CEI: A Process to Improve Communication in ERP System Implementation

Jaime Miranda Junior  
Universidade Federal de Pernambuco  
jmj@cin.ufpe.br

Simone Cristiane dos Santos  
Universidade Federal de Pernambuco  
scs@cin.ufpe.br

Caroline de Medeiros  
Instituto Federal de Santa Catarina  
carol@ifsc.edu.br

Abstract

ERP systems can be defined as information systems that aim of integrating and processing data for business organizations. At the beginning of the years 2000, organizations began to invest in these systems with a view to obtaining competitive advantage in the market. The literature shows a wide range of critical factors that account for the success of the installation of ERP and the communication of low quality is regarded as one of the main factors of fails. This article sets out a communication process designated by the acronym CEI, the purpose of which is to structure communication between the leaders and participants for ERP installation systems. CEI makes use of BPM concepts and the sensemaking. Two assessments were carried out: the first assessment involved the conception and the second concerned the usability of the CEI. Both yielded positive results and included several suggestions for improving the CEI.

Keywords


Introduction

Flexibility and agility are two key features that organizations seek to achieve to remain competitive in the market (Ramkhelawah; Barry, 2010).

One of the ways that organizations have found to keep abreast of the market is the acquisition of ERP (Enterprise Resource Planning) systems. A number of organizational benefits result from their acquisition and installation, which range from the integration of internal operations to an improvement in the quality of the information.

The communication approach is widely used in environments that are undergoing organizational changes, particularly those undergoing changes originating from the installation of ERP systems. It is easy to find indications in the literature of tools that can be used as guiding instruments for the problem of organizational change such as: communication models; methodologies for changes in communication; and communication frameworks. It should be noted that all of them underline the importance of communication as a key factor in the problem of change.

However, most of the tools that were investigated only adopt an approach to communication from a theoretical and academic perspective and fail to draw attention to essentially practical concerns.

Another noticeable gap in the literature is the lack of more suitable guidance for each player and each situation involved in organizational change in what affects this type of communication.

This article seeks to address this by setting out a communication process, designated by the acronym CEI (Communication Process in ERP Implementation), which is aimed at structuring the communication between the leaders and participants for ERP installation systems. CEI makes use of BPM concepts and...
the sensemaking methodology. The main outcomes of CEI are definitions of the most suitable approaches for communication for each player involved in the process of installing the ERP. The CEI has undergone two types of assessment, the first related to the concept of the process and the second to the usability of the CEI. Both have yielded good results and include several suggestions for the improvement of the CEI.

Theoretical Framework

The ERP systems

Zwicker and Souza (2003, p.64) define ERP systems as being: "integrated information systems acquired in the form of commercial software packages that aim to support most of the operations of a company". In the course of history, the concept of ERP has evolved as a classifying term and also at levels of functionality. In the 1970s, for example, these systems were known as Material Requirement Planning (MRP) – and were used for applications in the manufacturing industry where their basic purpose could be described as production planning on the shop floor if the factory (Slack et. al. apud Jesus 2006). The expression ERP was coined in the mid-1990s by the Gartner Group, with the aim of designing systems that could not only automate production lines but also departments in organizations, as a means of integrating different sectors.

Thus ERP was defined as a software business strategy that was capable of integrating manufacturing, financial and distribution operations, by dynamically balancing and optimizing entrepreneurial resources (Gartner, 2004, p.143).

Critical Success Factors (CSF) for the implementation of ERP systems

According to Hofer and Schendel (1978, p.77 apud Stollenwerk, 2002, p.188), CSF can be defined as consisting of variables which can to a considerable extent, influence the positioning of an organization within its operational activities.

Thus if the concept of CSF is specified and transposed to the site of the ERP installation system, it can be stated that they are the essential features that must be taken into account at the time of the installation to ensure its success (Holland; Light, 1999 apud Zimath, 2007).

The CSF model designed by Holland and Light (1999 apud Zimath, 2007, p.82), highlights thirteen critical factors in ERP systems installation projects, which can be divided into two categories: strategic and tactical. Tables 1 and 2 show the CSF of each category.

<table>
<thead>
<tr>
<th>N.</th>
<th>Critical Success Factors</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Legacy systems</td>
</tr>
<tr>
<td>2</td>
<td>Business vision</td>
</tr>
<tr>
<td>3</td>
<td>ERP Installation Strategy</td>
</tr>
<tr>
<td>4</td>
<td>Senior Management Support</td>
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<tr>
<td>5</td>
<td>Project Planning and Scheduling</td>
</tr>
</tbody>
</table>

Table 1. CSF for the implementation of ERP systems – strategic category.

