Causes of Failure in the Implementation and Functioning of Information Systems in Organizations

José Ramón Figueroa-Flores[1], Elizabeth Acosta-Gonzaga[2], Elena Fabiola Ruiz-Ledesma[3]

Instituto Politécnico Nacional
UPIICSA, CDMX
México

Abstract—**When implementing or starting up an information system, there are usually a number of causes that can lead to its failure. Today, there are few companies that do not rely on technology to carry out their business processes. Wanting to have a competitive advantage over its competitors and the changing global business, puts pressure on the implementation of information systems implementation projects, be it an ERP (Enterprise Resource Planning), a CRM (Customer Relationship Management) or Big Data projects to manage a central repository of all internal and external data that a company can manage. Although it is an illusion for the company to start a project to implement an information system, its failure can lead to its key business processes not being carried out correctly. This article has the purpose of exposing the most common causes when implementing an information system, but also during the operation of the system, which can lead to organizational chaos and to take measures that no company wishes to take. A real case of failure is exposed during the implementation of an information system in an important Mexican company. The research team was allowed to interview general and systems area managers as well as employees. In addition, a survey was carried out among 30 people between managers and heads of department who followed closely on the implementation process of the global operations and technology system within of the company. The most influential factors were a deficient administration, a bad definition of the project and inappropriate consultancy.**

Keywords—*Information systems; outsourcing; resistance to change; organizational culture; decision making; information systems implementation failures*

I. INTRODUCTION

Market globalization and internationalization has risen the competitive pressure on business, which has driven companies to participate in projects that may be critical to their development and even for their survival [1]. These projects, such as the implementation of information technologies for information systems, have one thing in common: they are to be managed, carefully planned, staffed, organized, monitored, controlled and evaluated [2].

Information Systems (IS) are specifically designed to provide a series of benefits to the enterprises and can even become an essential factor for their success by offering a competitive advantage. However, during the implementation or functioning of a computer system, some companies find out that they are not helping them to reach their goals or that they do not have the expected performance, which drives them to make costly changes that can set the company back.

There is a series of causes or factors that can affect the implementation and functioning of an information system. From a technical view, an information system's implementation can be a success, but functionally it can be perceived as a failure. During the implementation phase, the scopes that the information system is to have are to be defined accordingly to the company's objectives; that is to say, if these are not aligned to the company's mission and vision, it is very probable that a series of problems manifest during the functioning phase, leading to failure. A computer system's success or failure in implementation depends on counting with both the adequate information technologies and collaborators, such as a suitable administration during the project's development and implantation.

The objective of this study is to expose the most common causes that affect the implementation and functioning of a computer system, reviewing what other authors say about these causes and complementing them from personal experience, so that they can finally be compared with a real case which happened within a small Mexican company which, for this paper's purposes, shall be called "TVT". The analysis will reveal whether it was the most common causes which lead to the implementation failure of a computer system in TVT, or if there are other causes that must be considered.

II. CAUSES THAT AFFECT THE IMPLEMENTATION OF AN IS

A. Incorrectly Defining the Project

Before beginning, the development or implementation phases of a computer system, the first question that a company must answer is whether it really needs it or not. At times, not knowing what they want the system for is the main cause of its failure. Many failures in a computer system have been attributed to defects in the project's requirements. For example, McKinsey's study about large-scale IT projects informed that the factors associated with causes and requirements were the most common causes for IT project failures [3]. Companies usually define short, medium and long term goals as well as a vision for their future; if the objectives and vision that are being pursued are well defined, they must adjust to the development requirements of the information system so that, at the end of the implementation phase, it will meet the company's expectations.

B. Inadequate Technology

Nowadays there are many information technologies (software, hardware, communications, etc.) that aid in the

correct implementation of an information system. Amongst all its variety, one must choose the adequate tool so that one may reach the company's goals. A bad selection of these technologies could lead to failure in a short term since the system's implementation. One of the most typical consequences of a bad choice of technology is the underestimated or overestimated complexity of the tool, which can cause several users not to use it. This situation will be addressed later in greater detail.

With the constant evolution of technology and the creation of new technological tools with new functionalities according to our changing world, some become popular and transcend, while others have short utility spans. The chosen tool must not only be good and in vanguard, but also compatible with the company's goals. A typical mistake is to think that the best tool will give us the best system, but the high prices compared to the benefits are often not justifiable.

