Involvement of Stakeholders in Software Processes Improvement to Reduce Change Resistance

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Abstract. Organizational software process improvement offers a key opportunity for organizations to become more efficient. However, most of time implements software process improvements initiatives in organizations become a path full of obstacles mainly because stakeholders feel it as an imposition of anybody processes and its implementation as a threat of their jobs. As a result, most of the time the effort in the implementation of software process improvement fails, stakeholders feel frustrated and organizations are more convinced than ever that they must continue doing their work as before even when they do not have the expected results in their job performance. This paper presents an overview of how can be involved stakeholder throughout the implementation of software process improvements so that they feel key elements in order to have a successful software process improvement initiative. Therefore the new processes are perceived as own and their adoption as an evolution of their job that helps them to be more efficient and to have a better job performance.

Keywords: software process improvement, knowledge management, software supporting tools, multi-model environment.

1 Introduction

Organizational process improvement offers a key opportunity for organizations to become more efficient, therefore, more competitive [1]. As consequence, software process improvement initiatives is logical way to be competitive in the software industry [2][3][4].

However, although many organizations are motivated to improve their software processes, very few know how to do so in a proper way. One of the problems of introducing software process improvement in organizations is the difficulty that an organization faces when the new processes are implemented. In this context, the resistance that stakeholders have in the adoption of the new processes is a key element, since the new processes are perceived as someone else processes. As a

result, two scenarios can arise in organizations: the resistance to the implementation of software process improvement increases and the process improvement does not have the expected results [5].

In this context, authors such as O'Connor, Basri, Janh and Nielsen [6][7] have identified the involvement of stakeholders in the implementation of software process improvement as a key aspect in order to achieve a successful software process improvement, so the implication or involvement of stakeholders as a dynamic teams in a process improvement project allows to get better results [6].

The goal of this paper is to present an overview of how the stakeholders can be involved since the beginning of the software process improvement, so the resistance to change is reduced.

This paper is structured as follows: section two introduces to methodology; section three shows the stakeholders identified for the methodology; section four shows a set of activities proposed by the methodology in order to reinforce the prevention of resistance to change; section five presents the case study analysis focused on stakeholders' involvement and finally, section six present the conclusions.

2   MIGME-RRC Methodology

MIGME-RRC is a methodology for a gradual and continuous software process improvement focusing on minimizing change resistance called MIGME-RRC (by its Spanish acronym) [8].

This research work mentions MIGME-RRC methodology because this methodology allows to implement software process improvements with a completely involvement of stakeholders since the first improvement phases.

MIGME-RRC is a methodology that has been developed taking knowledge from different areas such as knowledge management; change management and multi-model environment, as follows:

Knowledge management: systematic approach that allows the capture, codify, use and operation of knowledge and experiences to develop better tools, methods and the ability to use them [9].

Change management: process of planning, organizing, coordinating and controlling internal and external components in order to ensure that process changes are implemented with the minimum deviation compared to approved plans and overall changes introduction goals [10].

Multi-model environment: involves all cultural aspects and the knowledge that advises the use in each process a mix of best practices from more than one model or standard to achieve the organization's business goals [11].

Besides, the methodology highlights three concepts throughout all its phases: best practices, business goals and business indicators. These concepts allow to focus the improvement depending on the organization needs.

MIGME-RRC methodology is formed of fourth phases, the phases and their activities are showed in Figure 1.
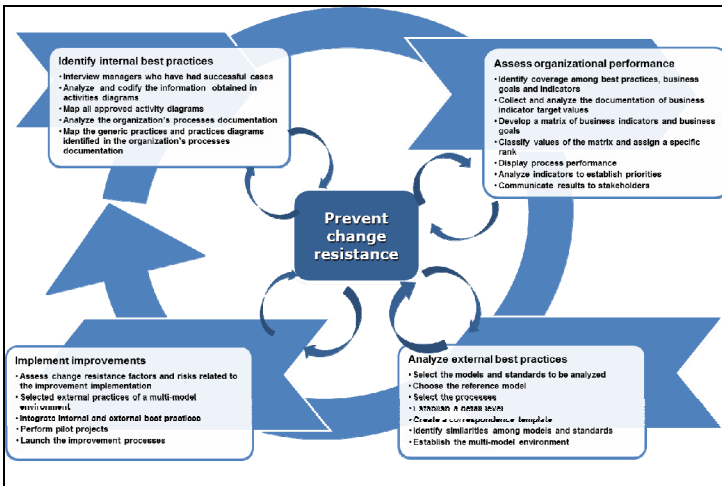
Fig. 1. MIGME-RRC methodology phases

As Figure 1 shows, MIGME-RRC proposes a different way to implement a software process improvement in an organization as follows: first it analyses how the organization works by identifying its best practices; after, it establishes the performance of its best practices, comparing the business indicators achievement with the identified best practices; then, it analyzes the best practices of different standards and models and selects those practices that best fit the way the organization works, and finally, depending on the internal and external best practices dependences and their impact on achieving the business indicators, new processes and their implementation sequence are defined. Besides, all its phases are focus on preventing resistance to change.

