Prioritisation and selection of the right business and IT requirements in the software engineering process

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Abstract: The overall prioritisation and selection of the right business and IT change requirements are an important area in the software engineering process as this is a critical factor that can ultimately impact the success of the business. In most cases the overall prioritization of business and IT change requests and the steps involved in the decision making process are not transparent enough for all stakeholders. Therefore it is essential that the business change request management process is visible and understandable in order to make the right decisions which are acceptable for all stakeholders. For this reason the prioritization and selection process should be built in an effective and efficient way by using quantitative tools, for example, by following Six Sigma methodology. This article will explain how we manage the prioritization and decision making process.

1 Introduction

One of the neglected or less handled topics in the software engineering and service management process is the prioritisation and selection of the right business and IT requirements in order to conceive and implement the proper software solution. This topic is also very important for the risk management and decision process.

The business and ICT teams gather daily business change requests from users and customers respectively. The users and customers expect that all of their requirements should be considered and implemented if they have a business change request in order to fulfil their tasks and to meet customer needs. As long as you have enough budget and capacity to capture and implement these business and IT requirements it is unlikely that anybody in the company will ask how efficiently and effectively these requirements are prioritised, selected and implemented. However, in times of limited budget, limited capacity, higher quality requirements from your business and customers, and higher competition; you should make your decision more carefully in order to select the business and IT requirements which are most important for your customers and by which you can meet the customer and business requirements. As not all business and IT requirements can be chosen and implemented, due to the reasons which are mentioned above, you should ensure the right choice is made between the business and IT requirements (in form of business and change requests) in order to manage your business in an efficient and effective way.

1.1 Problem

The overall prioritization and selection of the right business change requirements are a challenge for the stakeholders which can ultimately impact the overall success of the business. In most cases the business change request management process is not clear, not explicitly defined or not transparent enough for all stakeholders. For example, it may not be clear why their requirements are not implemented; there might also be confusing surrounding who is responsible for prioritising and approving business change requests. Therefore it is essential, that the business change request management process is clear and coherent in order to allow stakeholders to make the right decisions which are acceptable for all stakeholders.

In order to achieve this goal I suggest that this process should be built utilising a quantitative rather than a qualitative technique. That means the prioritization should be made in a quantitative way and hereby all of the business and IT requirements should be quantified. By working this way you have a ranking list of all of the business and IT requirements. According to the ranking you can select the most important/top requirements and determine where you should focus in the software engineering process. This gives the benefit of allowing you to invest in any critical and urgent requirements, therefore keeping your users and customers happy whilst reducing the risk of selecting of wrong requirements, which may jeopardise the success of the business.

This concept is currently successfully implemented in the small change request management process at Canon Europe in the Services & Support organisation.[1] In this article I would like to demonstrate the following:

- How we have organised the prioritization and selection process,
- How it is working,
- What experiences we have gained,
- What you can learn and apply in your business and IT processes.

1.2 Issues

The main issue is the transparency of the prioritization and selection process of the business and IT requirements for the stakeholders, as explained in the previous section, specifically the reengineering of the business and IT requirements management process in order to ensure the quality (efficiency and effectiveness) of the offered services and their costs.

The overall business change request management and the prioritization and decision process should be visible for all of stakeholders which means that every involved party can see the End-to-End process and act accordingly across the business functions (such as Marketing, Sales, Supply chain, Finance and IT etc.). This interaction across the business functions should be built in an efficient and effective way. In order to ensure the quality of this process a set of general decision criteria should be defined in terms of

[1] Small change means that the implementation of a change request costs not more than 20mandays effort.

time, budget and performance (features). In addition to this, further specific decision criteria should be defined in terms of resources, risk assessment and criticality.

1.3 Goals/Benefits

The following benefits could be achieved by this process improvement project in a business change request management process:

- Ensuring the visibility of the overall business and IT requirements management process for all stakeholders
- Eliminating any confusion which is linked with to the change request management (CHRM) process and making the process transparent.
- To allow you to make a better decision in order to work effectively and efficiently and to achieve better business results, thus increasing customer satisfaction.

