

How to approach the development of enterprise information system

Jak přistupovat k rozvoji podnikového informačního systému

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Abstract: Nowadays, many enterprises face the problem of implementing their enterprise information system in order to keep pace with their competition. It holds generally for all types of enterprises, as e.g. manufacturing, agricultural, trading, financial, transportation, educational, etc. This paper deals with the basic rules for building an information system of the enterprise, particularly of medium or large ones. The attention is focussed at the problems each enterprise must address before starting an IS project. These are mainly the enterprise information policy planning, project feasibility and forms of its management.

Key words: information system, information strategic planning, development plan, project feasibility

Abstrakt: V současné době mnohé podniky stojí před problémem zavedení svého podnikového informačního systému, aby držely krok s konkurencí. To obecně platí pro všechny typy podniků, výrobních, zemědělských, obchodních, dopravních, finančních, vzdělávacích, atd. Článek pojednává o základních zákonitostech budování podnikového informačního systému, zejména pro střední a velké podniky. Pozornost je změřena na problémy, které musí podnik vyřešit před zahájením projektu IS. Jedná se zejména o plán informační politiky, proveditelnost projektu a formy jeho řízení.

Klíčová slova: informační systém, plánování informační strategie, plán rozvoje, proveditelnost projektu

INTRODUCTION

At present, all enterprises and institutions need an information support for a variety of activities. The enterprise managements realise that modern computer and communication technologies may create a powerful tool to make the management of the enterprise more efficient at all levels, from administration up to top decision making processes. The managers seem to realize that a strategic advantage may be won in the current competitive environment by a prompt installation of a suitable information system. In the opposite case, they might be facing serious setbacks in the enterprise business sector.

In the past years, many enterprises have realized the advantages of integrated information systems and some of them have also been successful in their implementation. However, a great deal of expectations of the top management as to the benefits of information technologies are often in great contrast with the previous bad experience with the “information systems” currently employed in many enterprises. This situation may be illustrated by the following remarks:

- Currently, certain isolated and mutually non-compatible IS modules exist in the enterprise that:
 - as a rule, originated spontaneously (not systematically), often as products of enthusiasts who wanted to improve their own partial area of activity,

- they are of a limited scope,
- they do not mutually communicate or co-operate,
- their documentation is insufficient, which makes their maintenance and development more difficult or even impossible,
- they were mostly created without the necessary professional background as to the development of information systems and often they have been “reinvented”,
- they are often neither maintained nor further developed
- their “life” depends on the life of their only author,
- they are physically dependent on a particular type of hardware or operating system,
- the development tools employed are no longer supported.
- An important source of information suitable for all levels of enterprise management may be the data derived from the administration of enterprise activities (production, trading, transportation, research, public relations, ...). Therefore, information systems correctly designed for effective administration may also facilitate an efficient control of the enterprise and its parts.
- Co-operation of IS modules may be achieved by conceiving the IS as an enterprise information system. This procedure facilitates operation, maintenance, development, and data collection making them also more

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cost-effective. For this reason, enterprises try to design their own information systems to improve their management.

- The success rate of the information system implementation is generally very low, approximately 15%. During the development and implementation of an IS, variety of rules and regulations must be taken into account that directly influence the success or failure of these projects. Not considering these rules may substantially increase the risk of the project failure. However, many general conditions governing the success are often neglected or violated. Many projects fail due to lack of knowledge and experience in this field. The result is a waste of money and people frustrated. Apart from this, such failure may also bring a significantly lower efficiency of the enterprise management.

To reduce the risk of an IS project failure and to avoid unnecessary expenses and losses, the enterprise should adopt a systematic and co-ordinated approach. This article may help enterprise managers to do it by formulating the basic rules of IS project organisation at enterprises based on the latest development. It may serve as a guide for the correct management of the IS project.

