

DEFINING QUALITY CRITERIA FOR SITUATIONAL METHOD ENGINEERING

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ABSTRACT

Method engineering is a field of engineering that has been created a need expressed by engineers. These engineers faced problems in using conventional methods such as SSADM, DSDM, OOAD...In this way, Method engineering was created to intend to develop methods to meet these needs. Therefore, these methods have been employed in a wide range of projects led by these architects. In other contexts, we are led to customize a method for a particular project. The method obtained is called Situational Method (SM).

In this paper, we define the basics in order to achieve the monitoring of Situational Method quality in the early stages of its setting up to its effective exploitation.

In addition, we identify criteria that allow us to evaluate the construction of a method in terms of quality.

Finally, we discuss the choices we have made in this paper and challenges that we have to raise to achieve this quality concept.

Indexing terms

Quality criteria, Method Quality, Situational Methods.

Introduction

In software engineering, quality is a concept based on several criteria such as completeness, functionality, reliability, and flexibility of use or otherwise. The concept of quality is pushed to its maximum in the finality of satisfying the users of software. In consequence if two software, that address the same problem, are going to be evaluated, the best, conceptually, is the one that has complied with the various quality rules applied. In the world of method engineering (ME), particularly SM engineering (SME), a profusion of methods can result from user's requirements without being able to say which is better. Indeed, in these methods, some parts may meet with some requirements but occasionally an overall view is missing.

To achieve the creation of a method, the experience of the Method Engineering Architect has a major role in the choice of components. From the selection of components to their compositions, ME architect is confronting a multitude of challenges to ensure their proper assembly. For this purpose, we have attempted to provide an efficient solution in [1] ensuring the smooth running of these tasks.

Our solution is based on the concept of quality criteria, which was taken from the world of quality in software engineering.

In this paper, we present the different criteria that we found useful to allow the architect to properly manage the quality of the method. We also classified these criteria according to the ways of Seligman. Moreover, we tried to map the relationship between these criteria and these ways.

Our approach is presented in this paper as follows: In section 2, we present work related to the concept methods quality. In section 3, we give an analysis on the world of methods quality. Section 4 describes the different criteria identified. In the section 5, we discuss our contributions to improve quality in SME. Finally, section 6 presents conclusion and future works.

Related Work

Few are the works that have treated the notion of quality in an ME context. Most papers are about the evaluation process especially during the selection of method fragments [5] (chunks [16], components [18], OPF fragments [6] or method services [7] in other papers) to construct a situational method. As defined in [5], fragments are building blocks defined as coherent pieces of IS development methods. Brinkkemper distinguished two types of fragments: (1) product fragments, which model the structures of the products (deliverables, diagrams, tables, models) of a systems development method, (2) process fragments which model the development process.

The only paper that discusses the notion of quality of methods is [20]. It proposes a concept called "Method Tactics" which can be applied to a piece of existing method, a collection of pieces of the method, or an entire method.

The objective was to identify techniques that an engineer can use a method to improve the quality non-functional according to a preliminary list of tactics has been established.

Some criticisms can be stated:

- the analysis of the tactics they are using is made of informal factors and thus should be considered as general analysis;
- the list of tactics may seem arbitrary in terms of their orthogonality and level of abstraction; and;
- the list may omit some important types of tactics, especially those used in other areas of methods.

Given that the concept of quality is treated exhaustively in the world of software engineering, we will build on work such as McCall[13], Boehm[2,3] or ISO 9126[8,9,10,11] to determine the criteria that can help us in the selection and assembling method.

Method Quality Analysis

The ways of Seligmann

Different definitions of a method have been proposed. According to [4,14,19,12] the main ideas converge on the principle that a method is based on a set of models and consist of a number of steps that must be fulfilled in an ordered sequence.

As defined by Grady Booch, a method is "a rigorous process to generate a set of models that describe various aspects of software being built using a certain well-defined notation."

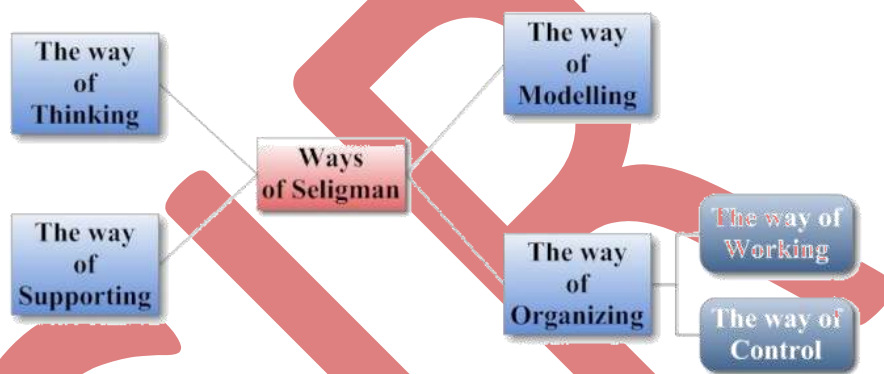


Fig 1 The ways of Seligman

As shown in figure 1, Seligmann in [17] specified that a method is defined according to different ways:

- The description of the visions of a methodology define the way of Thinking. This way is also known for defining the paradigm of a method;
- The description of the models used throughout the development process define the way of Modeling. This way is also known for defining the different models used in a method;
- The description of the techniques of support that are able to represent the different models issued from the previous way define the way of Supporting. This way is also known for defining the different support tools;
- The description of the concept of life cycle defines the way of Organizing. It can be subdivided into:
 - o The way of Working: how the work is organized. (The process)
 - o The way of Control (how): describes the management of the information system development process and its products.

Therefore, we can see that a method is characterized by:

- a process that describes the procedure (the approach).
- a set of templates that defines the product that we want to achieve.

Our Approach

The major problem we may face is to build a method that responds to the expectations of the team, which will use it.

According to all these aspects, we may say that the notion of quality is very complex to implement. It is the convergence of three axes: (1) the product axis defines the result of applying a method; (2) the process axis provides process models or approaches. It is expressed as a set of interconnected and activities carried out in order to define a product and (3) the tool axis which defines the support by software tools.

This complexity results from a multitude of factors and actors involved in the method. For example, during the setting up the structure of the method, the architect must make choices to select the fragments of the methods. These choices are ultimately very important to users. If these users do not find interest in using a component of the methods, or worse, if they do not understand the interaction and integration of components together, they can move away from this method or one of these from components and to look for other alternatives. The architect must remain responsive to these end users to be

sure to achieve a high level of assimilation of all components of the method and respond to feedback from these customers if there are any complaints.

It is important to notice that the notion of quality is associated to the methods applied and it depends on the context in which the method is applied. It is also in inference with the terms of use of the method; and how a user drives method to achieve his goal.

In addition, this increases the complexity of identifying elements that help to set up quality in methods.

Accordingly, we can give two definitions to method quality:

- It can be defined as a satisfaction contract from the use of the method resulting; and;
- It can be defined as a ratio between a set of criteria to establish, their appropriateness and the expectations expressed by the method designers and the end-users of the method.

As defined in [1] we have opted for the enrichment of the map proposed by Rolland / Ralyté / Deneckere [15] on the model definition the process of assembling of situational methods (figure 2).