In the latest years, Big Data technologies have gained much popularity and importance amongst companies, as they often bring multiple benefits. These technologies are part of a new generation specifically designed to extract the highest data volumes at the lowest cost. They allow for the collection of a wide array of data types, as they allow capture, discovery and/or analysis at high speed [4]. In order to keep up with the vanguard, many companies have started to implement this kind of technologies; however, more often than not they end up never exploiting their full potential. Most of these Big Data implementations can be found in companies that do not need to manage high data volumes nor do they have large sources or do not require high speed processes, and the only thing they are doing is migrating their actual intelligence processes to a new technology. Even if Big Data technologies are less costly for their distribution and support business model (compared to business intelligence, which stem from a licencing model), the implementation can be excessively expensive due to the high prices of consultancy and collaborators that are involved during this phase. This, added up with the little profit that these companies can get out of such a system, the benefits will be small and probably similar to those obtained with tools that were already giving them their desired results.

C. Inappropriate Consultancy

It is precisely an inappropriate consultancy that can lead to an incorrect choice of technology. It is very common for companies to acquire and pay for services of third companies to be in charge of the implementation of IT, often called systems consulting or IT support. These organizations often lack enough staff to take care of it and are also often reluctant to hire large quantities of employees for projects that might not be a part of their usual business processes. An IT consultancy company provides the required advice in order to increase the success probabilities in the implementation of a system and in taking advantage of its technology. Most times, however, IT consultancy services do not grasp the functional and non-functional requirements in the analysis phase, leading to them not being portrayed in the final system's general functionality. Added to this, IT consultants, taking advantage of technological fads and the little experience of some companies, are likely to offer their customers expensive systems that they do not need.

To make sure that one has selected the correct consultancy services and technologies for their implementation in an information system, several concept tests must be carried out on different IT companies and tools in order to know which ones adjust better the project's definitions. It is also ideal to conform a work team with highly qualified staff, so the management levels in the organizations must be aware of all consultants that the IT company is to enter into their project.

Oftentimes, it is also important that the IT consultancy company knows how to integrate the technologies inside the organization with swift development methodology instead of the traditional cycle. In the traditional cycle, organizations often become desperate to see tangible results, and, according to their needs, after large timespans, which can lead to frustration and the cancellation of the implementations. In the last decade, software development has been characterized by two main approaches: the development of agile software, which has the objective of achieving a greater speed and flexibility during the development process, and user-oriented design, that places the final user's needs and objectives at the core of the software development centre so to deliver software with adequate usability [5]. Even if the benefits of implementing agile methodologies and work schemes are known, it is true that a poor execution of these can be counterproductive, but that is a topic for another study.

D. Inadequate and Incomplete Training

Suring the implementation of an information system, it is important that the collaborators who will be the system's final users, be it an ERP or a CRM, are trained to operate it correctly. It is a common practice to dedicate several hours on this effort so there are no questions referring to the functioning of some task or module. Oftentimes, fearing that the collaborators might neglect key activities at the company where the system is to be implemented, their immediate bosses and management assign less time than recommended to the training, which can result in the collaborators not employing the system adequately.

It is also important to point out members of the staff that are most fit to operate the system. Training, as it is, rarely produces competent employees [6]. The collaborators must have the necessary skills to understand the system's functioning; otherwise, no amount of training they can be subjected to will make them able to fully take advantage of the system's functionalities.

E. Resistance to Change

The user's resistance to the implementation of new information systems has been identified as an important cause of failure for new systems, and this must be understood and managed. Historically, information systems implementation projects have been plagued by failures for which user resistance has been identified as the main obstacle. The user's resistance is the first challenge for the implementation of a new information system on the greater scale [7]. Among the factors that generate said resistance are fear of the unknown, of failure, of losing authority inside the company, of not being able to learn the new abilities and knowledge that are required during training, and fear of the incorporation of a new talent that might prove superior. Other causes are the lack of information

about the project and questioning of the workload that the usage of a new system might incur.

To face all these causes of resistance, there must be a multidisciplinary team within the project, and workers must be able to contribute with ideas about the processes and activities, organizing periodic follow-up meetings, and keeping a positive attitude and open communication within the team. The project's importance must be set clear along with the advantages that will be obtained with its use, such as a positive change in the company's technological evolution.