IDENTIFYING THE NEED TO IMPLEMENT IS

Prior to building an information system, the enterprise management must address several basic issues. One should be honest and correct when dealing with these issues avoiding self-deception to prevent future disappointment and losses. There is not necessarily a straight answer to each of the questions listed below:

- Do we really need an information system?
To assess the need of information system is not a simple and easy task since this need may have several reasons difficult to compare. Most people would rather answer “yes” just to show that they do not want to be taken for conservatives. The following aspects may be important for a correct answer to this question:
 - Do we need to improve the collection, distribution, processing and presentation of information? Can an information system be of any help?
 - Can we improve the image of our institution by using an IS?
 - Do we need a higher reliability, accuracy and security of information?
 - Do we need better documents for the management of such areas as planning, production, trading, financial matters, co-operation of divisions and departments?
 - Will an IS help us to improve the order or to remove disorder?
 - Do we need an easier reporting to business partners or superior authorities?
 - Would it be possible to use the IS to solve some further problems?
- Do we realise the risks of an enterprise information system project?

The enterprise management will have to realise from the very beginning that an IS project:

- will be accompanied by certain problems and difficulties both general and specific for our business sector;
 - will bring some risk of a failure caused by factors that an enterprise cannot influence. Such risk will be low if the enterprise management and the IS project management get familiar with the risk factors and undertake timely measures decreasing such excessive risk. Otherwise, it will be high.
- Can we create conditions favourable to the project of an enterprise information system?

This includes above all:

- clearly declared support by the enterprise management
- organisational background
- adequate budget
- modification of existing internal rules and creation of new ones.

Figure 1 shows typical basic questions that the enterprise top management must answer before making any decisions and the consequences of such answers. This, of course, depends on many other circumstances for example on the degree of the existing IS development. This particular flow chart corresponds to an IS worked out “from scratch” and, in particular cases, it must be modified accordingly.

INCORPORATION IN THE DEVELOPMENT PLAN

A working information system is usually not the principal mission of an enterprise. This rather includes good production, technology and trade. An insufficient information support can impair the functioning of these basic activities with long-term consequences. Thus an incorrect information system may negatively influence the performance and competitiveness of the enterprise even in its mission critical fields.

An information system should be designed not only for the administrative staff, but above all, for the management of the enterprise and for employees of various categories. The system provides information and teaches all these people how to work with information. The implementation of an enterprise information system is not a single act but rather a process that may last several years in larger enterprises. The successful mastering of this task requires a good organisation and allocation of funding and personnel. It is very risky to view the implementation of an IS only as an operative task. On the contrary, it must be incorporated in the enterprise development plan, discussed and approved by appropriate bodies (top management, board of directors, general assembly, etc.).

The enterprise information strategy must be created according to the enterprise development plan. Designing information systems regardless of the strategic business may cause problems later on. An isolated creation of the information strategy plan will probably produce

costly systems that will not be able to cover the full range of the enterprise's requirements. During the strategic planning, it is useful to adopt a process-oriented view of major activities performed at an enterprise. However, the enterprise life is not possible without supporting also processes such as financial management although it is usually not a business subject. The basic (institutional) processes can be decomposed down into a large number of partial processes defined in terms of data flows and

operations. Some of these processes can run in parallel, others consecutively, each process waiting for the termination of a number of other process. Some processes may be critical for achieving the enterprise mission. A change in the information service of some (business) processes enables a different (better) organisational structure of the corresponding workplaces. These and many other circumstances must be taken into consideration when designing the information strategy of an enterprise.

