

Competence Building in Software Product Management

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Abstract & keywords

Competence building in Software Product Management (SPM) is regarded as a crucial but difficult undertaking. This paper presents the Situational Assessment Method (SAM) for Software Product Management (SPM). The SAM is a tool that allows product managers to evaluate and improve their processes in an incremental manner that takes into account the characteristics of the organization. We present our experiences and main observations with SAM based on assessments at 47 software vendors.

Software Product Management, Software Process Improvement, Maturity Matrix, Software Process Models, Process Implementation and Change

1. Introduction

Software product management (SPM) is a crucial area for many software vendors. Empirical evidence shows that strengthening the product management discipline has a huge influence on the success of a software product [1]. However, for most organizations improving SPM processes is difficult. One of the reasons for this is that hardly any education exists in SPM, which means there is a lack of knowledge. Another reason is that most established software process improvement approaches, such as CMM and SPICE, are often heavy weight and process improvement iterations can take years. To illustrate this: SEI has done a survey among 1,804 organizations that indicates that the median time to move from one CMM level to another ranges from thirteen to twenty-four months [2]. Finally, these heavy weight process improvement approaches do usually not take the situational factors of an organization into account, such as the sector it operates in, the development philosophy that is used, or the amount of customers

We therefore created the Situational Assessment Method (SAM) to aid product managers in improving their SPM processes in a practical manner. The method provides organizations with concrete improvement steps and supporting methods which fit the organization's profile. The organizational fit is achieved by inspecting organizational characteristics and subsequently only selecting improvement steps and methods that fit the organization.

The performed assessments also allow us to create a profile of the current state of SPM in software organizations, based on 47 case studies. Knowing the organizational characteristics of these cases, enables us to create overviews of subgroups within the software sector, such as large organizations, agile organizations, or organizations with long-established products.

[SIDEBAR SPM COMPETENCE MODEL ABOUT HERE]

2. The Situational Assessment Method

The SAM (Figure 1) was developed to help increase the maturity (the degree of development) of SPM. The middle part depicts the process of the assessment method. The left depicts the user with the input he provides and the output he receives during the assessment. The right side shows the information retrieval and changes to the knowledge base. The knowledge base contains all the information needed to perform the assessment: the SPM Maturity Matrix, a matrix containing an overview of all the important SPM areas in an ordered manner, the Situational Factors used to determine the characteristics of the organization, and the best-practices.