2 Stakeholders in the business change request prioritisation and decision process

In order to prioritise and select the business and IT change requests properly (and to make rights decisions) the priorities of all of stakeholders should be considered.[RSH06] This decision should be made in a consensus of the stakeholders in order to get their acceptance and meet the customer requirements. This is one of the key factors in minimising the business and IT risks. For example, selecting of minor or (in a worst case) the wrong business and IT requirements, increases the risk of the implementing a poor service or software solution. On the other hand, you can increase the acceptance of management decisions and business success.

In the tension field of the stakeholders there are three parts for stakeholders to prioritise and select the (right) business and IT requirements (change requests) (see figure 1). The business team(s) which requests the business changes (technology, process, policy and people), the management who decides on the right business change requests and the ICT team who analyses, plans and implements the business change requests in the business and IT environment. In this tension field of the stakeholders, there should, therefore, be a balance between these three stakeholders.

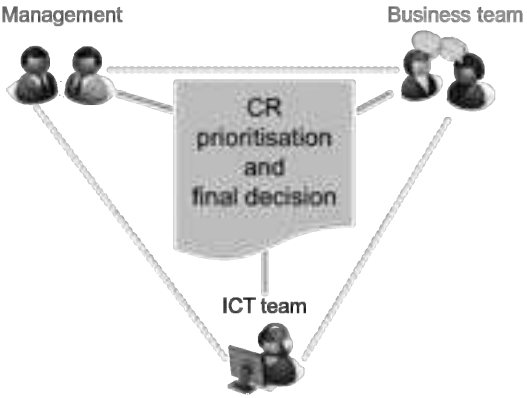

Figure 1: Tension field in the decision making process

3 Business change request prioritization and decision process

The prioritization of business change requests involves making multiple decisions. This means that each priority of all stakeholders should be taken into account as explained above. Now in the following section, I will explain which priorities can and should be considered. The first priority is given on a long term basis by the management on a general criterion. This follows the business priority which is made by the business teams (on short or long term) and the IT priority which is made by the ICT team. The final priority is made by the combination of the three priorities of the stakeholders where a ranking list of prioritised business change requests is created.

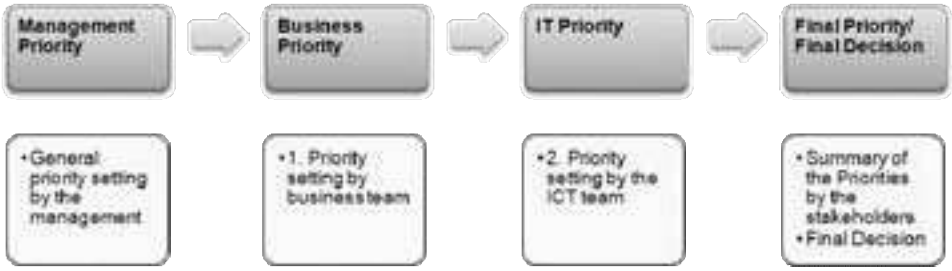

Figure 2: Prioritization and decision process

The (general) Management Priority for the business change requests (projects and enhancements) is given by management. The general priority should be in line with the business strategy and objectives. Management priority is achieved by considering the Time, Cost and Performance of the implementation of the business change requests. For the Management Priority/Decision, the costs of implementation could have more weight in times of limited budget than other decision criteria Time and Performance.

The Business Priority is made and given by the business teams. According to the given management priority, business teams should prioritise their business change requests,

which come from users, business teams and national sales and operation companies, by the RPN (Risk Priority Number) analysis. Business Priority is based on the management priority and can be assessed and respectively calculated by the RPN (SOD score) analysis within a team discussion which will be explained in the next section.

Once the business priority is done, the ICT team should prioritise the business change requests by the IT risk analysis. IT Priority is made and given by the ICT teams. IT Priority is based on the weighted criteria of the ICT teams which are for example the following points:

- Maintainability
- Performance
- Functionality
- Security
- Integration
- Etc.