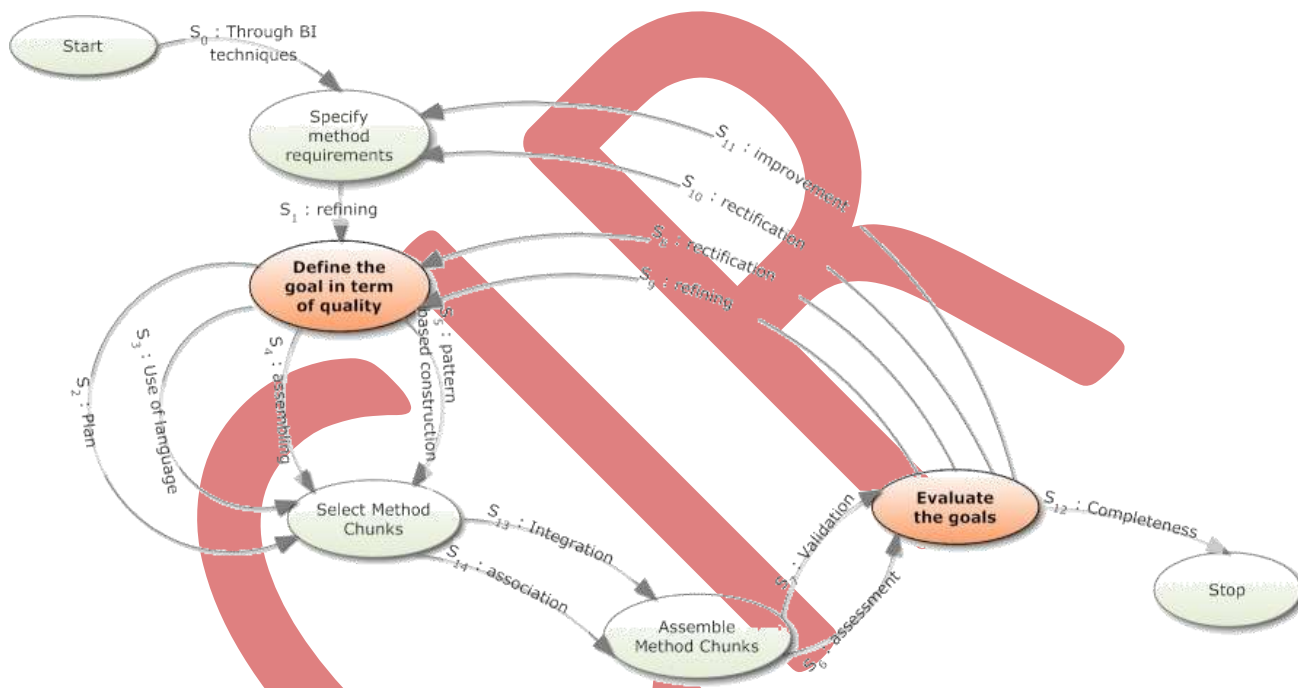


Fig 2 The methods construction map extended

The original map provides different ways of selecting fragments of methods that correspond to initial requirements as well as the strategies for their assembly.

Our extension of the model provides mainly two intentions in addition to the initial process map:

- The first step comes right after the definition of the objectives of the construction method in “Specify method requirements” intention to enrich its objectives by providing the definition required for the quality characterization of the different methodological fragments of the final method. In order to ensure that valuation of the choices, we have defined a set of criteria for qualification and validation cited in the next section.
- The second step is located at the construction of the method and the end of the process. This is due to a concern with evaluation and validation of the initial decisions.

Having said that, we should not forget the changes made to the construction phase of the method to enrich this construction by the rules defined in the previous steps.

Quality criteria

In this section, we will specify the different criteria related to the notion of quality methods. We have selected to use the ways of Seligmann to classify these different criteria from those ways. For each criterion, we will give a definition, followed by the ways of Seligman that are affected and we will end up by giving the different possible values as determined in [1]. These criteria are summarized in table 1 at the end of this section.

Adaptability

Definition:

Refer to the capability of a fragment in a particular situation to be adapted without affecting the other fragments. This criterion allow us to enrich the existing fragment database with the new one.

The Seligman's ways affected by this criterion are: the way of Support and the way of Control.

Possible values

Possible values for this criterion {yes,no}

Agility

Definition:

Defines if a fragment is capable of agility by ensuring the measurement of the following variables (features) : flexibility, speed, leanness, learning and responsiveness.

The Seligman's ways affected by this criterion are : the way of Thinking , the way of Modeling, the way of Support and the way of Working.

flexibility

The Seligman's ways affected by this criterion are the way of Thinking and the way of Modeling. Possible values {yes,no}

speed

The Seligman's way affected by this criterion is the way of Working. Possible values {yes,no}

leanness

The Seligman's way affected by this criterion is the way of Thinking. Possible values {yes,no}

learning

The Seligman's ways affected by this criterion are the way of Support and the way of Working and. Possible values {yes,no}

responsiveness

The Seligman's way affected by this criterion is the way of Working. Possible values {yes,no}

Cohesion

Definition:

Cohesion fragment method is defined by its ability to be a coherent and self-sufficient.

The Seligman's ways affected by this criterion are : the way of Thinking , the way of Modeling, the way of Support , the way of Working and the way of Control.

Possible values

Possible values for this criterion {low, normal, high}

Completeness

Definition:

The method contains all method fragments that are covered by other fragments in the situational method.

The Seligman's ways affected by this criterion are : the way of Thinking , the way of Modeling, the way of Working and the way of Control.

Possible values

Possible values for this criterion {yes,no}

Complexity

Definition:

Determine if a fragment is complex to be used in a SME in general.

The Seligman's ways affected by this criterion are: the way of Thinking, the way of Modeling, the way of Working and the way of Control.

Possible values

Possible values for this criterion {low, normal, high}

Composability

Definition:

The ability of a method to be easily modified and extended. The modularity of fragment method can be summarized in the ability of the fragment to define methods in a modular way. A fragment is composed of fragments of another method.

The Seligman's ways affected by this criterion are : the way of Thinking , the way of Modeling, the way of Support , the way of Working and the way of Control.

Possible values

Possible values for this criterion {low, normal, high}

Consistency

Definition:

Refer back to the fact that the same fragment can be reused in different contexts.

The Seligman's ways affected by this criterion are : the way of Thinking , the way of Modeling and the way of Working.

Possible values

Possible values for this criterion {low, normal, high}

Coverage

Definition:

The ability of a fragment to meet with the different needs initially specified.