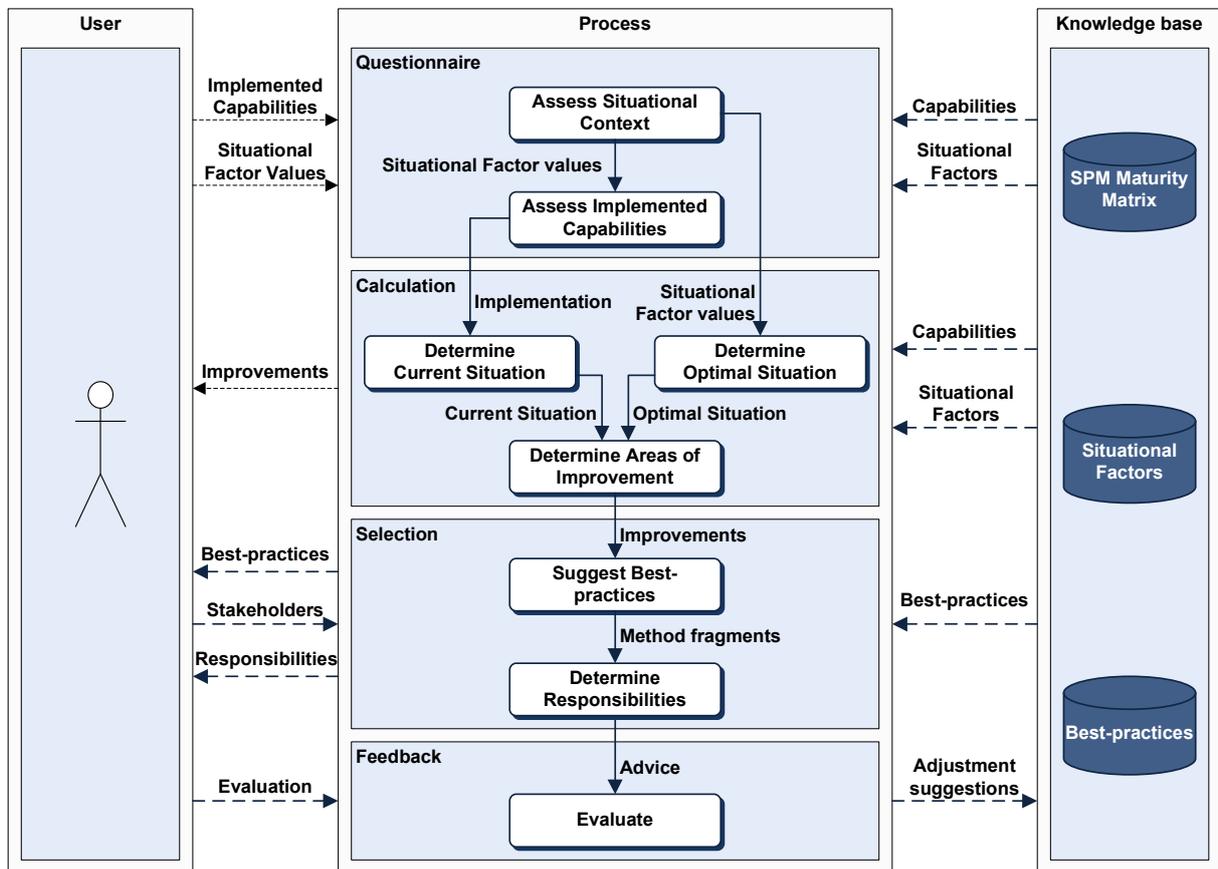


Figure 1 – The Situational Assessment Method

[SIDEBAR CAPABILITIES AND THE MATURITY MATRIX ABOUT HERE]

2.1. Questioning the product manager

The questionnaire in the SAM gathers the information needed for the assessment. It only uses close-ended questions, making it easier to answer. The first part contains 26 questions to determine the characteristics of the organization (the situational context). E.g. "How many customers do you have?" and "What type of customers do you have (individuals or small to large businesses)?". The second part consists of 68 questions to determine what practices are currently implemented. This part consists of statements such as "The build is validated by external parties (customers, partners) to verify the builds quality (e.g. by settings up a pilot)." and "A structured prioritization technique is used (e.g. MOSCOW, Wiegers).".

2.2. Calculating the gap

The calculation consists of a gap analysis where we compare the current situation within the organization with the optimal situation. The current situation is an overview of the SPM Maturity Matrix in which all the capabilities that have been implemented by the organization are marked. The optimal situation is an overview of the SPM Maturity Matrix from which all the irrelevant capabilities (for the organization in question) have been removed. E.g. if an organization doesn't have any partners, than all capabilities concerning partners can be removed. Comparing the current situation (what is implemented) to the optimal situation (what should be implemented) gives us an overview of what is missing.

2.3. Selecting the best-practices

Best-practices are linked to improvement areas in the SAM. This means that, based on the gap analysis, we can select those best-practices that, if implemented, lead the organization to a higher maturity. However, best-practices cannot be applied in all situations. We use the Situational Factors to indicate when a best-practice is useful. For example, a prioritization process in which all customers are visited by a sales representative of the organization will only be realistic when an organization only has a select number of customers. In this case the Situational Factor 'Number of customers' will be used to indicate a range of customers for which this method can be applied efficiently. The practices have also been scored by organizations that have already used them. These scoring allows us to select the methods which are most appreciated by industry.

The next step is to indicate who will be responsible for the implementation and execution of the selected improvements. We use a responsibility assignment matrix to do this.

2.4. Processing the feedback

After the implementation we ask the organization to provide feedback about their experiences with the SAM. And we ask them to rate the used best-practices so we can provide better suggestions in the future.

3. A case study experience

We use this section to present one of our case studies performed at a business unit of Centric IT Solutions. Centric is the largest privately owned product software organization in the Netherlands with over 5000 employees and is active in many different branches. This business unit acts as an independent software vendor; it is responsible for its own profit at the end of the year.