Source: Holland and Light (1999 apud ZIMATH 2007, p. 82).
Critical Success Factors

<table>
<thead>
<tr>
<th>N.</th>
<th>Critical Success Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Client consultation</td>
</tr>
<tr>
<td>2</td>
<td>Personnel</td>
</tr>
<tr>
<td>3</td>
<td>Business process change and software configuration</td>
</tr>
<tr>
<td>4</td>
<td>Client acceptance</td>
</tr>
<tr>
<td>5</td>
<td>Monitoring and feedback</td>
</tr>
<tr>
<td>6</td>
<td>Communication</td>
</tr>
<tr>
<td>7</td>
<td>Troubleshooting</td>
</tr>
</tbody>
</table>

Table 2. CSF for the implementation of ERP systems – tactical category.

Source: Holland e Light (1999 apud ZIMATH 2007, p. 82).

As we can see in the model developed by Holland and Light (1999 apud Zimath, 2007, p.82) the subject of communication is considered a critical success factor in the implementation of ERP systems. Thus, having a directed communication channel with an appropriate type of communication for each organizational level at the different stages of the deployment is of paramount importance for a successful deployment.

Communication

The word “communication” derives from the Latin word “comunicare”, and it originally meant the act of sharing and dividing (CHAVES, 2015).

In the view of Littlejohn (1982 apud Hohlfeldt, 2008), communication is a very abstract concept and has a large number of meanings. In the light of this, the author classified the different meanings into several categories, ranging from communication as a symbol, to communication as the ability to reduce uncertainties.

Within the various groups of concepts, what most drew the attention of the authors and what most stood out in this classification, was communication as a process of transmission. This refers to the transmission of information, ideas, feelings, and skills among other factors, by means of symbols, words, images and numbers.

With this same purpose in mind, Chaves et. al. (2014) define communication as: “a process that involves the transmission and reception of messages between a source and receivers, in which the information is encoded at the source and decoded at the destination through the use of conventional systems of signs or auditory, written, iconographic and gestural symbols, ....”

The literature dwells on the fact that the adoption of communication approaches in organizational changes is carried out in a diversified way. Several communication approaches are examined but none of them are singled out.

For example, Langer and Signe Thorup (2006) draw attention to the use of storytelling, in a case study carried out with an airline company during a period of organizational change. According to Xavier (2015, p. 3), storytelling can be defined as “one of the techniques for plotting and linking together scenes by giving them a meaning that attracts people’s attention and allows them to assimilate a central idea”.

Table 3 summarizes the communication approaches that are most widely used communication approaches in organizational change.

<table>
<thead>
<tr>
<th>Type</th>
<th>Approach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monologue</td>
<td>Messages (memorandums and emails)</td>
</tr>
<tr>
<td>Monologue</td>
<td>Speeches and presentations</td>
</tr>
<tr>
<td>Monologue</td>
<td>Publications in the web environment</td>
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<table>
<thead>
<tr>
<th>Dialogue</th>
<th>Storytelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dialogue</td>
<td>Face-to-face communication</td>
</tr>
<tr>
<td>Dialogue</td>
<td>Team for a communication of change</td>
</tr>
</tbody>
</table>

**Table 3.** Communication approaches.

Source: Holland e Light (1999 apud ZIMATH 2007, p. 82).

**Sensemaking**

The concept of sensemaking was devised in the middle of 1995, by Karl Weick, a researcher and Professor of Organizational Behavior and Psychology at the University of Michigan, in the U.S., when he supported the need for a sophisticated process of understanding the unknown as a preparatory measure for taking action (SEBRAE, 2014).

Weick (1995 apud MELO, 2013) defined seven essential features that encompass the concept of sensemaking, which are as follows:

1. Identity
2. Retrospect
3. Enactment
4. Social
5. Ongoing
6. Extracted cues
7. Plausibility

The first feature of sensemaking is related to the characteristics of people which can alter when faced with change. The second item called “retrospect”, is an analysis and interpretation of activities that have already occurred or in other words, that relate to the past. The enactive and sensible environment relies on analyzing the way people are influenced by the environment while, in turn, also influencing it. The fourth feature called social, explains the interaction between people in society, since at some period of change there is an interaction required for the process of creating meaning. Following this there is the ‘ongoing’ process, which expresses the idea that the process of acquiring knowledge must never stop – in other words it is an ongoing process. The sixth feature called “extracted cues” consists of phenomena that are presented for the creation of meaning by means of identifying signals. Finally, there is the item ‘plausibility’ which provides evidence that the accuracy of the information for the creation of meaning is not essential.