F. Uneficient Management

The change initiative within an organization so to set an information system implementation project into motion comes from high management. A good manager or systems director must have enough skills to use and maintain a specific kind of technology that will aid the company's business processes [8] The project's planning must be aligned with the company's goals for the functioning of a system, and, from there, the high management team must be able to choose the correct elements in terms of resources, time, help, and technology to carry out a successful implementation. Experienced strategic partners should be put in leadership positions so to make the right decisions according to the defined objectives, and not to personal interests. High management problems usually surface when they fail to notice that the implementation of a system equates to changes in the business. Oftentimes they are not committed to change, don´t define clear business goals and incur in unhealthy practices such as nepotism.

III. CAUSES THAT AFFECT THE FUNCTIONING OF AN IS

A. Lack of Commitment at the Management Level

In the strategic process, which includes formulation, execution and control of the strategies in the company, the characteristics of the management style can be appreciated. Managers, in most cases, imply chances in the company's organization, due to a strategy that strives towards approaching new institutions that the company needs to adapt to. While facing said changes, resistance to change is likely to arise both in the individual and organizational levels [9]. It is important to assume that resistance to change is going to be present during the functioning of an IS, but if high management does not set an example by adapting to the upcoming changes, lower-level collaborators are not likely to do it. An information system that produces reports or graphics of the company's situation must be used by high management with the confidence that the information is real, once that the project has been concluded, tested, and demonstrated to be working to perfection.

B. Lack of Performance Indicators

An indicator is a piece of data or a set of data that help measure the evolution of a management system. Indicators are means of evaluating to what extent the strategic objectives are being met. They are useful for they produce information that helps in analysing the performance and detecting deviations in the meeting of objectives. There are several kinds of indicators, such as fulfilment, evaluation, efficiency, effectiveness, and management.

The results of measured performance indicators can be used not only to enhance processes, products, manufacturing, app programming, staff, activities, etc., but also to advise decisions in company management [10]. If an IS does not count with performance indicators, it will be hard to have a it clear whether the system is meeting the objectives that were defined during the planning of the implementation project. Having performance indicators helps the company to decide if it is profitable to continue with the actual functioning of the system, or whether the strategies have to be rethought and changes are to be made to adequate to a new operation.

C. Lack of Change in Organizational Culture

Organizational culture is the set of values that the collaborators of a company share. These values persist through time and can be noted through behaviour patterns, signs, symbols, idioms and other forms of behaviour [11]. A company's organizational culture can be affected during the functioning of an IS, but for good. A culture of use of technology in these times helps to the adequate implementation of a system [12]. An organization that is used to manual processes without technology as a part of their day-to-day routine will hardly accept the integration of a new system to assist in their everyday activities, even if it will allow them to save time to dedicate to other activities that will probably generate more value. The change of cultural paradigm must be synched with the accepting of an IT system, as it helps create cohesion between the company and the system, thus tracing the right path for things to turn out in the best possible way [12].

Managers must be aware that culture at the organizational level can strongly influence the adoption of an IS, and not all aspects of the culture can be controlled in their totality; on the other hand, culture is always on the making (it cannot be spontaneously created) and it forms and reforms itself through social relationships [13].

IV. METHODOLOGY

A research was carried out directly in the Mexican company TVT, in which the research team was allowed to interview general and systems area managers as well as employees to find out their thoughts about the failure of there is. In addition, a survey was carried out among 30 people between managers and heads of department who followed closely on the implementation process of the global operations and technology system within TVT. A third company studio also provided data that helped measure the negative impact that the implementation of an IS had within TVT.

V. CASE OF STUDY

A. About the Information System that was Attempted to Implement

A technological evolution project was carried out within the Mexican company "TVT", which involved all its business operations areas from their key business processes to their support ones. The project consisted in various phases in which several modules were to be released according to an already planned strategy. These modules included the incorporation of a corporative-level CRM, the integration of all their legacy systems into a functional one, business intelligence projects

that included area reports for management and strategy, new sale interfaces in their online portal, portal services for speeding up customer service and a corporative Data Warehouse whose model had been acquired with a well-known IT company, among others. The project started on 2010 and was expected to fully conclude on 2014. However, after years of delays, the project was officially concluded on 2017, unsuccessfully. TVT invested approximately 10 million Mexican pesos throughout the implementation of the global project, from which, only 29% of the modules were released to the productive environment. In Fig. 1 the relationship per year (from 2011 to 2014, years of start and finish according to the global project plan) one can observe the modules that were released versus the ones that were supposed to be released. In all the years, the number of releases was always below planned. The project's financial losses are estimated in more than 4 million Mexican pesos.