In order to apply the knowledge from change management and knowledge management throughout performing MIGME-RRC a set of activities has been defined as follows:

1. *Change management activities*

-   *Identify internal best practices*: (1) stakeholders' involvement; (2) observe behavior, describe and classify behavior and identify risk focusing on middle management and process users; (3) understand organizational work culture; and (4) establish communication channels.

-   *Asses the organizational performance*: (1) communicate the results of process performance; (2) highlight the need to implement a process improvement to achieve the established business goals; and (3) observe behavior, describe and classify behavior and identify risk, focusing on senior management.

- *Analyze external best practices*: (1) select just those models and standards accorded to the organizational work culture; and (2) select the external practices to be candidate to the new processes accorded to the organizational work culture.

- *Implement process improvements*: (1) analyze change resistance factors and risk associated with process implementation and establish actions to prevent them; (2) analyze the difficulty level of adoption of external best practices; (3) select pilots projects, focusing on early adopters; (4) make the material of process presentation based on the target staff (level of interest in change and influence); (5) let the new processes to be available for all stakeholders; (6) establish adequate communication channels as follows: top-down (allow to transmit all relevant information to senior manager from middle management and process users); bottom-up (allow to collect feedback and experience using the new processes) and lateral (allows to reinforce commitment to achieve the work); and (7) allow the organization to adapt the new process at a pace of change supported by them.

2. *Knowledge management activities*

- *Identify internal best practices*: (1) extract knowledge; (2) understand and select knowledge; and (3) characterize and structure knowledge.

- *Asses the organizational performance*: (1) Analyze, understand and select information related to process performance as a historical data; and (2) structure and store information selected as historical data in order to have process assets.

- *Analyze external best practices*: (1) Analyze, select and structure external knowledge through analyzing external best practices and (2) structure the new knowledge, so that, it could be easily adopted within the organization.

- *Implement process improvements*: (1) analyze the impact of external best practices toward the achievement of the business goals; (2) analyze the internal best practices and external best practices dependences; (3) define the new processes taking into account external best practices and internal best practices; (4) structured the new processes based on the organization's needs; and (5) collect feedback of new processes and the experiences of their use and store them as process assets.

3   Stakeholders' Involvement

A feature of MIGME-RRC methodology is the involvement of stakeholders through all phases as dynamic teams to get better results.

To understand MIGME-RRC stakeholders' involvement, it is important to focus on the main set of stakeholders identified for MIGME-RRC. This section lists the main

set of stakeholders that have an important participation throughout MIGME-RRC phases.

- *Senior management*: staff that has the power to take strategic decisions refers to business goals. In this set staff such as account managers, senior managers, improvement facilitator and partners are included.

- *Middle management*: staff that has the power to take operational decisions toward achieving the business goals. In this set staff such as project managers, quality managers or quality management group; and process improvement managers or process improvement group are included.

- *Process users*: staff whose work is directly related to the use of software processes to do their work. Or staff whose job is not directly related to the use of the software process but they need information or product produced as output of software process performance. In this set staff such as team leader, team engineers (planning, quality, process, development and support) are included. Besides, depending on the type of process, the methodology allows to involve in an interactive way stakeholders who are interested in participating, providing important information of how the organization works.

Next, a briefly description of how MIGME-RRC involves the stakeholders is included:

3. *Identify internal best practices*: middle management staff and process users have an important role because they are the source of the organization's tacit knowledge. Therefore, they are the only ones who should validate it. It is important to highlight that in this first phase of the methodology the validations of best practices are considered a key activity in order to formalize the organization's knowledge because organizational knowledge is formalized in processes, using its best practices as a base. Besides, at the end of this phase the "documentation findings" are showed to senior management staff in order to be aware of the real organizational software process and the actual gaps in process documentation so they can appreciate a first methodology work product that helps to increase their trust and confidence in the methodology.