**Methodology**

The DSR (Design Science Research) method was used for the construction of CEI. The choice of this method was prompted by the fact that it was employed for the development of artifacts and because of its cyclical character or in other words, the fact that each cycle that is carried out leads to a new artifact.

Three cycles were carried out in the research, and an artifact was formed at the completion of each of them, namely:

- 1st Cycle - the formed artifact: the requirements of the approach;
- 2nd Cycle – the formed artifact: the prototype of the approach;
- 3rd Cycle - the formed artifact: the first version of the approach.

A number of stages were followed to complete each cycle of the DSR methodology. There are several divergences between the authors about the number of stages within the cycles needed for carrying out the DSR. In this study, the stages defined by Dresch, Lacerda and Antunes Júnior (2015) are used as a
benchmark. The initial idea of these authors is characterized by twelve stages, but for the purposes of this research, they are grouped into four macro-stages as follows:

- 1st Stage: identification of the problem;
- 2nd Stage: development of the artifact;
- 3rd Stage: evaluation of the artifact;
- 4th Stage: learning and adjustments.

**Communication Process in the ERP Implementation - CEI**

The CEI seeks to structure and improve communication between those involved in the installation of ERP systems in organizations. The objective is to define a set of activities and tasks that take place in a sequential pattern and that can make it possible to determine which communication approach is most suited to each of the players involved in installing the ERP. The goal is to get input that can enhance the awareness of those involved in the installation of the ERP, and allow the mapping and creation of meaning during a period of organizational change.

The CEI has three key features and is based on four assumptions. With regard to the features, these are: applicability, usability and adaptability. As for the assumptions, these can be divided into four categories:

- The institution must have acquired an ERP system for installation or at least be about to complete the process of acquiring it.
- The CEI must be administered by one or more people who are involved in the project of installing the ERP.
- The CEI approach is incremental, or in other words, the defined communication process is applied to each module of the ERP that will be installed.
- The communication process must be aligned with the ERP installation project in the organization.

The basic CEI structure comprises four activities and six tasks which are separated by the current stage of the ERP installation. The tasks take place in a sequential pattern and are geared to the timeline for the installation of the ERP. After each activity in the process has been undertaken, a mini-artifact is created, which at the end of the entire execution, gives rise to the final outcome of the process, or rather, the communication matrix. Figure 1 displays the process in the BPMN notation.

![Figure 1. CSF for the implementation of ERP systems – strategic category.](image-url)

The objective of the activity is described in each of the stages of the CEI, together with the description of tasks, recommendations for the execution, the guidelines for carrying out the task and the mini-artifact that is produced.
1st CEI activity – Preliminary analysis

The aim of the first CEI activity, which is described as the preliminary analysis, is to conduct a survey and gather together all the key features that are present in the installation of a module of the ERP system. The secondary aim is to form an alignment between the installation and the communication process.

The tasks of the first activity are closely linked to determining what methodology will be employed for the installation of the ERP, as well as identifying the players who can be found in the modules. Three tasks were selected to achieve this goal: i) getting to know the process for installing the ERP; ii) identifying the players involved in the modules; and iii) determining the degrees of responsibility of the players.

At the time when this CEI activity is applied, several challenges arise that have to be faced so as not to disappoint the expectations of its execution. There are two recommendations that can be made for this activity: i) to correctly identify the members of the committee for the installation of the ERP, ii) to carry out a detailed study of the documentary material in the module, with a view to correctly identifying all the players involved, as well as their different levels of activity.

The first step when carrying out this task, is to summon a general committee for the installation of the organization’s ERP in the study or the leading figures who are playing a prominent role in the installation of the ERP in a particular institution. Following this, the CEI objectives must be set out in a general way, and it should be pointed out that it will run in parallel with the installation project. At this same meeting, a request will be made for a set of technical and business documents that will be used in the installation, as well as detailed information about the module that will be installed, such as the model employed for the processes used in the sector. The second activity in this task is as follows: after obtaining the documentary material of the module that must be studied, the mapping of the different players will be interpreted and the areas of responsibility of everyone within the project will be defined.

The main outcome (mini-artifact) of this first activity is a knowledge of the installation process and the identification of the players involved.

2nd CEI activity – Forming a communication matrix

The matrix for identifying the most suitable communication approach will begin to be formed in the second stage of the process, called the building of the communication matrix, and will be based on an identification of the previous stages. The column of the matrix will comprise the different players involved in the module of the study, while the lines will comprise the stages required for the installation of the ERP.

Since the main aim of this activity is to construct the communication matrix, only one task is recommended: the mapping between the players and phases of the implementation process.