B. Causes that Lead to Failure

When TVT noticed that it was unfeasible to continue to support a project that demanded too much money and offered little to the company's interests, it decided to cancel the project, which caused for many people to be unemployed including high command people which many employees point as the main cause of the failure. To carry out the global project, TVT hired the services of a leading consultancy company in their IT area, as well as hundreds of internal employees that usually stayed for short periods within the company.

After the failure, TVT hired the services of a leading statistics company to find the causes for their financial loss. Even if some of the modules were released and are still operative within TVT, many of which were thought to be put in production and were to be used for strategic processes within the company weren´t.

The statistics company that TVT hired to find the causes for their global project's failure identified the following causes along the interviews that it applied to TVT's employees:

- Bad planning from the systems director: Their systems director had no control over the planning of the global project, resulting in him not defining development strategies that would lead to the delivery of partial results.

- Nepotism within management positions and subdirection: The high commands recruited friends and family members that were not sufficiently qualified for their posts. The collaborators that were capable were often relegated to the background and not taken into account for the planning.

- Construction of projects or modules that depended on third-party conclusion: Consistently with the management's bad planning, many projects that depended on the conclusion of other modules were started before their previous stages had even concluded their analysis phases.

- Bad analysis of requirements: A lot of time was invested in the analysis phase of each project, but the analysts did not understand TVT's business. When the SCRUM agile framework was enabled, the time in the analysis phase was reduced, but the functional requirements were not being met. There was no follow-up to the agile framework; each team did what they understood for methodology, there was no training or involvement on the managers' part for their teams to carry it out correctly.

- Excessive salary of the systems employees: For many collaborators within TVT, the systems employees' salaries were too high and this generated envy, which resulted in the rest of the staff refusing to attend to the systems employees, thinking that if they made a higher amount of money it was because they could do the same work without business context. Here the principal cause was that there was no control over salary information, and it generated jealousy among the employees.

- Corruption in the purchasing of technology: It was rumoured, and basically of general knowledge, that de acquisition of technology in tenders and concept tests were stained with corruption that the providing companies generated towards the systems directives. It is spoken of expensive gifts and trips abroad.

At the end of the global technology and operation project, the systems director was removed from his charge and transferred to another company from the same group TVT belonged to. The subdirectors and some other managers were fired, and new collaborators were hired for their positions to try and reorganize the project's course, but none of them found a way of salvaging it. Thus, the project was terminated, and a new global strategy project that included new technology and a different focus was started in its stead.

In the 30 interviews that were carried out for this paper, the employees often mentioned that the sensation of failure and little functionality of the global project were constantly present over the years that it lasted, and that it worsened over time. Many employees within TVR did not trust the course the project was taking after the second year, and many began questioning whether their collaboration was truly useful or if it was even going to bring any benefits to TVT.
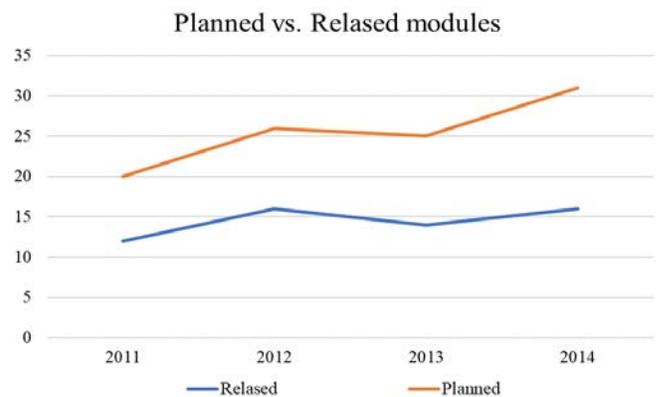