The organization in this case study has gone through the entire improvement process and has implemented the suggested improvements. Two of the organization's product managers were actively championing the improvements throughout the entire improvement cycle. Together these product managers are responsible for five different products. Their manager, the business unit manager also supported the process, which was crucial

for the success of the project. The business unit manager had to explicitly change the priorities of some stakeholders to free up time for the implementation of the best-practices.

3.1. Found Problem Areas

The SAM questionnaire was filled in by the product manager who was supported by a consultant. Answering the questions took about two hours and was performed in two parts. A first run through the questionnaire, and second run to fill in the gaps after some verification of the missing answers. The results of the questionnaire were then automatically mapped to the SPM Maturity Matrix by the questionnaire tool. It turned out that the organization in question already performed very well in the areas of requirements management and release planning, but could clearly use improvements in the areas of product roadmapping and portfolio management.

3.2. Selected Best-practices

An interdisciplinary team of stakeholders (the business unit manager, product manager, development manager, account manager, and consultants) selected best-practices and decided to implement them in two increments. Since implementing them all at once would result in a long wait before any of the results would be visible. Having results that are visible early on helps to keep up morale during the implementation of improvements.

The first increment consisted of small well-known models to support decision making:

- Porters Five Forces
- A win-loss analysis
- The Boston Consultancy Group Matrix
- A market trend analysis based on research by well-known research firms
- A SWOT (strengths, weaknesses, opportunities, threats) analysis

The second increment consisted of the development of visions in several important areas:

- Technology: what technologies are going to come in the next years that are useful to us?
- Partners: what are our partners going to do that we can use to our advantage?
- Competition: what do we think our competition is going to do?
- Society: how is the society going to change in the coming years and how can we use this / will it influence us?

3.3. Mapping Responsibilities

An important step in the selection process is the assignment of responsibilities of stakeholders for the selected best-practices. We used a variant of the RACI-model called RASCI [3]. Table 1 shows the matrix as it was applied in one of our cases.

	Portfolio management					Product planning			
	Five Forces	Win – loss analysis	BCG-matrix	Market trend analysis	SWOT	Vision of technology	Vision of partners	Vision of competition	Vision of society
MT Cluster	C	-	-	-	I	-	-	C	S
MT Unit	A	A	A	A	A	A	A	A	A
MT Product	C	S	S	C	S	-	-	S	-
Sales	S	S	C	S	S	-	-	S	S
Marketing	-	C	-	-	-	-	-	I	-
Development	-	-	-	-	C	S	S	-	-
Strategic PM	S	-	-	S	S	S	S	S	S
Product man.	R	R	R	R	R	R	R	R	R
R&D	-	-	-	S	-	S	S	-	-
Consultants	C	C	-	C	C	-	-	C	-
Other BU	-	C	-	C	S	-	-	-	C
Support	-	S	-	-	C	-	-	-	-
Partners	-	-	-	C	C	C	C	-	C
Customers	-	C	-	C	-	C	-	-	C

Table 1 - The RASCI matrix as applied during a SAM case study

The matrix shows a mapping of the responsibilities (the body of the table) stakeholders (the leftmost column) have with the best-practices (the topmost row). The responsibilities were defined as:

- **Responsible** – Those who are responsible for the task, ensuring that it is done as per the Approver.
- **Accountable (Approver)** – Those who are ultimately accountable for the correct and thorough completion of the deliverable. There must be only one Accountable specified for each task or deliverable.
- **Support** – Those who will help Responsible complete the task.
- **Consulted** – Those who provide input (two-way communication). Unlike Support, Consulted doesn't help complete the task, but only provides input.
- **Informed** – Those who are kept up-to-date of the progress, usually only on completion (one-way communication).

The matrix provides a simple, clear overview of all the responsibilities. However, assigning the responsibilities of the different stakeholders still takes quite some time in most organizations. It generated an important discussion about the responsibilities, especially in areas that weren't assigned to anyone in the past. Having the business unit manager participate in the process is important since he could make the final call when there was a dispute about certain responsibilities.