The communication approaches of the CEI are aligned with the players involved in the installation together with the particular phase of the installation of the ERP. Thus considerable care must be taken to ensure that the spreadsheet contains all the players and phases – by both grouping together the players in the areas close to the matrix column and encouraging the involvement of the leaders of the ERP installation to stick to the proposed communication process.

In this stage, those responsible for carrying out the communication process will start to design the matrix for the communication approach. During this period, the players identified in the previous stage are restored and attention is also paid to the different stages of installation. Setting out from these two stages, the matrix will be ready to receive the communication approach that is most suited to each player within the quadrant of the communication matrix that has been established.

The artifact produced in this stage of the CEI consists of a part of the data from the communication matrix, but without the communication approaches.
3rd CEI activity – Allocation of communication approaches

In the third CEI activity, (called the allocation of communication approaches), the communication approach most suited to each player and phase in the process, will be incorporated in each quadrant of the matrix.

Since the lines (stages of the installation) and columns (players) of the communication matrix were defined in the previous activity, at this time, the following recommendation can be made – the communication approaches should be allocated to the communication quadrants.

At this period of the execution process, the communication matrix is complete. In undertaking this, care should be taken with the source of the consultation approaches and it is necessary to make sure that it has already begun to be programmed in the final stage of the process. This gives rise to two key recommendations; i) the defined communication approaches should be adopted, and ii) a concerted effort should be made to bring everything together so that new material can be produced.

In this stage, those responsible for the communication process will complete the task of filling in the communication matrix on the basis of the level of each player in the process linked to the installation stage of the ERP. Account will be taken of the communication approaches that are selected in defining the communication process, when completing the communication quadrant, as described earlier.

The CEI establishes the communication approach that is most suitable for each player in the installation stages. With the aid of these guidelines, the ERP installation team has to form strategies to ensure that the creation of materials that will be channelled through the chosen approach, will take place in a transparent way.

Like the artifact that is produced in the third activity of the process, there must be a completed communication matrix.

4th CEI activity – Creation of materials

The final task of the communication process is called the creation of materials and is one of the most arduous stages of the CEI. This is the stage when the communication approach suggested in the communication matrix, begins to be formed, or in other words, when the strategies for putting the system into practice are determined. In this period, the predefined models in this study can be employed or one can even start the construction from scratch. This stage only involves one task – the creation of material.

The aim of this phase is to carry out a kind of communication that can be used to send messages to the players in the process and in this way, it will begin to be evident that meanings can be created for the required organizational change.

This activity has only a single task when it is geared and aligned to the construction of material – the adoption of communication approaches.

The main recommendations at the time of the application of the CEI, strictly speaking concern the preparation of material and also the time when this communication is issued. In view of this, the following recommendations should be made: i) creativity should be relied on when preparing the material; ii) a particular moment should be defined for the dispatch/application.

In this phase, the leading figures in the communication process hold a meeting and begin to divide up the work needed for the preparation of material that will be disseminated. As a part of the strategy, professionals can be invited from other areas to assist in the construction, such as communications professionals, designers, and information technology specialists.

One of the main challenges at this stage is not to lose sight of the approach that is being employed. For example if a storytelling session is being carried out, at no stage can this be undermined through the use of concepts from other communication approaches.

In the concluding period, after all the mini-artifacts have been produced in previous activities, the complete communication matrix is produced, together with the communication artifacts.
In the use of the CEI, we can exemplify the implementation of an ERP frequency registration system in an organization. After its application we have the matrix of communication generated, where all the actors and phases of this processes are mapped. Thus, in the planning stage, the type of communication to be performed for the top management of the organization is face-to-face communication.

**Evaluation**

The CEI was subjected to two kinds of assessment during this process of development. The first was undertaken from the standpoint of the concept and the second with regard to usability. The characteristics of the participants and the techniques used for collecting information are highlighted in the sections that follow.

**Evaluation of the concept**

The first level of assessment for the communication process in question, was called a concept evaluation. This was incorporated in the first cycle of the DSR methodology. Its purpose was to check the alignment of the literary concepts of the processes and compare them with those that had already been formed. The alignment was ascertained on the basis of four items which are as follows:

- Consistency: the determination of the basic concepts used for its construction – for example, activities, tasks, and process design among other factors;
- Understanding: determination of the clarity of the description of the phases and the stages of the process;
- Intuition: determination of the degree of ease in the use and handling of the process;
- Completeness: the determination of the concepts or features of a process.

**Profile of the participants**

It was necessary to select people with an advanced knowledge and experience of process to ensure the aims of the assessment could be achieved, given the fact that one of the main values of research is the principle of a process.