4. *Assess the organizational performance*: senior management staff have an important role in this phase for three main reason: first, they establish the business goals and set target values to them; second, they have access to the internal sensitive data such as projects performance audits data; and third, they are able to take a decision about what criteria must be established in order to prioritize the business goals to be achieved. Besides, because this phase ends with communicating the process performance results and where to address the improvement effort, middle management staff and process users are involved in order to increase the need to implement a software process improvement as a strategy toward achieving the business goals identified.

5. *Analyze external best practices*: middle management staff and process users have an important role in this phase because they are the sources toward selecting models and standards to be analyzed. These models and standards are selected depending on the analysis of the practices they perform and they mention by them in the interviews. Besides, senior management staff provides a list of those models and standards in which they are interested.

6. *Implement process improvements*: senior management staff has an important role in this phase because they take decisions on the analysis and priority of the change resistance factor and risks associated with the process improvement implementation and the activities to be implemented in order to prevent them. So, middle management staff has an important role selecting those pilot projects which should use the new processes and giving feedback that is very important to the success in the launching of the new processes and the success histories using them. Finally, at the end of this phase, the process users' staff has an important involvement in launching the improve processes because they have to use these processes and give their opinion of their experience with using them.

4   Reinforcing the Prevention of Resistance to Change

To reinforce the prevention of resistance to change that can arise from stakeholders, MIGME-RRC methodology includes activities focused on preventing resistance to change. Table 1 shows a summary of the activities defined as a part of MIGME-RRC focused on preventing the resistance to change.

All activities should be performed together with the stakeholders, so the resistance to change can be prevented or minimized.

5   Case Study Results

This section presents an analysis of implementing MIGME-RRC methodology focusing on stakeholders' involvement. Then, this section shows the type of stakeholders that have used either the methodology or the new processes gotten by implementing the methodology, their expertise area, and how they accept and perceive the new processes.

The case study was performed at everis. everis is a multinational consulting firm with factories in Europe and Latin America Region. It offers services which provide solutions to large companies in any sector and it is based on three pillars: innovation, methodologies and efficiency. Since its creation in 1996, it has grown both in revenue and staff in a steady and organic way. Turnover in 2009 where the case study was carried out, everis was over 404M€ and the company employs more than 7,000 people. They have over 1,000 projects opened every month.

Table 1. Activities focused on preventing change resistance

Phase	Activities focused on preventing change resistance
Identify internal best practices	1. Present the software process improvement initiative to stakeholders. 2. Involve stakeholders in the extraction and validation of tacit knowledge. 3. Establish a communication plan. 4. Understand the organizational work culture. 5. Perform three activities: observe behaviour, describe and classify behaviour and identify related risk focusing on senior management.
Assess the organizational performance	1. Show the process performance with the actual internal best practices. 2. Highlight the need to improve the processes to achieve the established business goals. 3. Perform three activities: observe behaviour, describe and classify behaviour and identify related risk focusing on senior management
Analyze external best practices	1. Select the models and standards taking into account the business goals and the organizational work culture. 2. Establish a multi-model environment as a reference model.
Implement process improvements	1. Analyze change resistance factors and risk factors. 2. Select external best practices depending on: impact and adoption difficulty. 3. Select early adopters' staff for pilot project. 4. Establish efficient communication channels (top-down, bottom-up and lateral). 5. Perform continuous support: before, during and after the processes implementation. 6. Prepare the material for processes training taking into account the stakeholders identified, their influence in the change and the proper way to address them.

It is important to mention that before the MIGME-RRC methodology was implemented, it should be validated by the delivery management group of everis. Then, meetings with the delivery management group were performed. The meetings were focus on presenting all methodology content as well as the training material. Performing these meetings allowed to get feedback that was used for improving both methodology activities and the training material.

5.1   Implementation

Everis need to develop a project management method as a part of its Corporate Methods methodology (COM), therefore, the new improved processes were grouped

as the projects management method they needed. The method obtained was validated and approved by everis' quality and methodology group.

After, as proposed in the last phase of MIGME-RRC methodology, pilot projects were performed. Besides, in order to have better results and reduce risk of performing the new project management method pilots with specific features were selected.

The features of pilot projects were as follows: 1) medium sized projects (no longer than 3 months); 2) a staff of 4-7 people working in the project; 3) budget around €100,000-15,000; and 4) project manager junior profile leader.

After the pilots results were analysed and the COM project management method refined, the new COM project management method was launched through everis' intranet. everis intranet allows the improvement process to be available for everis project managers.

