Wide Evaluation Processes

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Abstract: The evaluation process in software quality is very important because it helps to identify strengths, weakness and to provide information that can help to improve the developer's efforts on application development. In this paper, we describe the functionalities of the web system EVAP COMPETISOFT (Wide processes evaluation based on COMPETISOFT project) that implements the evaluation methodology described on COMPETISOFT project and we introduce some results of applying it in some development enterprises.

Keywords: Quality evaluation, software quality, COMPETISOFT, SMEs.

1   Introduction

To get quality, is required the use of methodologies and standardized process for the analysis, design, development and software testing obtaining like this an uniform way to work guaranteeing more credibility and maintainability on our software and getting at the same time more productivity, not only at the development process also in the software's quality control.
Is important to know that adopting good practices in quality helps to get software quality but it does not guarantee it. Therefore, besides knowing the quality criteria is important to evaluate the fulfillment of them.
The evaluation process in software quality is very important because it helps to identify strengths, weakness and to provide information that can help to improve the developer's efforts on application development.

2   COMPETISOFT Project

COMPETISOFT is the result of different Ibero-American investigation groups. It was funded by CYTED (Ibero-american project of science and technology for development) and it has as main objective increase the competitive level of all ibero-american software developer SME (Small and Medium Enterprises) through its methodological framework that could turn into a base to get evaluation and certification process in software industry recognized in all Ibero-American[1].
This project also offers to the software industry a model based on the best international practices. The main characteristics that it has is the facility to understand it, its facility to apply it, that is not expensive on its adoption and maybe the most

important is that it a base to get a successful evaluation with other models like ISO 9000:2000 o CMM®1 V1.1.

2.1 Processes Model

The COMPETISOFT Processes Model is the one defined by MoProSoft[1].It counts with three process categories: High Direction, Management and Operation. These categories with their respective processes reflect an organization structure. The figure 1 represents the different categories with their processes and sub-processes:
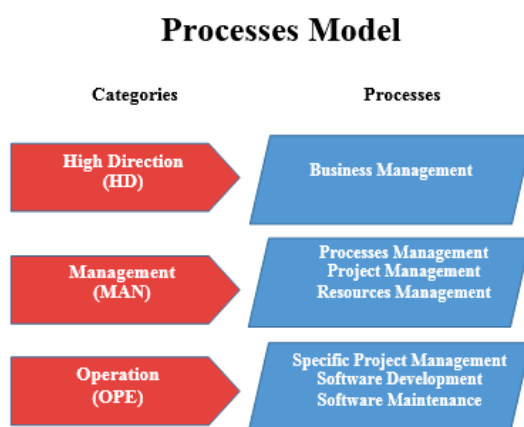

Fig. 1 Processes Model

2.2 Processes Evaluation Methodology

The main objective that tries to obtain the processes evaluation methodology (EvalProSoft)[2] in software industry is to deliver to the applicant organization the profile of the level capacity on the different implanted process and a level of maturity on the capacity of the organization.
The capacity level got from the evaluation result it could be a number in a scale zero to five. The zero level is the lowest capacity level the process can obtain and it means that the process does not fulfill with the process purpose. The fifth is associated with the highest capacity level and it means that the actual and projected business objectives are fulfilling through the optimization and the continued improvement.
On table 1 are described the different capacity levels.

Table 1: Capacity level description

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[1] Página oficial del modelo. http://www.moprosoft.com.mx/
[2] Método de Evaluación de procesos para la industria de software (EvalProSoft) - Versión 1.1 -Marzo 2004
http://materias.utags.edu.mx/claroline/backends/download.php?url=L0FydGljdWxvcy9FdmFsUHJvU29mdHYxMS5wZGY%3D&cidReset=true&cidReq=CALS_IVET

Level	Description
Incomplete	The process was not implanted or it fails to reach the process purpose.
Completed	The process reaches its purpose.
Administered	The process "Completed" was implanted in an organized way and their work products are properly established, controlled and maintained.
Established	The process "Administered" was implanted through a defined process that is capable to obtain the process results.
Predictable	The process "Established" works inside the limits to obtain the results.
Optimized	The process "Predictable" is improvement continuingly to reach the actual business goals and the future relevant ones.