Fig. 1.   Relation between Planned Modules and Released Modules within the Productive Environment. Own Elaboration.
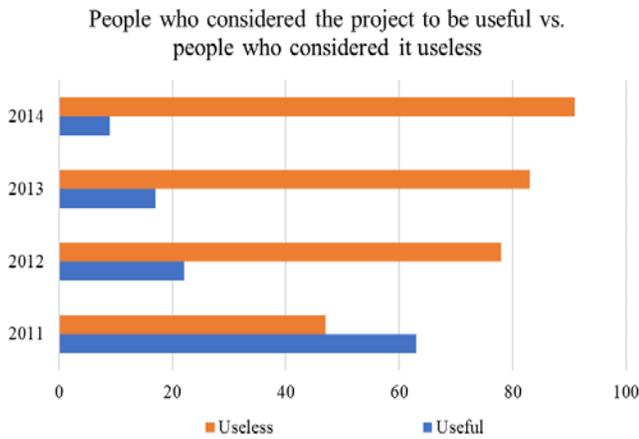
Fig. 2. Percentage of People who think the Project is useful Versus the Ones that Considered it useless. Own Elaboration.

In Fig. 2, we can appreciate that in 2011 the majority thought the global technology project to be useful to the company; by 2012, however, most people deemed it useless. Among the reasons they identified for their feeling, are that none of the modules that were supposed to be active worked correctly in a productive environment, and that there were delays in most of them, which caused discomfort to the employees who were promised the service, management and operative areas included.

As it has been said, many staff members considered that the systems employees were being overpaid for the few services they provided, and there was not an effective strategy that defined the direction in which the global project went, for modules that depended on other modules that had not yet been finished were being started. In a desperate attempt of delivering results, the SCRUM agile management framework was included with the rest of the projects, but for many it was what sunk what was left of the global project. The same interviewed people thought that there was not an accurate business focus and that the objectives were not being set clear for the conclusion of the global project.

VI. DISCUSSION

It is important to position ourselves at the moment of the IS's implementation, since, for this case of study, the functioning stage never fully arrived. Though the most common cause of failure during implementation is resistance to change [7], for TVT this factor was discarded since the employees showed that they were open to collaborating and were even eager to take part take part in the project.

An investment was made in technology training courses for all the collaborators so that they would easily adapt to the new operation modules. The average age of the employees was of 32 years, and there was a solid organizational culture that was well aligned with the technology that was to be implemented.

Here the most influential factors were a deficient administration, a bad definition of the project and inappropriate consultancy. All the causes that the statistics company found are related to these factors, with the lousy administration and management as the main causes. The beforementioned causes

are usually the most determining for failure, as mentioned by [3]. A good manager or systems area director must have enough skills to use and keep a particular kind of technology to aid in the business processes within the company [8]. In this case, however, the managers and directors usually delegated activities to people who lacked knowledge in technology and put their untrained "trusted people" in high command positions. The fact that several modules whose development depended on previous, unfinished modules were started can be due to the company not defining clear short and medium term goals; the activities were instead loosely defined and people were hired even though their services were not needed, as the projects were in standby. Contrary to Brhel's statement in their article [5], the SCRUM framework did not come to the rescue of the global project, as it was incorporated without clear knowledge and correct management of its handling and lacked a correct consultancy during its incorporation. The failure of introducing the agile framework SCRUM is due to it being carried out incorrectly, recurring to bad practices that harm the agile development's reputation.

VII. CONCLUSION

Obtaining a competitive advantage nowadays must be a key strategy for companies, which makes it worth to invest in technology to help achieve it. TVT invested (and had no qualms about it) a lot of money to get said advantage over its closest competitors, which in Mexico include a leading transnational company. The problem is not having a laid-out action plan to achieving this advantage, and the planning not being oriented towards the company's business goals, thus not having a defined strategy and planning that will lead to the desired results. The lack of a responsible management department that is aware of the goals they are to reach is most counterproductive in the implementation of an IS; even worse is not noticing the real cause of failure in time. In TVT they noticed too late, and there was nobody who could rescue a project that was condemned to fail from its management. It is important to keep metrics or indicators during both the planning and development of such a project, so that when problems surface they can be corrected and avoid major diversions from the layout. Among all the causes cited in this paper for the failure in an IS's implementation and functioning, it is probable that someone who works in the systems area has faced at least one in their career.

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