For the final decision and the final priority of the business change requests the management should take the results from the RPN (Risk Priority Number) analysis, IT risk analysis, Budget, Time and Resources into account.

4 Prioritization, ranking and decision process model

4.1 Management Priority

The Management Priority provides a general and strategic aspect to the decision making process on a long term basis for all business change requests (new projects and enhancements). This means that the management decision making process should be aligned with the objectives of the business in different areas, which can be defined in a Strategy Map (i.e. by using a Balanced Scorecard). [RSH06]

Figure 3: Cost situation and management priority

In order to achieve the business objectives, the management also defines priorities for its decisions by considering four components of its resources; Time, Cost, Performance and People. Whenever the management prioritises a business change request it should always consider the given circumstances of the business. For example, in figure 3, the management prioritises the cost of the implementing the business change request over the other decision criteria and says the cost situation is a constraint which should be handled with high priority. The other conditions Time, Performance and People should be accepted and optimized.

4.2 Business Priority

In order to determine the business priority a business risk assessment should be performed with the use of the RPN analysis by the business teams. The RPN analysis consists of the risk parameters Severity, Occurrence and Detection (SOD score) of a business change request. At the same time, the possible risks and their effects (as well as the possible reasons of these risks) can be determined. The RPN is an important component of a FMEA (Failure Mode and Effect Analysis) which is known from Six Sigma methodology and engineering process in different industries and companies.[2] By the FMEA tool the potential risks of a project or design and its effects on the product, process and systems can be identified and a control mechanism can be defined and applied by appropriate responses and actions [KN07][Ka12].

[2] See [Ka12] for the benefits of using Six Sigma methodology and its tools in the software quality engineering process.

Business Change Request	Potential risks	Potential effects of the risks	Severity (S)	Occurrence (O)	Detection/Current Control (D)	Risk Priority Number (S*O*D)	Ranking
Availability of an online billing service	Manual process for billing	Long process cycle time	9	7	5	315	1
Availability of an online invoicing service	Invoices with errors	Wrong amount of money collected	9	5	5	225	2

Figure 4: Business Risk Assessment and Business Priority determination by the RPN Analysis (SOD score)

We use the Risk Priority Number (SOD score) from the Six Sigma tool FMEA in our risk management, prioritization and decision process and have had positive experiences. The risks and their effects can be calculated by the following formula:

Risk Priority Number (RPN) = S * O * D

The Risk Priority Number can be calculated by the multiplication of the following parameters:

- Severity (S)
  - Impact of the risks on the business
  - Rating Scale 1-10 (1=Minor - 10=Hazardous)
- Occurrence (O)
  - Probability of the risks
  - Rating scale 1-10 (1=Unlikely – 10=Very High/Critical)
- Detection (D)
  - Manageability of the risks
  - Rating Scale 1-10 (1=Almost certain – 10=Almost Impossible)

After the execution of RPN Analysis a ranking list of the business change requests can be prepared which shows the business priority as this is determined by the team discussion (See Figure 4).

4.3 IT Priority

On the other hand, IT Priority is made and given by the ICT teams who should prioritise the business change requests by the IT risk analysis of their implementation within team discussions. IT Priority is based on the weighted criteria of the involvement of different ICT teams along the progressing of the business change requests. The ICT teams can be listed by the following tasks:

- Maintainability
- Performance
- Functionality
- Security
- Integration
- etc.

Business Change Request	Potential Risks	Potential effects of the risks	Required Functionality	Criteria/Weight						IT Risk Number	Ranking
				Maintainability	Performance	Functionality	Security	Integration	Other		
				4	6	6	7	3	1		
Availability of an online invoicing service	Invoices with errors	Wrong amount of money collected	Ability to create invoices and correct errors automatically	2	6	7	8	2	3	151	1
Availability of an online billing service	Manual process for billing	Long process cycle time	Ability to bill automatically	3	4	3	7	3	3	115	2

