty space)

```
int Delete (FILE* f, long dim, int poz)
{ char* art;
  int er;
  er=Positioning (f,dim,poz);
  if(!er)
  { art=(char*)malloc(dim+1);
    fread(art,dim+1,1,f);
      if(art[0]==0)
            er=2;
      else
      { er=0;
        art[0]=0;
        Positioning (f,dim,poz);
        fwrite(art,dim+1,1,f);
      }
      free(art);
  }
  return er;
}
```

In an economic application it is necessary to include multiple modules that refer to different articles and so there are needed programs that manage the insertion, deletion and updating of those. These algorithms must respect the business logic and the complex paterns of management information systems that imply to a solid design and the newest software design and applications for different types of economic participants (Lee, Chu, & Tseng 2009; Clarke, Elliman & Lehaney 2000).

5. Conclusions

The decisional subsystem requires specific information needed to substantiate strategic decisions on the one hand and tactical and operational decisions on the other hand. Reengineering means the fundamental rethinking and radical redesign of business processes to achieve substantial improvements in cost, quality, and response speed of decision makers and so this rethinking of how to do business is influenced and finds answers in new IT solutions (Clarke 2016; Ching 2016). The usage of reengineering implies to rethink the business logic and to adjust or to replace certain algorithms that are

implemented in the current systems. Adaptive algorithms may resolve the need for frequent changes of the programs that implies high costs and time unusued by the newest algorithms (Levent 2014; Murray 2014). Reengineering the information subsystem implies to improve the information flows between the decision subsystem and the operational subsystem and to provide the necessary information to the managerial staff, and also to provide means of communication between the other two subsystems in such a manner that the beneficiaries to see a significant improvement.

References

Clarke, S., Elliman, T., Lehaney, B. (2000). Reengineering an Information System: A Case Study in Risk Reduction. *International Journal of Flexible Manufacturing Systems,* Vol. 12(4), pp. 305-320. Available at: https://link.springer.com/article/10.1023/A%3A1008126200531.

Coleman, K.G., Pigman, D., Pulak, D. (2015). Reengineering MIS: Aligning Information Technology and Business Operations. PA, USA: IGI Publishing Hershey.

Lee, Ya-Ching & Chu, Pin-Yu & Tseng, Hsien-Lee. (2009). Exploring the relationships between information technology adoption and business process reengineering. *Journal of Management & Organization.* Vol. 15(2), pp. 170-185. 10.5172/jmo.837.15.2.170.

Malhotra, Yogesh. (2016). Business Process Redesign: An Overview, *IEEE Engineering Management Review*, Vol. 26, no. 3.

Murray, Mary Ann. (2014). Business process reengineering/information system development to improve customer service quality. *Business Process Management Journal.* Vol. 3 (1), pp. 9-16, https://doi.org/10.1108/14637159710161558

Orman, Levent V. (1998). A Model Management Approach to Business Process Reengineering. *Journal of Management Information Systems*, Vol 15(1), pp. 187-212. DOI: 10.1080/07421222.1998.11518202.