Role of Human Factor During Implementation and Use of Management Information Systems

Ing. David Michálek

Tutor: Doc. Ing. Martin Zralý, CSc.

Abstract

Objective of this paper is to cover key areas of influence of human factor to success of implementation and use of management information systems. The whole process of implementing a solution within a company is divided into several of subsequent stages. Within each stage, there are key aspect which have to be managed properly if the implementation of management information system is to proceed seamlessly and subsequently, bring maximum effect for a customer and create long and successful cooperation.

Key words

Management information system, MIS, implementation, human factor

1. Objective of This Paper

Presently, there is no doubt that modern enterprise management needs sophisticated software information systems, which cover all the areas of management – inventory, sales, finance, accounting etc. All these areas are already covered by adequate software tools and customers can choose from many solutions, varying in both functions and prices. Such solutions, covering "everyday routine", are referred to as ERP (stands for **E**nterprise **R**esources and **P**lanning) systems.

While ERP systems solve everyday tasks within a company, efficient management needs a bit more of overview and integration of information from various areas. This is the point where so called MIS, or Management Information Systems, play their part. These systems can either be in a form of a "managerial add-on" for ERP system, or they can come in a form of standalone solution, often from a provider that is different from ERP provider. Purpose of MIS solutions is to provide a different view of ERP generated data and offer supplementary tools for analyses and planning, utilizable mainly by middle and top enterprise management.

Implementation of (not only) management information systems is often viewed mainly from the technological point of view. The technological aspect, although undoubtedly important, is often not the main which decides resulting quality of the final solution. Often, aspects concerning human factors come to front and are perceived as the foremost for the overall quality and utility of the solution.

Objective of this paper is to describe influence of human factor during implementation and utilization of management information systems and, which is even more important, propose suggestions on how to make the implementation as seamless as possible and subsequent utilization to bring maximum utility for the customer.

To accomplish the aforementioned objective, these key tasks have to be completed:

a) Describe *MIS solution characteristics*, which have key impact on the process of implementation.
b) Divide process of MIS implementation into several separate, *subsequent stages*.
c) Within these stages, identify aspects of *significant influence of human factor* in the terms of success of the particular stage (and very often, also following stages).
d) Within each stage, *give suggestions* for successful implementation and utilization of MIS solution within a company.

2. Specific features of management information systems and their life-cycle stages

Management information systems have certain specific features, which can make them different from other software solutions that we commonly know in companies. This also creates a form and content of their particular stages of management information systems realization.

2.1. Specific features of management information systems

Specific features of management information systems, which have significant influence on the process of implementation, are for example the following:

a) Uniqueness of every implementation

Every MIS provider naturally strives for a certain "standardization" of typical partial components of the solution. However, we can say that in the case of more complex MIS implementation, the final solution is in its' nature closer to custom-made software, than "out of box" one, which is just installed and quickly set up. Such customized solution is from the customer's point of view usually perceived as an advantage, as the solution really fits the needs of particular company, on the other hand, however, it's more challenging in the terms of collaboration between MIS provider and future users.

b) Dependence on data which cannot be influenced from MIS

Another specific feature of MIS is the fact that, mainly in case of actual data analysis, MIS generates no "primary data", but instead of that, almost entirely depends on quality and form of data supplied from external sources. That, especially in the case when MIS provider is not the same subject as ERP provider, represents a serious challenge in the terms of analysis quality and subsequent communication in the process of gathering data necessary for implementation of MIS solution.

c) Comprehensive integration of data from various areas

In a management information system, data from various areas of corporate management are usually put together. Areas such as sales, manufacture, purchasing, financial management etc., all of this should ideally be put together into one homogenous unit. However, that requires a lot of effort not only from the MIS provider, but also from the customer. This is very often underestimated and then problems arise, when responsible personnel "would like to" put more effort into MIS implementation, but "are unfortunately too busy" to do that.