To determine the level of compliance it is used an ordinal scale which ranges are described on table 2.

Table 2: Compliance scale process attribute

Result	Description	Value range scope
N	Not Reached	Between 0 and 15%
P	Partially Reached	> 15 % until 50 %
W	Wide Reached	> 50 % until 85 %
C	Completely Reached	> 85 % until 100 %

Once that the evaluation method finish it obtains a report with the results that are send to the applicant organization. On it, is documented the profile of the capacity level on the different process, the maturity level of the capacity and a resume of the findings detected. On the statistics report is also provided general information about the evaluated organization, the results of the evaluation and also the learned lessons about the evaluation methodology.

2.3 Improvement Processes

PMCOMPETISOFT (COMPETISOFT Improvement Processes) based on Agile SPI[3], is an agile improvement process that can be used as a guide on the improvement process program of small and mediums enterprises. The main objective of this process is to give a guide on the improvement software process to improve some of the following aspects: productivity increase, quality improvement, adequacy to software process standards, improvement on the customer satisfaction and improvement on the process perception inside the organization.

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[3]Mejora de Procesos de Software Ágil con Agile – Spi Process.
   http://dyna.unalmed.edu.co/ediciones/164/articulos/a25v77n164/a25v77n164.pdf

PMCOMPETISOFT is composed for five macro-activities: Installation, Diagnostic, Formulation, Improvement and Program Revision.

3   EVAP Competisoft

AECP (Application to capability evaluation process)[2] is a tool to make self-evaluation through the Evaluation Process Model proposes on COMPETISOFT project. The application was developed to implement the two first steps of the improvement process model that proposes COMPETISOFT: Program Installation and Diagnostic, leaving the other three (Formulation, Improvement and Revision) in charge of the organization through the app diagnostic.

But AECP counts with some failures as the following:

- It is not possible to evaluate the processes from all the categories presents on the Processes Model because only implements the self-evaluation for "Operation" category.
- It does not count with an historical of previous evaluations. The detailed result is available to see it once finished the evaluation, after that is not possible to do it.
- Questions are not flexible in the possible answers. It only accepts "YES/NO" answer but it does not accept a range of acceptance as answer.
- The security scheme to handle the passwords does not count with web security aspects.

EVAP (Wide Process Evaluation), which takes as bases the web system AECP, fixed the failures mentioned before and some others to make it the most complete and efficient as possible.

- The app was modified to allow evaluate the processes from the other two categories that present COMPETISOFT project: "High Direction" and "Management".
- The original database was modified to allow the different organization to answer the processes they want to evaluate. In other words, the new version allows evaluating all the processes but in case that the organization doesn't want to evaluate some of them now it is possible.
- But the most important modification made to the application was to adapt the questionnaire to allow a range of acceptation on the answers.

Originally the app was designed to accept "YES/NO" answers making the evaluation results processes faster once that the self-evaluation was finish. But, considering questions as the following: "*Are activities planned taking into account the resources available?*" we determine that everyone plans, good or bad, with sheets or mentally but everything is plan someway which in most of the cases the answer will be "YES".

Now, taking as objective reach a better approximation to reality it was analyzed the questionnaire of the different processes and they were adapted to accept a range of acceptation.

As example we show the adaptation of the previous question: "*In which way the activities are planned respecting the resources available?*".

In this way questions that before just accepted "YES/NO" as answer now can accept range of acceptation.

To make it more practical and not to make the self-evaluation a tedious task it was defined the range of acceptation in four groups:

Table 3: Range of acceptation in answers

Percent	Description
1-25%	[Really Little]
26-50%	[Little]
51-75%	[Almost Everything]
76-100%	[Everything]

Furthermore, was made a categorization of the evaluation process questions, so in the final report that presents the evaluation results, the good quality practices that the enterprise doesn't fulfills on the different process can be grouped by category, getting on this way a better visualization of those aspects to improve to get better results in future evaluations.

4   Results

EVAP COMPETISOFT was applied on some software development organizations from different areas, from public organizations until private companies. Before they answer the new questionnaire there was a previous conversation about the objectives of their help and explain them about the COMPETISOFT project and the benefits that it can generates in quality subject on small and medium enterprises.