3.4. Feedback from the Product Managers

We asked the product managers to provide us with feedback about the process. Overall they were positive about the results of the improvements in the SAM. They also presented these experiences and conclusions to product managers of other organizations and the company board. The following is an overview of the results as they presented them:

- They found the process fun, inspiring, and future proof;
- The model also provides theory, which was found to be logical and necessary;
- The implemented improvements created more involvement in their product among their organizations employees;
- Communication within the organization has improved;
- The capabilities within the SPM Maturity Matrix provide a good basis for discussion, choices, and actions;
- They found the achieved focus in the development of their products to be the most important result.

They would, however, suggest using smaller increments of two or three capabilities since the implementation took longer than they expected. These improvements had to be performed next to the regular day-to-day activities and therefore took several months before they were not only implemented, but also filled in with actual data.

4. Observations in industry

Performing our model at many independent software vendors also provided us with a detailed overview of the practices that are typically performed by SPM organization. We performed the Situational Assessment Method at 49 Dutch SPM organizations. The case studies were performed very diverse organizations. Our case organizations:

- Are active in many sectors: logistics, healthcare, government, real estate, discrete manufacturing, finance, retail, etc.
- Have varying numbers of customers. Ranging from less than 50, several hundred, to tens of thousands.
- Have customers of varying sizes: individuals, small, medium, and large organizations.
- Both new and old products. Ranging from 2 to over 15 years old.
- Both agile and traditional waterfall methods.

In general software organizations tend to have formalized operational processes better than their tactical and strategic processes. Requirements management and release planning are better formalized than product planning and portfolio management.

The situational aspect of the SAM allows us to look at the practices implemented by specific subgroups within the SPM sector. All of the comparisons discussed in this section are based on at least 28 cases.

There are some logical results, that show highly influential factors such as the fact that older product organizations (products that have been sold for more than 10 years) have implemented 24% more processes compared to organizations with younger products. This difference is most visible in the areas of requirements management and release planning, which is very well organized by older organizations (eight of the capabilities in these areas were implemented by all organizations).

A slower release frequency (the time between releases spans at least 90 days) also results in a sharp rise in formalization of SPM processes (26% more processes): release planning rises 24% and roadmapping activities rise with 59%.

Some aspects seem to only have a limited influence on the SPM. For example, the numbers of requirements an organization has to deal with. A higher amount (more than 300 per year) only results in the implementation of a few extra capabilities for the registration of the requirements. However, there is one remarkable result:

organizations that deal with more requirements perform win-loss analyses more than twice as often (80% of them perform it) to determine where their product/service needs improvement.

The size the organization has (the number of employees working on the product) also only has minimal influence on the SPM practices. Small organizations (less than 20 full-time equivalent) implement 7% less capabilities than larger organizations. The larger organizations tend to have incorporated long-term thinking more into their way of working.

Organizations with more customers (more than 200) have implemented 4% more capabilities. Product planning (roadmapping activities) and portfolio management are formalized a little better when there are more customers.

We also looked at agile versus non-agile organizations. Surprisingly, our overall calculations showed that organizations that apply an agile methodology have implemented 23 % more capabilities than non-agile organizations. Their release planning and product planning is organized better over all the aspects of those areas (24% and 19% more formalized). But the biggest difference was in the portfolio management area. Here agile organizations have implemented 56% more capabilities than non-agile organizations.

5. Conclusions

5.1. Lessons learned

Providing a flexible framework, which allows for adaptations to the organizations way of working, achieves more results than a strict way of working. Participants found it fun to brainstorm and create templates, etc. to improve their organization. This active participations of the stakeholders also created more commitment amongst them to make the improvements work.

It is important to map responsibilities when applying the SAM. Not explicitly making someone responsible and someone accountable results in the job not being done. People usually won't take the lead when they have busy schedules (and they almost always have). So improvement steps, especially those aimed at long term benefits, tend to get put aside. We found that the RASCI matrix is an excellent tool to map responsibilities.

Being agile doesn't mean being unstructured. The agile organizations in our case study were actually a lot more organized in terms of their SPM than the non-agile organizations.

The observations presented in section 4 indicate the level of SPM applied by commercial software vendors in different circumstances. These results can help anticipate the consequences of changes in the context of other software vendors. And thus help them plan ahead to handle these changes timely.