2.2. MIS Solution Life-cycle Stages

Whole process of MIS "life cycle" within a certain company can be divided into several subsequent stages, reaching from initial sales presentations for a potential customer to operational stage when the management information system is fully implemented.
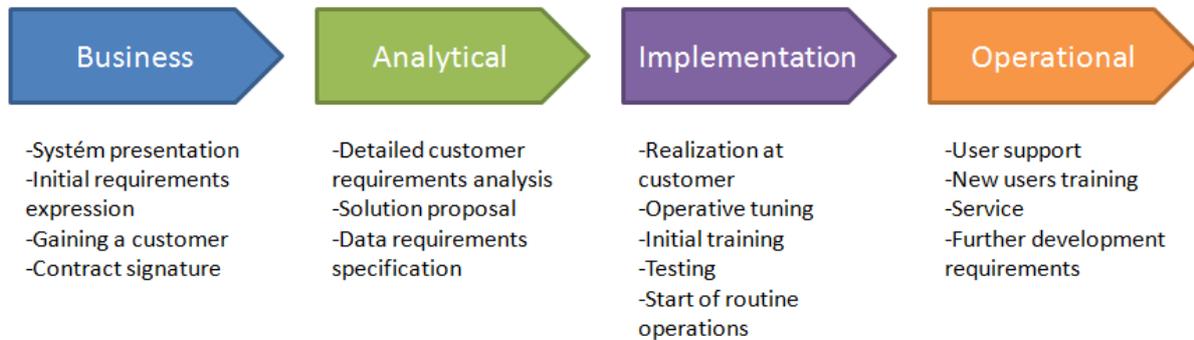

Business	Analytical	Implementation	Operational
-Systém presentation -Initial requirements expression -Gaining a customer -Contract signature	-Detailed customer requirements analysis -Solution proposal -Data requirements specification	-Realization at customer -Operative tuning -Initial training -Testing -Start of routine operations	-User support -New users training -Service -Further development requirements

Fig. 1. Management information system life-cycle stages

As figure above shows, whole life-cycle can be divided into four stages.

Business stage begins with initial contacts with potential customer. Usually, model solution presentation occurs, followed by first gathering of user requirements and needs. In the end of this stage, in case of successful tender, this stage is concluded with contract signature.

Business stage is followed by **analytical** stage, where, following requirements discovered during business activities, a detailed analysis is made and proposals of future solution are outlined. This process is usually iterative and goes gradually more and more into details.

During **implementation** stage, MIS solution is actually deployed at the customer. Even during this stage we can expect some corrections of solution design, as customer usually gets more detailed idea of the system and its' functions.

Final, **operational** stage, includes mainly user support, solution of user requests and also further development of the system - implementation of new features not under the framework of original solution design.

Although the process of implementation is divided into several stages, it's absolutely necessary to perceive their *interconnection*. Every following stage bears successes and failures of previous stages. Therefore, it's not correct to think that inadequate attention to any stage can be fully or in majority "compensated" by higher activity during stages that follow.

In this context, it's useful to mention that future success or failure of entire solution is in majority decided in the first two stages. Poorly set contract terms or inadequate effort put into detailed analysis, those are aspects that can subsequently have significant bad influence on implementation, or even operational stage.

In the following text, particular stages and key points with decisive role of human factor will be analyzed.

2.3. Role of Human Factor in The Individual Stages of MIS Life Cycle

Each of above mentioned stages of life cycle is more or less susceptible to human factor:

Business stage

In the business stage, an initial contact between sales manager of provider and potential customer is established. Usually followed by prototype or model solution (for a particular branch, corresponding to branch of customer enterprise) presentation, taking part in a tender, it ends (after winning a tender) by signing a contract for future implementation.

Within the business stage, we can identify these significant moments, where human factor plays an important role:

- Participation in a tender (presentation of model solution to the customer, discovering customer's needs, designing a solution proposal)

- Setting contract terms of solution realization

In order to get a contract for future MIS solution realization at a potential customer, provider usually has to participate in a tender. Within this tender, a presentation of demo or prototype is done, followed by initial discovering of real needs, expectations and requirements, that customer has towards a MIS solution.