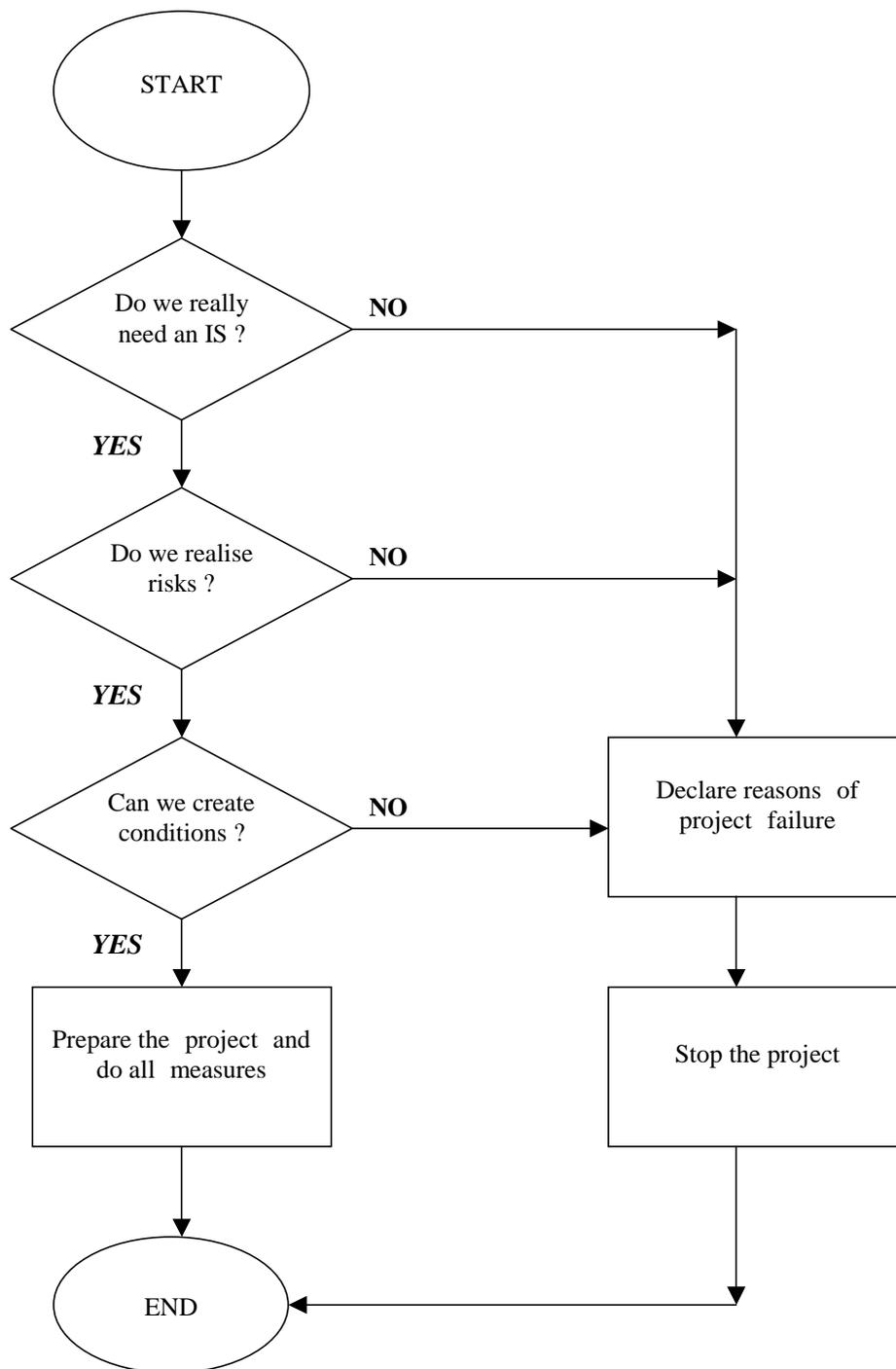


Figure 1. The flow chart of basic questions to be answered

A suitable form of preparation for a negotiation of the development plan is to prepare a study on “*The Plan of the Enterprise Information Strategy*”. This study should be a source of knowledge for all enterprise personnel involved being “the enterprise mirror”. Typically, it should focus on the following:

- survey of the current state of information service in individual routine activities;
- proposal for the information service required in each sphere of activity;
- outline of solution variants with respect to the enterprise priorities;
- expected financial and personal costs;
- cost effectiveness of each variant.

Usually, both enterprise management and ordinary personnel assess these aspects intuitively with only incomplete information. Thus, the above-mentioned study is very useful for further decision making, since it provides a systematic view of these aspects supplying arguments for the discussion needed to adopt the right decisions and determine the responsibility of each person for the consequences of these decisions. The “Information Strategy Plan” may be useful even if, later on, the enterprise management decides not to build an IS.