The idea of applying the app on real software development organization was to show that COMPETISOFT is not just a theoretical model, is a useful framework that can help to improve quality practices. Another objective was discover which of the good practices that the questionnaire presents are more difficult to satisfy considering the reality of the small and medium enterprises. Furthermore, to get an overview about the reality of this type of organization respect of quality practices.

EVAP Competisoft's validation was made on 10(ten) enterprises and development groups, among them: 1(one) big enterprises, 2(two) médium enterprises, 5(five) SMEs and 2(two) public organizations.

4.1 Processes evaluated

It was given a new profile to each organization in the application to evaluate the different categories processes that make up the COMPETISOFT process model leaving to them to choose the process to evaluate.

The results of the different evaluated processes by each organization are described below:

Table 4: Processes Evaluated

Category	Process	Level						Total
		0	**1**	**2**	**3**	**4**	**5**	
Management	Processes Management	3	4	-	-	-	-	**7**
	Resources Management	3	1	1	-	-	-	**5**
	Human Resources Management	1	1	-	-	1	-	**3**
	Goods, Services and Infrastructure Management	2	-	1	-	-	-	**3**
Operation	Specific Project Management	-	2	1	-	-	-	**3**
	Software Development and Software Maintenance	2	5	1	-	-	-	**8**
Total		**11**	**13**	**4**	**-**	**1**	**-**	**29**

As we can see from all the processes evaluated:
- 11 of them are on level 0 or Incomplete → represents the 38% of the total.
- 13 of them are on level 1 or level Completed → represents the 45% of the total.
- 4 of them are on level 2 or level Administrated → represents the 14% of the total.
- 1 of the are on level 4 or level Predictable → represents the 3% of the total.

The following table shows the results of the different evaluated processes grouped in the other by category, process and level compliance.

Table 5: Level compliance of the evaluated processes

Level	Level Compliance	Management	Operation	Total

		PM	RM	HRM	GSIM	SPM	SD-SM	
1	Between 0 and 15%	-	1	-	2	-	1	**4**
	> 15 % up to 50 %	3	2	1	-	-	1	**7**
	> 50 % up to 85 %	4	1	1	-	2	5	**13**
	> 85 up to 100 %	-	1	1	-	2	1	**5**
2	Between 0 and 15%	-	-	-	1	-	-	**1**
	> 15 % up to 50 %	2	4	2	1	1	1	**11**
	> 50 % up to 85 %	5	1	-	-	3	7	**16**
	> 85 up to 100 %	-	-	1	-	-	-	**1**
3	Between 0 and 15%	-	1	-	2	-	-	**3**
	> 15 % up to 50 %	2	3	1	-	1	5	**12**
	> 50 % up to 85 %	5	1	1	-	1	2	**10**
	> 85 up to 100 %	-	-	1	-	2	1	**4**
4	Between 0 and 15%	2	-	2	1	-	5	**10**
	> 15 % up to 50 %	-	4	-	1	1	-	**6**
	> 50 % up to 85 %	-	-	-	-	2	-	**2**
	> 85 up to 100 %	5	1	1	-	1	3	**11**

4.3 Quality practices not implemented

With the result of the evaluations carried out, it was possible to identify those best practices proposed by COMPETISOFT that are more difficult to meet by small and medium-sized companies.

The table below summarizing the results founded.

Table 6: Summary of categories of quality practices not implemented by process

Type of Question	Management				Operation		Total
	PM	**RM**	**HRM**	**GSIM**	**SPM**	**SD-SM**	
Knowledge Base	-	-	-	-	1	-	**1**
Automation	-	4	-	1	9	-	**14**
Documentation	11	12	11	6	99	-	**139**
Control	1	-	2	-	-	7	**10**
Definitions	8	10	11	1	47	17	**94**
Reviews	2	-	2	5	-	-	**9**
Validations	-	-	2	2	-	-	**4**
Management	2	-	-	-	-	-	**2**
Capacitation	3	16	7	23	2	20	**71**
Total							**344**

As can be seen in the table above, the weakest aspects of the evaluated processes are mainly lack of documentation, lack of definitions and lack of training.