5.2   Stakeholders Type

The scope of the experimentation was focused in everis' project management processes because it has a broad impact on the organization business goals. Therefore, this section shows an analysis of the kind of managers included in this case study.

a) *Managers by office*: as mentioned before everis has factories in both Europe and Latin America Region. Then, managers from both regions have used the project management processes. The distribution of the offices in both regions help to ensure that applying the methodology was possible to implement new processes that reflect the way everis works. Figure 2 shows the number of managers for offices.

As Figure 2 shows, most of the managers who used the new processes where from Spain (Madrid, Barcelona, Murcia, Sevilla) (72%), because the main everis' offices are in this country; around 7% where from countries such as Italy and Portugal group as Rest of Europe; and around 21% of managers where from countries such as Peru, Chile, Argentina and México group as Latin America.
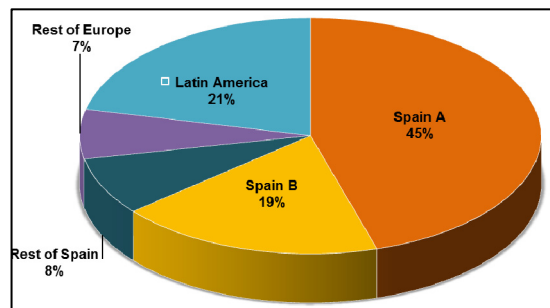

Fig. 2. Managers by office's region

b) *Managers' expertise area*: we consider an important data to have identified what kind of managers has used the new processes, this helps to ensure that the new processes are used by managers no mather their expertise area or level. Figure 3 shows managers by expertise.

As Figure 3 shows, most of the managers who have used the new processes (72%) are from Solutions area that offers to generate complex and complete solutions to meet customers' needs based on experience, best practices and other projects; 11% of managers are from Business area that comprises highly-specialized areas of business strategy; 10% of managers are from Outsourcing area that offers the best solutions thus assuring a high added value to achieve both the alignment and evolution of our clients' information systems; the rest of managers are from the follow areas: 4% are managers form Structure, 1% are managers from BPO, 1% are managers from everis initiative and 1% are managers from everis center.
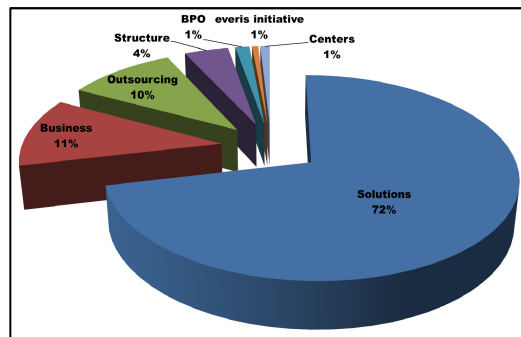

Fig. 3. Managers by expertise

5.3   Analysis of Results

To understand how stakeholders accept and perceive the new processes, this section is focused on the project management method acceptance analyses. Then, the analyses were focused on project management carried out by managers using COM project management method and how they evaluated the COM method after using to manage their projects.

These analyses are focused on process use and process usefulness to know how well or not users accept the new processes. On the one hand, analysis was done by analysing surveys carried out by managers involved in and used the method to manage their processes. The collected data were from 2009-2010 (FY'09) period. Next, each analysis is showed.

a) *Processes use*: as Figure 4 shows, 48% of project managers uses COM project management method to manage their projects; Around 21% of the managers do not use the COM project management method because the must use the methodology of the customer. About 23% of managers use their experience in order to manage their projects and finally around 8% do not perform any kind

of management in order to manage their projects. Therefore, we can say that the new processes contained in the COM project management method have a good acceptation by managers.
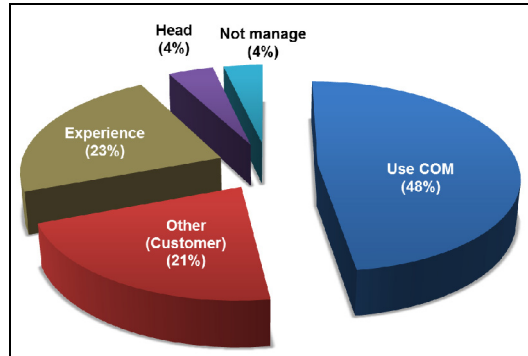
Fig. 4. Use of COM by managers