IS PROJECT FEASIBILITY

The project feasibility expresses the ability to control the project and to complete it successfully. The IS project feasibility is influenced by a variety of factors. It is, above all, the determination of the enterprise management to implement this project. Issues concerning the organisational background must also be addressed such as the quality of the system itself (its functionality, performance, ...), the way of communication with the system and, possibly, still others. The share of these factors in influencing the project feasibility is shown in the Table 1.

In an ideal case, that is, if there is a strong determination, perfect organisation, an error-free system, etc., the share of each factor listed in the table reflects its effect on the project feasibility. Thus, the feasibility of such a project would be 100%. The real project management model is, however never ideal and so certain limitations must always be considered. Under the real conditions of an imperfect management, the contributions of the fac-

Table 1. The main factors contributing to the IS project feasibility

Influence percentage	Factor
40	Enterprise management determination
25	Project organisation
20	Quality of the system
10	Form of communication with the system
5	Other

tors to the project feasibility decrease. Thus, the actual feasibility of the project is also lower than the ideal one and is less than 100 %. If it drops below 50 %, the project gradually gets out of control and becomes nearly hazardous. In the sequel, we will describe in more detail how the project feasibility is influenced by the management model chosen and by the factors shown in the Table 1.

What factors are the most important for an IS project to be successful – this is a very frequently asked question. We are going to deal with those factors that are the most typical for an enterprise environment:

- The implementation of a new system brings about order into all the spheres affected by the system. The employees are forced into a certain structured model of work. However, some people may not like order, regardless of their post. Also the feeling that they are becoming a small wheel of a complex mechanism might vex them. Therefore, it is of key importance that the enterprise personnel should be instructed that the new technology is here to help them and to make their work easier.
- An IS makes access to information transparent (depending of course on the role of an individual and the corresponding access rights). On the other hand, within the complex mechanism of an enterprise management, some top managers misuse their exclusive access to information. The instalment of an IS means that such managers lose their exclusive position and this might be the cause of their (hidden) resistance that should be taken into account.
- Many people expect a perfect system or supplier. Nothing like that exists.
- The IS project must be given a high short-term priority among other enterprise activities. Even if the implementation of an IS is not a primary mission of the enterprise, the enterprise management must convince its employees that the IS will have a decisive long-term impact on the enterprise prosperity.
- Many employees will participate in building of an IS. Some of them will play roles that are vital for the success of the individual phases of the project. It would not be wise to expect a project fuelled only by the enthusiasm of some individuals to be successful. All participants must be motivated and made responsible, particularly the key managers.
- Good planning and checking are vital for the project particularly as far as the timing and funding are concerned. For the whole duration of the project, it is necessary to allocate sufficient funding to cover the purchase of the software components and to buy central equipment.
- Due to the required scope of the system, its reliability and security, it is necessary, from the very beginning, to pay attention to the selection of the technical infrastructure, i.e., suitable software, operating system, database management system and network resources. These are the key factors of the resulting IS performance, reliability and security.
- The enterprise management and also the project management should foresee problems that are bound to

occur during the project implementation. If a problem of any kind occurs, its specific description should be requested and vague formulations should be avoided. This is the only way to enable a prompt remedy to the problem.

- The management should identify the possible problem areas and take measures for their early recognition and prevention.
- As a rule, there are no complete and compulsory internal regulations or routines governing the document flow and information processing.
- Usually, experience is lacking for simultaneous processing of data shared by several users.

ENSURING TOP-LEVEL SUPPORT FOR THE PROJECT

Table 1 shows that the enterprise management determination to accomplish the project has the major influence on the feasibility of an IS. However, one should clearly differentiate between two different levels of the enterprise management manifestations of such a determination:

1. Public declarations of individual officers or bodies on the necessity to support the IS project.
2. Practical actions undertaken to show this determination:
 - putting through the funding of the project from the enterprise budget or from other sources,
 - taking the necessary organisational measures, including the personnel background,
 - adopting the required internal legislature to ensure the efficient use of the IS,
 - strict monitoring of the project implementation and practical measures undertaken to remove any deficiencies detected.