A sales representative should, within a framework of effort to get a new customer, naturally strive to offer as good satisfying of customer's needs and requirements as possible and present the offered solution and make the best impression possible. However, the representative should also be properly trained and also cooperate with other specialists, who are to work on the following analyses or implementation, to not offer (within a business effort) something which is not realistic, in the terms of either functionality or deadlines.

Furthermore, it's highly recommended that the sales representative truly and honestly informs a potential customer about the extent of required collaboration. Implementation of MIS solution, mainly within analytical stage, requires a significant engagement of customer's key specialists from areas that MIS is about to cover, so a detailed specification of solution design can be made. Inadequate attention to informing a customer about this aspect of realization may lead to delays of subsequent stages, as customer's key specialists won't have time to collaborate on MIS implementation as required.

After winning a tender, a contract signature comes to question. Within a contract, it's absolutely necessary to define the form and extent of collaboration between MIS provider and customer, and also, what are the measures for considering a part of the project as done and finished.

It's also essential to define what happens, when any of the contract parties doesn't collaborate according to contract. This is usually automatically defined for the provider (penalties for missed deadlines), however, it tends to be often omitted for the cases of lack of collaboration from customer (most often because of time constraints). In case of participation of other subjects, such as external specialists for ERP system for data delivery, it's also necessary to have contract terms of collaboration for these as well.

For business stage, from the provider's point of view, there are following suggestions:

1. Close cooperation of sales representatives and analyses and implementation specialists as early as model solution presentation.

2. Offer only what can be realized within reasonable time and costs framework.

3. Inform customer (in a honest and detailed way) about its' required participation on MIS deployment.

4. Define clear acceptation criteria for partial stages of solution.

5. Set contract terms for cooperation between provider, customer and eventual other subjects.

Analytical stage

Analytical stage is absolutely essential; it's the key stage in terms of MIS solution implementation success. Outputs of business stage are usually not very detailed and it's just after consultations within this stage, where more detailed needs and requirements of the customer are being expressed and MIS solution design is created.

In the analytical stage, human factor plays a key role all the time, because this stage is mainly about communication between MIS provider and a customer. Following are the key processes and activities:

- Detailed analysis of customer's needs and requirements

- MIS solution design proposal

- Data requirements interpretation, ensuring data availability

As already stated above, outputs of the business stage are usually not very detailed and so the objective of analytical stage is to further precise them and make them more detailed. From provider's specialists' point of view, it's necessary to do as precise discovery of customer's needs and requirements and ideas of MIS solution as possible. Such requirements and ideas need to be (as early as analytical stage) corrected and directed towards available functionality offered by MIS solution. In case it's necessary, it's also good to direct the requirements a little in case they go out of the MIS framework (for example, duplicate solving of the same task within ERP and subsequently, in MIS).

MIS solution design proposal is another very important area for the following implementation. It's necessary to realize that this solution design will be then confronted with a resulting solution and will therefore serve as a basis for evaluation of completeness of a particular implementation stage or of the project as a whole. Therefore, it's necessary that output of the analytical stage is as detailed as possible, with no vague formulations or „grey zones", where the actual form of the solution is not clearly defined and is dependent on subjective interpretation.

Last, but definitely not the least important point to pay attention to, are data requirements and ensuring that all parties involved understand them. As previously stated, MIS works with large amounts of data from various sources, that need to be gathered in a corresponding way – from ERP system, in the form manual input, from MS Excel sheets etc.

Therefore, one of the outputs from analytical stage has to be detailed *data requirements* document. This document specifies what data are needed for MIS solution data structures implementation. In such situation, three parties usually interact with each other – provider's specialist (consultant), customer's specialist (e.g. controller) and third subject, providing data delivery.