b) *Processes usefulness*: as Figure 5 shows 62% of managers how has used COM project management method to manage its projects perceive the method as usefulness; 16% of managers perceive the method as immature; 12% of managers perceived the method as unprofitable effort; 6% of managers do not know the method; 3% of managers has another reason to not use the method and finally 1% managers perceived that the method do not apply to their projects. After analyzing the percentage of managers who perceived the method as usefulness we can say that the new COM method, which contains the new project management processes, has been perceived as usefulness by managers who have used it to manage their projects.
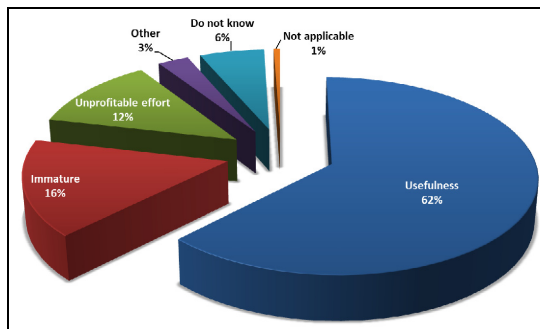
Fig. 5. Perception of COM project management method by managers

6   Conclusions

Organizations need to create strategic advantages with respect to its competitors in order to be competitive and software process improvement is one of the most widely used strategies to achieve this. However, not all software improvement implementations have the expected results. This research work highlights the involvement of stakeholders in order to implement successful software process improvements. The use of MIGME-RRC methodology allows to involve stakeholder all time throughout the implementation of the software process improvement. As a result, stakeholders have a better acceptation of new processes because they perceived them as their own processes. Besides, they feel as an important element of the process improvement, therefore, they become improvement promoters because they believe in the new process and are convinced of using them in order to be more efficient and to achieve the organizational business goals. As results obtained shows, the new processes had a good acceptation reflected by the number of managers who use them to manage their projects. Then, we can say that the resistance to change of adopting the new processes has been minimized. Finally, it is important to mention that actually COM method is having an evolution according to the actual business goals needs. Besides, we are making an evolution of MIGME-RRC methodology, so it can be easily applied in SMEs and other domains.

References

1. Soto-Acosta, P., Martínez-Conesa, I., Colomo-Palacios, R.: An empirical analysis of the relationship between IT training sources and IT value. Information Systems Management 27(3), 274–283 (2010)
2. Gupta, J.N., Sharma, S.K., Hsu, J.: An Overview of Knowledge Management. In: Jennex, M. (ed.) Knowledge Management: Concepts, Methodologies, Tools, and Applications, pp. 1–22. Information Science Reference, Hershey (2008), doi:10.4018/978-1-59904-933-5.ch001
3. Molina, J.L., Marsal, M.: Herramientas de gestión del conocimiento; Gestión del cambio. In: La gestión del conocimiento en las organizaciones, pp. 60–68, 87–94, Colección de Negocios, Empresa y Economía. Libros en red (2002)
4. Turban, E., Aronson, J.E., Liang, T.-P.: Knowledge management. In: Decision Support Systems and Intelligent Systems, pp. 1–23. Perentice Hall, Uppers Saddle River (2005)
5. CMMI working group, The Economics of CMMI®, NDIA System Engineering Division, Software Engineering Institute, 1, 9-21 (2009), http://www.sei.cmu.edu/library/assets/Economics%20of%20CMMI.pdf
6. O'Connor, R., Basri, S.: The Effect of Team Dynamics on Software Development Process Improvement. International Journal of Human Capital and Information Technology Professionals 3(3), 13–26 (2012)

7. Jahn, K., Nielsen, P.A.: A Vertical Approach to Knowledge Management: Codification and Personalization in Software Processes. International Journal of Human Capital and Information Technology Professionals 2(2), 26–36 (2011)
8. Calvo-Manzano, J.A., Cuevas, G., Gómez, G., Mejia, J., Muñoz, M., San Feliu, T.: Methodology for process improvement through basic components and focusing on the resistance to change. Journal of Software Evolution and Process 24(5), 511–523 (2012)
9. Williams, T.: How do organizations learn lessons from Projects—And do they? IEEE Transactions on Engineering Management 55(2), 248–266 (2008)
10. Burke, G.D., Howard, W.H.: Knowledge management and process improvement: a union of two disciplines. CrossTalk, The journal of Defense Software Engineering 18(6), 28 (2005)
11. Muñoz, M., Mejia, J., Calvo-Manzano, J.A., San Feliu, T., Alor, G.: Advantages of using a multi-model environment in software process improvement. In: 2011 IEEE The Electronics, Robotics and Automotive Mechanics Conference (CERMA), Cuernavaca, Morelos, pp. 397–402 (2011), doi:10.1109/CERMA.2011.85