5.2. Future Goals

We want to adapt the questionnaire that determines the current situation of the organization to have a more detailed answer level that better describes the implementation level of the processes. We are currently experimenting with a refined manner of scoring where organizations can also indicate whether they perform a capability in some but not all situations.

The expansion of the knowledge base, and especially the best-practices, is vital to the SAM. We will therefore be focussing on this in the near future.

It would be interesting to follow up on the observations we made in industry to research the reasons behind the results. Especially the fact that agile organizations are usually have more processes when it concerns their SPM processes. It could be that these organizations are spending more time on the implementation of the latest methods and tools in their organizations.

Author biographies

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References

- [1] Ebert, C. (2007). The impacts of software product management. *Journal of Systems and Software* 80(6), 850 - 861.
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- [3] Brennan, Kevin (2009). *A Guide to the Business Analysis Body of Knowledge (Babok Guide)*. International Institute of Business Analysis. pp. 29. ISBN 0981129218.

SPM Competence Model

The SPM Competence Model (Figure 2) is the result of previous research into SPM [1]. It presents an overview of all important focus areas in the field of SPM.

The relevant external and internal stakeholders are presented on the left and right sides of the model. The model does not include the development departments' activities of the organization. Development is simply one of the stakeholders that provide input for the SPM processes.

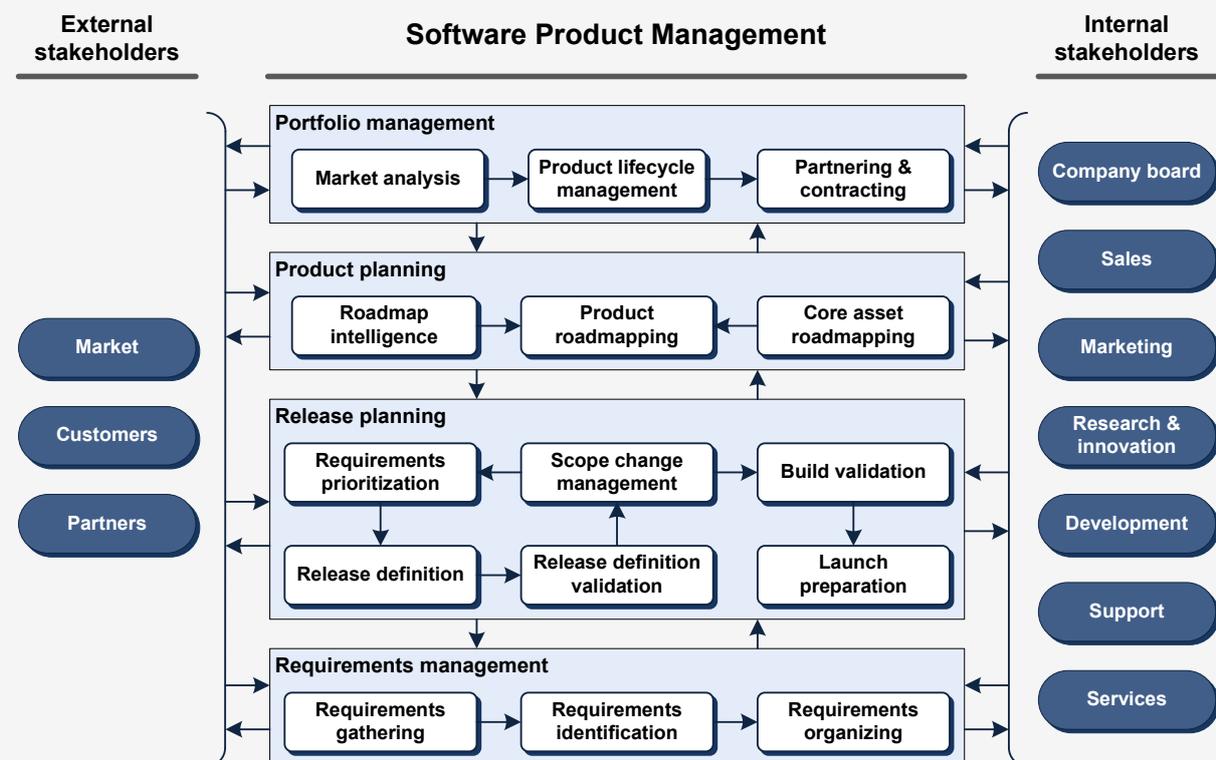


Figure 2 - The Software Product Management Competence Model [1]

Four main business functions are defined in the model, namely: Requirements management, Release planning, Product planning, and Portfolio management. These business functions are based on the structure where a portfolio consists of products, a product consists of releases, and releases consist of requirements.