This third subject, referred to as "data provider", can (in some cases) be a database specialist of MIS provider implementing the solution, with sufficient knowledge of customer's ERP system. In such case, the situation is a bit simpler. But mainly, data provider is either customer's database specialists, or stand-alone external subject (e.g. ERP solution provider).

It's both MIS provider's and customer's top priority to ensure, that all three subjects involved understand the data requirements. That may not be a simple task, because each of these subjects comes into play from a little different position. Provider's specialist knows what data requires and why, but doesn't know where and if are such data obtainable from ERP system. Customer's specialist usually knows, what data he encounters in everyday work, but usually, is no database expert, so probably won't be able to provide data in a corresponding form by himself. Finally, third subject, the data provider, is usually able to provide data based on (from his point of view) comprehensible data requirements, but is usually too "far away" from actual MIS realization and has usually a little or no clue at all about how the solution should look like. Therefore, data provider requires precise inputs of what data to provide, usually with little or no chance of figuring anything out himself.

The above mentioned interaction of three key subjects may lead to serious difficulties, if their cooperation isn't taken care of properly. In a better case, the data delivery is just delayed. Worse case is when we discover that some data aren't (or even can never be) available in demanded structure, and we discover that as late as implementation stage. It's necessary to provide and repeatedly verify that all parties involved understand their roles. Furthermore, as early as the analytical stage, it should be verified that data can be obtained in the requested form. If not, it's either necessary to change MIS data structures, or provide alternative data sources, for example in the form of external Excel files, maintained by customer just for the purposes of MIS implementation.

During analytical stage, it's necessary to take care of these key points:

1. Perform a detailed analysis of customer requirements, correct customer's idea in a way that they are seamlessly realizable and aren't out of MIS framework or against MIS philosophy.

2. Describe solution design proposal in as detailed way as possible, no vague formulations allowing subjective interpretation.

3. Ensure that all parties involved understand the data requirements.

4. Verify data availability in a required form early enough, take necessary steps in case of problems.

Implementation stage

Implementation stage is where the actual solution (designed and approved during previous stages) realization takes place. Although, in case of enough effort put to previous stages, there is not so frequent interaction between provider and customer, even in this stage can be identified some important steps, where human factor plays a key role:

- Communication during delivery of partial stages and carrying out eventual changes

- Testing of solution (both provider's and customer's tests)

- User training

MIS implementation is usually divided into several partial steps, where individual functional parts are delivered step by step. In this stage, customer may try to change or correct original solution design on the fly. That doesn't have to be motivated by bad intentions, it may be caused just by a fact that only after seeing the actual implementation of some parts, the customer may come to an opinion that the originally proposed solution doesn't fit the company's needs completely. For such cases, it's necessary to have well set communication rules - who and under what conditions can do such change requests and what are their impacts on project (delayed deadlines, extra charged works).

After realization of each partial step, there should be a throughout testing - done by both provider (so called internal tests) and customer. From provider's point of view, it might seem natural to have the solution tested by person different from the one who implemented it. But, under a deadline pressure, some providers tend to override this suggestion. However, there is a risk, that in case of same person for both implementation and testing, there won't be sufficiently detached view and so the approach of a customer seeing a certain functional part of the system for the first time won't be simulated well enough.

From the customer's point of view, there should be enough time for testing. It shouldn't be done under time pressure. Furthermore, precise acceptation criteria, resulting from previous, analytical, stage, have to be set. This is where minimum of vague or subjectively interpretable formulations becomes important again. For example, "fast enough system response" - for the provider, with knowledge of calculations complexity in the background, anything below 10 seconds is good, customer may have idea of 2 seconds maximum.

It is also important to prepare a proper schedule of user training - ideally in multiple stages. On one hand, it's necessary that the customer's specialists have some basic knowledge as early as partial steps testing, where they need to work with the solution. On the other hand, there is no doubt that customer won't have enough knowledge for routine work. Experience shows, that it's good to perform basic training using prototype solution at the beginning of the implementation, so that customer gets basic skills for testing. Following should be "advanced training" after delivery of complete solution, so the customer has all the necessary skills for routine work.