The determination of some members of the top management is given by their enlightenment and anticipation with which they can assess the future benefits an IS may bring to the enterprise. However, one should be wise enough not to rely too much on individuals but, rather, one should have sufficiently convincing arguments to strengthen all the top-level management officers' determination to implement the project. The "Enterprise Information Strategy Plan", its honest assessment and subsequent systematic dissemination is a suitable tool for achieving this goal.

It is very important that the project implementation should not be dependent on the determination of individuals even those at top positions. It must be a project whose implementation is incorporated in the plans of all involved components of the enterprise.

PROJECT SCOPE FORMULATION

The top-management officers, the potential users of individual services provided by the IS, the technical staff, the suppliers, etc. may all expect different things of an IS

and, thus, may have different ideas of its scope. To avoid later disputes, speculations and disappointments, such as that the system does not provide the services as expected or, on the contrary, that it is too expensive because it provides too many services that are not actually needed, it is necessary from the very beginning to define the exact scope of an IS project. This definition should be based on the "Enterprise Information Strategy Plan", which is a suitable basis and a guide for this purpose.

The IS project scope definition should provide the basic framework of the project in terms of its content, time and funding (without going into detail). Typically, it should comprise the following:

- Activity areas in which the IS will provide its services.
- Organisational units for which the IS components will provide their services. It may be useful, even at this stage, to specify the hierarchic subdivisions of the organisational units, their placements, etc.
- Connectivity of the IS components and the required scope of data shared by several components. This may have an effect on the selection of a supplier (suppliers) and on the first time schedule of the project. The components may be implemented in any order or simultaneously. This, of course, may not apply to components that share or exchange data.
- IS user categories and their roles.
- Deadlines for the putting into operation of each IS component.
- Available funding.

CONCLUSIONS

There is no doubt about the usefulness of enterprise information systems, provided these were correctly implemented. There is no room for "reinventing a wheel" when implementing an enterprise information systems by trials and mistakes. Such an approach would be very expensive and associated with a high risk of failure. Instead, the "good practice" examples and experience should be preferably used. Following the later approach will reduce risks and allow an enterprise to achieve expected benefits from their information system.

REFERENCES

- Flaatten P.O., McCubbrey D.J., O'Riordan P.D., Burgess K. (1992): Foundations of Business Systems. Second Edition, The Dryden Press, A Harcourt Brace Jovanovich College Publisher, Forth Worth Philadelphia, U.S.A.
- Martin J. (1989): Information Engineering. Book I-III. Prentice-Hall, Inc., Englewood Cliffs, NJ 07632, U.S.A.
- Vrana I. (1996): Integrated information system. EUNIS International conference: Using information in the electronic age. Manchester, December.
- Vrana I. (1997a): Critical factors of success in projecting and management of Integrated Information Systems. (An invited lecture). University of Essen, Germany, April 8.

- Vrana I. (1997b): Projects of Integrated Information Systems and their Management. (Invited lecture). University of Agriculture Wageningen, April 24.
- Vrana I. (1997c): Critical factors of the (university) information system management (in Czech). "University information systems" seminar, Zvíkov, Czech Republic.
- Vrana I. (1997d): Implementation of University Information Systems. EUNIS'97 Congress European Co-operation in Higher Education Information Systems, Grenoble.
- Vrana I. (1997e): How to Avoid Problems During the Implementation and Development of University Information Systems (in Czech). RUFIS International conference, Prague, Czech Republic.
- Vrana I. (1997f): On the management of Information System Project (in Slovak). UNINFOS 97 International conference. (Invited key lecture). Košice, Slovak Republic, November.
- Vrana I. (1998a): Methodical Approach to the Building of University Information Systems (in Czech). UNINFOS 98 International conference. (Invited key lecture). Nitra, Slovak Republic, April.
- Vrana I. (1998b): Changes Required by ICT Era Are Sometimes Painful. Congress CAUSE'98. Seattle, U.S.A., December.
- Vrana I., Bůřil J., Černý A. (2001): Methods for Building a University Information System. Edited by EUNIS, Brno, March.

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