Each business function consists of a number of focus areas (the white areas in Figure 2), each of which represents a strongly coherent group of capabilities within a business function. The SPM Competence Model consists of 15 focus areas which are explained in more detail in [1].

[1] Bekkers, W., Weerd, I. van de, Spruit, M., and Brinkkemper, S. (2010). "A framework for process improvement in software product management". Accepted for the 17th EuroSPI conference, September 1-3, Grenoble, France.

Capabilities and the Maturity Matrix

Capabilities

We define a capability as the ability to achieve a predefined goal. The SPM Maturity Matrix contains 68 capabilities (three to six per focus area). Each capability contains the following attributes:

- **Name** – A name shortly describing action required by the capability.
- **Goal** – The advantage gained by the execution of the capability.
- **Action** – What must be done in order for the capability to be implemented.
- **Prerequisite(s)** – Some capabilities require that one or more other capabilities be implemented first. This optional relation is described by listing all the capabilities that have to be implemented first.
- **Reference(s)** – The optional reference attribute describes related literature which can aid in understanding and implementing the capability.

SPM Maturity Matrix

The SPM Maturity Matrix is a key component of the SAM for SPM. It is based on the SPM Competence Model and provides an ordering of SPM Capabilities over a sequence of maturity levels. Organizations can use the matrix to identify improvement areas. Furthermore, the capability positioning leads to a best-practice implementation order that can be followed by the organizations that use the matrix.

The matrix depicted in Table 2 is a Focus Area Maturity Model [1]. A focus area maturity model consists of a number of focus areas, each with its own number of specific maturity levels. The focus areas are placed in the leftmost column in Table 2. The focus area specific maturity levels (the capabilities) are represented by the letters A-F in Table 2. Their spread across the overall maturity levels (the topmost row in Table 2) indicates a best-practice order, where the organization needs to implement the capabilities in the maturity matrix from left to right. The capabilities have been carefully balanced over the different maturity levels to ensure that the amount of work needed to increase the maturity level to the next level is logical for all the maturity levels.

A detailed overview of all the entire Maturity Matrix for SPM with full descriptions of all the focus areas and capabilities can be found in [2]. The development steps of a Focus Area Maturity Matrix in general are discussed in length in [1].

Focus area	Maturity levels										
Title	0	1	2	3	4	5	6	7	8	9	10
<i>Requirements management</i>											
Requirements gathering		A		B	C		D	E	F		
Requirements identification			A			B		C			D
Requirements organizing				A		B		C			
<i>Release planning</i>											
Requirements prioritization			A		B	C	D			E	
Release definition			A	B	C				D		E
Release definition validation					A			B		C	
Scope change management				A		B		C		D	
Build validation					A			B		C	
Launch preparation		A		B		C	D		E		F
<i>Product planning</i>											
Roadmap Intelligence				A		B	C		D	E	
Core asset road mapping					A		B		C		D
Product roadmapping			A	B			C	D		E	
<i>Portfolio management</i>											
Market analysis					A		B	C	D		E
Partnering & contracting						A	B		C	D	E
Product lifecycle management					A	B			C	D	E

Table 2 - The Software Product Management Maturity Matrix

- [1] Steenbergen, M., Bos, R., Brinkkemper, S., Weerd, van, I., Bekkers, W. (2010). "The Design of Focus Area Maturity Models. Proceedings of the 5th International Conference on Design" Science Research in Information Systems and Technology (DESRIST2010).
- [2] Bekkers, W., Weerd, I. van de, Spruit, M., and Brinkkemper, S. (2010). "A framework for process improvement in software product management". Proceedings of the 17th EuroSPI conference, September 1-3, Grenoble, France.