Figure 5: IT Risk Assessment

In order to determine the IT Priority each ICT team assigns a priority number on a scale of 1-10 (where 1 is low and 10 is high) to the business change request. The priorities of each ICT team will be weighted according to their involvement in the implementation of the business change request. This means, the criteria weight of each team is determined within the discussion of ICT teams. After the criteria are weighted for each team, the risk values for each business request should be determined during the discussions with the relevant ICT teams. The IT risk value is the correlation of the business change requests and the weighted criteria. The IT Risk Number is determined by the sum of the correlation of each criterion and its weight in the implementation of this business request. This can be calculated by the following formula:

IT Risk Number = $\sum_{i=1}^{n} Criterion_i * Weight_i$

The IT Risk Number should be determined for each business change request in order to create a ranking list at the end of the IT Risk Assessment. In the next step the IT Priorities can be compared with the business priorities in order to make a final ranking list. This is explained in the following section.

4.4 Final Ranking

The Final ranking is a simple comparison of the initial business priority of the business change requests vs. business risk and IT risk assessments. The initial business priority is specified when a business request is raised. This priority could be in a scale of 1-5, (where 1 is low and 5 is high). During the verification of this business request by a busi-

ness analyst and the owner of the business request a risk priority number (SOD score) is determined as explained in the previous chapter. A technical risk assessment is also performed for each business request. Once the business and IT risk assessments are completed, the business and IT priorities should be determined. In the next step the final ranking can be created. The final ranking will be prepared by comparing the prioritised business change requests in a ranking list. The higher the scores of the business and technical risk assessment results the higher their ranking in the final ranking list. Once the final ranking is created, a final decision can be made. This will be explained in the next chapter.

Business Change Request	Severity (S)	Occurrence (O)	Detection/Current Control (D)	Risk Priority Number (S*O*D)	Criteria/Weight						IT Risk Number	Final Ranking
					Maintainability	Performance	Functionality	Security	Integration	Other		
					4	6	6	7	3	1		
Availability of an online billing service	9	7	5	315	3	4	3	7	3	3	115	1
Availability of an online invoicing service	9	5	5	225	2	6	7	8	2	3	151	2

Figure 6: Final ranking according to the Business and IT Risk Assessments

4.5 Final Decision

After the business and IT risk assessments have been completed, a decision board, consisting of the stakeholders (see the chapter 2), should take the final ranking of the change requests and different circumstances of the stakeholders into account for the final decision. This means that the decision board's decision making process is not completed by simply selecting change requests from the final ranking list, but also by considering the relative business benefits. The relative business benefit means that the most important business areas can get their business change requests considered first in the Final Ranking list. This is determined by the management decision board focusing on the most important business areas which are defined by the business strategy. This aspect can also have a negative effect on the less important business areas which could struggle to get their business change requests considered with high priority. This is also a challenge for the management decision board to always ensure that they select the right business and IT change requests. In order to mitigate the negative effect of this business strategy aspect on the less important business areas and to ensure that there exists a healthy balance between the different levels of the business, we introduced a business fairness mechanism into the decision process.

Business Teams	Budget Allocation Criteria		
	Current Business Priority	Business Fairness Factor	Final Allocation Weigth in %
	75%	25%	100%
Team 1	32	5	37
Team 2	30	5	35
Team 3	7	5	12
Team 4	3	5	8
Team 5	3	5	8
Total	75	25	100

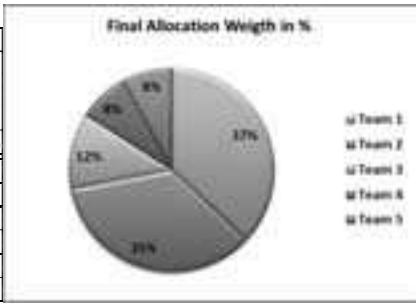

Figure 7: Budget Allocation Matrix

The business fairness mechanism should come into effect, if a limited budget needs to be allocated between the smaller and bigger business teams for the implementation of their business change requests. We call this point "the business fairness factor" when the budget will be allocated according to this final ranking list. The business fairness factor reduces the risk that smaller business teams cannot get their change requests approved. This is an important point as it will allow smaller business teams to be made aware of the relative importance of their business change requests in comparison with those of the larger business teams. In figure 7, the budget can be allocated according to the relative importance of the business teams (current business priority). The business fairness factor describes the situation and ensures that every team gets the same amount of the money (25%) from the budget, regardless of their relative importance in the business. The rest of the money (75%) can be allocated according to the current business priority. See the column "Current Business Priority" in figure 7.