Generally, it can be said that during implementation stage, following aspects are the most important:

1. Set clear rules for requesting and approving partial changes.

2. Define what partial changes will be out of the framework of the original solution, thus extra charged.

3. Prevent the situation of one person both implementing and testing a certain part of a solution.

4. Emphasize importance of testing to the customer, so that there is enough time to do it properly.

5. Have clearly set acceptation criteria for both provider's and customer's tests.

6. Ensure sufficient user training - suggested to be performed in multiple stages.

Operational stage

Not even successfully completed implementation stage means the end of the process. Customer relationship has to be taken care of even after delivering solution to routine use. Important influence of human factor is mainly in these areas:

- Solving errors, warranty claims

- Further development of solution

Even the best software is usually not error free and it's common that despite the effort of both customer and provider to test the solution properly, it may occur that customer reports minor or major errors in system functionality.

For such cases, it's necessary to have rules for solving such situations. It's good to categorize possible errors according to importance - for example, having a certain cell of a table in orange instead of expected yellow color is unpleasant, but certainly less serious than a more serious error when the system isn't capable to provide any data at all.

Under the framework of such categories it's necessary to set a corresponding way of communication (e-mail or telephone reporting) and adequate response time. MIS solutions usually cover many areas of enterprise management, various users come into contact with MIS solution and so there can be numerous potential requests. It's clear that not all requests can be solved by direct contact between customer and provider's specialist who implemented the particular part of a system and request "immediate" solution, regardless of error nature.

It's also good to have solution for cases when customer reports "error", but this is just a result of lack of effort put into user training from customer. Unfortunately, it's not rare that customer prefers calling a provider again and again every month to have the same thing explained, instead of trying to learn it once and for all.

Another very important task during operational stage is further system development - MIS solution should be live and growing and reflect changing conditions within a company.

Provider should have proactive approach, not just wait for the customer to request something. If for example some system process, although originally designed so, turns out to be too complicated for a customer, the provider should propose an alternative solution. Another natural thing is offering new features, which may be useful for a particular customer.

To summarize, there are following suggestions for operational stage:

1. Well set rules for error reporting and responses (problems categorization, response times, communication forms).

2. Regular contact with a customer.

3. Proactive provider's approach, not just wait for customer to need something, but try to anticipate customer's needs.

3. Conclusion

The objective of this paper was to describe management information system (MIS) solution characteristics and define areas of significant influence of human factor within individual stages of solution life cycle. The cycle consists of four stages - *business* (tender and contract), *analytical* (detailed analysis), *implementation* (actual realization of the solution at the customer company) and *operational* (routine use after finishing implementation).

Within each of these stages, several areas (processes, activities) have been pointed out and described, with regards to significant human factor influence. Furthermore, several suggestions were made for each of these areas, to ensure easier progress of MIS solution at a customer.

In the terms of final success, detailed analysis and data requirements interpretation are key activities, with a suggestion to make analysis as detailed as possible, with no grey zones or vague formulations allowing subjective interpretations. Also, it's highly important that all parties involved understand data requirements in order to ensure seamless implementation of MIS data structure. Both these activities occur in the analytical stage, which is seen as critical for overall success of MIS implementation project.

For each of the above mentioned life cycle stages, several suggestions have been given, to help make the implementation as seamless as possible. These suggestions should be by large part applicable generally, regardless of particular solution or technology used.

Bibliography

[1] Michálek, D.: Integration of software support tools into corporate management. PhD. thesis bibliographic research, CTU Prague, Faculty of Mechanical Engineering, Dept. of Management and Economics, Prague, 2011

[2] Michálek, D.: Knowledge management at Inekon Systems. Diploma thesis. CTU Prague, Faculty of Mechanical Engineering, Dept. of Management and Economics, Prague, 2009

[3] Molnár, Z.: Efektivnost informačních systémů. Grada, Prague, 2011.
ISBN 80-7169-410-X