Thus in the analysis of possible candidates two people were invited who had a considerable academic knowledge, as well as practical skills in the process. In this research they were referred to as Participant GF 1 and Participant GF 2, to ensure their confidentiality and anonymity.

**Data collection**

The data collection technique chosen for the assessment was to employ a focus group. As described above, two specialists in processes were invited for this activity.

The focus group was divided into two stages: the first entailed the completion of a questionnaire with questions that encompassed four predefined items for evaluation (consistency, understanding, intuition and completeness). Item level 5 of the Likert Scale was used for the data analysis of the questionnaire. In the second stage, discussions were held on questions that emerged, such as other items related to the idea of the process.

**Analysis of the results**

After the answers had been analyzed, the data were compiled and obtained an Average Ranking value of 4.58, by means of the shown formula. With regard to the weighting and recorded observations, after the discussion about open-ended questions, a number of useful factors were collated including the following: 1) “Corrections made in the presentation of the BPMN process”, 2) “Noting the documentary material of the Process”, 3) “Models for the creation of communication approaches”, among others.

**Evaluation of usability**

The purpose of this evaluation was to assess the CEI from the perspective of usability and utility.
Profiles of the participants

In the selection of participants for this evaluative process, priority was given to people who are, or have been, at the forefront of the installation process. This was owing to the fact that the purpose of CEI is to make available a structured communication for the leaders of the ERP installation process.

Thus four people were selected who are at the forefront of an ERP installation process or who at some stage, have taken part in the leadership of the installation.

For the purposes of ensuring the confidentiality of the work, they were called Participant EN 1, Participant EN 2, Participant EN 3 and Participant EN 4.

Data collection

Two tools were chosen for the data collection that arose from the evaluation of usability: questionnaires and semi-structured interviews. With regard to the questionnaire used for the evaluation of usability, it was decided to employ the System Usability Scale (SUS) and the Technology Acceptance Model (TAM) for the evaluation of utility.

The questionnaires were sent to the participants selected for the evaluation of usability together with the general presentation of the CEI. After they had fully understood the purpose of the questionnaire, the participants answered the questions.

In a second phase, two participants were chosen to take part in a semi-structured interview. In this stage, further deliberations were collected that had not been anticipated by other questions in the questionnaire. The interviews were carried out on an individual basis and each lasted for about 30 minutes.

Analysis of the results

The two questionnaires yielded satisfactory results and the following values were obtained: 4.05 for the RM of usability and 4.03 for the RM of utility. With regard to the observations recorded in the interviews with the two selected participants, a number of points emerged, among which the following can be cited:

1) “It is necessary to create a suitable ambience with the CEI so that it can be applied in a more efficient way”
2) “I believe that the CEI is a kind of planning strategy which can lead to the optimization of the installation system”,
3) “I believe that the CEI will greatly assist in the installation of the module with which I have been directly involved because at this time we are using basically only two kinds of communication”.

Conclusion

The literature makes clear that communication of low quality, or that is even non-existent, in the area of ERP installation systems in organizations, can be regarded as a critical factor for the success of its installation.

In the light of these circumstances, the overall objective in conducting this research was the structuring of communication between the leaders and participants of those involved in installing an ERP system. This was carried out by means of a process based on the BPM domain and employing the sensemaking method, as a theoretical model for solving the problem of low-quality communication.

It can be claimed that this study achieved its aims because at the end of the research, it was possible to make available a practical tool that can be applied in organizations that are undergoing technological change. As well as developing a communication process, the main object of this research was to produce three other artifacts: a communication matrix, guidelines for the execution of the process and key features that must be present in the communication approach that is adopted.

In general, the CEI has proved to be a consistent process, when account is taken of the initial assessment of its concept and usability. As a result, it is possible to measure its degree of applicability in a case study carried out in organizations. Another positive factor in the process put forward, was the way types of
communication could be monitored in accordance with the phases of the installation process. When the communication matrix is analyzed, regardless of the ERP module that is installed, the following points can be observed: i) the direction of the dialogic communication in the first phases, ii) a blending of dialogic and monologic communication in the unfolding of other stages, and finally iii) a refinement stage that is a signalling for a kind of communication that only has a monologic character.

A noticeable feature in carrying out the research, was the utility of the CEI, not only for improving communication in the process of installing the ERP systems, but for other challenges found in this installation such as the non-involvement of senior management, or even the resistance of the personnel to adhering to ERP systems. However, although the outcome of this research has led to a communication process that can serve as a benchmark for organizations seeking to deploy ERP, it is still recommended that some important further steps should be followed, including a more in-depth analysis of their applicability.

References