5 Risk Management Model - Qualitative vs. Quantitative Rating

In practice, different risk assessment and prioritization models are used, in most cases e. g. MoSCoW-Principle or three level risk matrix (low, Medium, High) etc. [Ge04] For example, if the rating of the risk assessments is completed by using a three level risk matrix consisting of a simple scale of importance (low, medium, high) for business change requests (see figure 8), then the results of this business risk assessment are not sufficient for an optimal business decision.

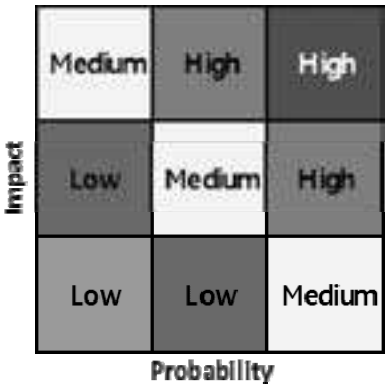

Figure 8: A typical Risk Management Model

The problem with these three levels is that if there are hundreds of business change requests and a decision board has to correctly select the valid business change requests. If a ranking list of selected business change requests is created by the three level risk matrix then there are three groups of ranked business change requests but the decision board cannot judge simply which of them in each group is most important, e. g. if there are 100 business change requests and each group has the same number business change requests, then we cannot say that every business request has the same importance in each group.

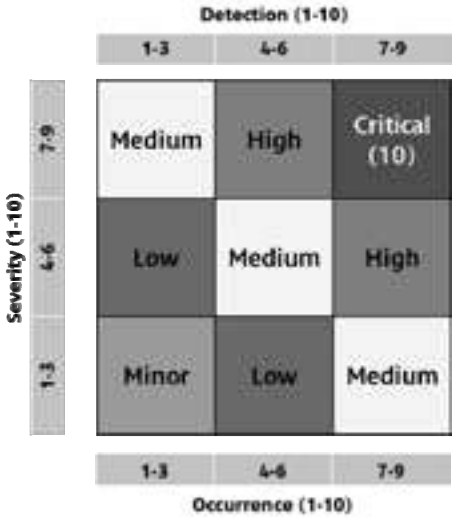

Figure 9: Qualitative vs. Quantitative Risk Assessment

This point was the main problem (and caused many long discussions without any reasonable decision) for the stakeholders in the risk management and prioritization process. Instead of this, prioritising with a three level importance/priority scale which is more a qualitative rating/ranking and not adequate instrument for making a right decision, we proposed that a quantitative rating instrument should be applied. In the previous chapters we explained the RPN/SOD (severity, occurrence, detection). If we put the elements of

the RPN in the following matrix, we can calculate the relative importance and the priority of each business requirements exactly (see figure 9). Instead of just saying that a certain business request is in a group of priority levels and has the same priority with the other business change requests, we can calculate the exact position of a business request according to the calculation of risks and effects by their severity, occurrence and detection.

6 Conclusion

The prioritization and selection of the right business change requirements are an important area in the software engineering process as this is a critical factor that can impact the overall success of the business. Therefore the business change request management process should be transparent for all stakeholders and built in an effective and efficient way by using quantitative methods and tools. We could improve and optimize our prioritization and decision making in the business change request management process by the using Six Sigma methodology which helps the application of quantitative methods and tools and makes the results more accurate, understandable and acceptable for the stakeholders. We could also reduce the variation of different business initiation and change request management processes and their cycle time. The prioritization and decision process is now visible and transparent for the stakeholders; the discussions and the risk of the suboptimal decisions have been reduced and the planning of resources and budget allocation is improved by the new prioritization and decision making process. The active involvement of all of stakeholders is also essential.

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