Below the details in percentages:

- Knowledge Base → 0.29%
- Automation → 4.06%
- Documentation → 40.40%
- Control → 2.90%
- Definitions → 27.35%
- Evaluations → 2.61%
- Validations → 1.16%
- Management → 0.58%
- Training → 20.63%

4.4 Comments about the evaluations.

After the evaluations each organization gave their opinion about the quality practices proposed by COMPETISOFT and if they believe that are hard to apply them considering the reality of small and medium enterprises. Next are detailed those comments:

Company 1:

- "It wasn't difficult to understand the questions, I believe that to all the people what work on this area should know what they mean".

- "The implementation of the quality practices will depend on what kind of organization you are working with, what I mean with this, in public administration is very difficult because unfortunately is leaded by politic and they are changing permanently, they change from one day to another. I see it easier in private organizations with enough people in the required areas because it would be an overwork on one person and in the end things would be made in hurry and in a wrong way."
- "There must be a lot of emphasis on it because time is a factor that always goes against the organizations and with our economy it would take more time to develop a system and what the price of the system today won't be the same in two months. This also means that a lot of steps that we have to do are not made, of course this is more easy for a big company, where all these steps are established. "

Company 2:

- "The questions weren't difficult to understand and to answered them."
- "Actually I'm working in a small area and almost new so most of the practices we don't apply it."
- "I think it wouldn't be difficult to apply the practices that the application mention, even more, it would be really useful if we could do it"

Company 4:

- "The organization where I'm working it doesn't work that much in quality aspects, is quite little or nothing at all."
- "I think it would be great and that we have to implement them here, but it would demand too much work and time, but it would be good to implement them because it would fix lot of problems that we have now."
- "I think for a big company it would be easier to implement these practices that in a small one like this."

Company 5:
- "I consider the questions excellent although I do not think they are feasible to be fully implemented in small companies. I also consider that the demands will come from the companies that implement it. "
- "I also found that the question form was very long, it had too many questions."
- "As I mentioned earlier, the questions are well written, but some I had to read twice to know what they were referring to, I think a context should be put in place to make them understand them better."

Company 6:
- "In my case it is not feasible because we are still very young."
- "I think in the case of large software companies this type of practices is easier to implement."
- "The questions are understood and clear. They ignore ambiguities when it comes to answering. "
- "It is almost impossible for a SME to adopt as well as the proposed questions. I think we should lower the requirements for this type of company. "

Company 9:

- "The questions are easy to understand but I think you should use a language more accessible and not so technical."
- "I think the practices mentioned are very idealistic about the reality of a software SME, but being able to implement them would help considerably in the performance of companies."

5 Conclusions and Future Guidelines

Evaluations carried out by software development companies have highlighted the lack of some aspects that companies should make and place more emphasis, such as documentation, definitions and training.

The lack of attention in these aspects was reflected in the high percentage of processes that obtained low levels of capacities, 83% of the processes evaluated are at level zero or level one.

At the same time it was observed that companies are aware of the lack of quality practices and the main reason is due to the lack of time and staff to be able to adjust this reality.

It was also observed that the incorporated modifications helped not only to have questions that are closer to the reality of the evaluated processes, but also to determine the causes or factors that influenced the result through the categorization of the questions of the questionnaire.

As future guidelines for the tool it is proposed:

1. Within the profile of the administrator add the management of questions, activities, items, processes and categories introduced by COMPETISOFT.

2. Within the manager's profile add the generation of statistical reports based on the results of the evaluations.

3. Within the profile of the user modify that a same user can be the owner of more than one company and answer questionnaires of any of the registered companies.

4. Within the profile of the user modify so that the questionnaire is not restricted to answer everything at one time. It is not currently possible to continue the questionnaire on another day than the day the questionnaire was started. That way you will gain flexibility with the users' time, especially in long questionnaires such as the Specific Project Management.

5. Within the profile of the user modify so that the report with the results of the evaluation contains recommendations based on the missing practices. Currently the report generated after the evaluation of the process contains a sector dedicated to the shortcomings found that are those practices that the company responded that do not comply. It is proposed to modify the sector of failure of the report so that it not only shows the practices not performed but also recommendations on how to improve these missing aspects.

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