The Seligman's ways affected by this criterion are : the way of Thinking , the way of Modeling and the way of Working.

Possible values

Possible values for this criterion {yes,no}

Dependency

Definition:

Defines the dependence between fragments. The relationship of a fragment with others or a set of fragment to one fragment. (Up-down / down-up)

The Seligman's ways affected by this criterion are : the way of Thinking , the way of Modeling, the way of Support , the way of Working and the way of Control.

Possible values

Possible values for this criterion {yes,no}

Documentation

Definition:

The fragment in question is documented (by any medium)

The Seligman's ways affected by this criterion are : the way of Support.

Possible values

Possible values for this criterion {yes:{graphic,textual,mix},no}

Ease of use

Definition:

The ease of use of the method by human agents to achieve the goals supported by the method.

The Seligman's ways affected by this criterion are : the way of Working.

Possible values

Possible values for this criterion {low, normal, high}

End user implication

Definition:

The implication of the end user in the obtained method.

The Seligman's ways affected by this criterion are : the way of Thinking and the way of Working.

Possible values

Possible values for this criterion {low, normal, high}

Extensibility

Definition:

The ability of a fragment to be heard by new concepts to provide new requirements.

The Seligman's ways affected by this criterion are : the way of Modeling, the way of Support , the way of Working and the way of Control.

Possible values

Possible values for this criterion {low, normal, high}

Fiability

Definition:

This criterion indicate if a result fragment has a minimum level of fiability to ensure...

The Seligman's ways affected by this criterion are : the way of Modeling, the way of Support and the way of Working.

Possible values

Possible values for this criterion {low, normal, high}

Functional capability

Definition:

The ability of a fragment to provide the functions which respect the requirements originally specified.

The Seligman's ways affected by this criterion are : the way of Thinking , the way of Modeling, the way of Working and the way of Control.

Possible values

Possible values for this criterion {low, normal, high}

Formalism

Definition:

Used formalism to define the fragment.

The Seligman's ways affected by this criterion are : the way of Modeling, the way of Support , the way of Working and the way of Control.

Possible values

Possible values for this criterion {formal, Semi-formal}

Granularity

Definition:

Indicate the capacity of a fragment to be composed and the result fit in the hugest fragment.

The Seligman's ways affected by this criterion are : the way of Modeling and the way of Working and the way of Control.

Possible values

Possible values for this criterion {yes,no}

Non redundancy

Definition:

Ensure that a fragment is not used more than once or a determined number of time in the composition of a method.

The Seligman's ways affected by this criterion are : the way of Working and the way of Control.

Possible values

Possible values for this criterion {yes,no}

Reusability

Definition:

Ability of a fragment to be reused.

The Seligman's ways affected by this criterion are : the way of Modeling, the way of Working and the way of Control.

Possible values

Possible values for this criterion {yes,no}

Satisfaction

Definition:

The ability of a fragment to satisfy the needs specified initially.

The Seligman's ways affected by this criterion are : the way of Thinking, the way of Modeling, the way of Support and the way of Working.

Possible values

Possible values for this criterion {yes,no}

Scalability

Definition:

The ability of a method to retain its effectiveness with larger team size and product size.

The Seligman's ways affected by this criterion are : the way of Modeling, the way of Working and the way of Control.

Possible values

Possible values for this criterion {low, normal, high}

Scheduling / priority

Definition:

The ability to define ordered sequence or precedence relative to other fragment."

The Seligman's ways affected by this criterion are : the way of Working and the way of Control.

Possible values

Possible values for this criterion { (frag:pred/succ:frag) , (frag:start) , (frag:end) }

Specific needs

Definition:

A fragment method is specified by requirements dedicated.

The Seligman's ways affected by this criterion are : the way of Thinking, the way of Modeling, the way of Support and the way of Working.

Possible values

Possible values for this criterion {yes,no}

Tools support

Definition:

Fragment method requires support such as software or other tool.

The Seligman's ways affected by this criterion are : the way of Support.

Possible values

Possible values for this criterion {yes,no}

Time Pressure

Definition:

The time to set up and use allowed to the project is short or instead by the fact that the time of implementation does not force specifically how the project is carried out. Time pressure appears to be a variable that takes the value high when the duration of the project implementation is short (high pressure) and the low value instead when the time is long enough (there is no pressure).

The Seligman's ways affected by this criterion are : the way of Modeling, the way of Working and the way of Control.

Possible values

Possible values for this criterion {low, normal, high}

Size

Definition:

The size of the product obtained is large or not, in terms of effort required.

The Seligman's ways affected by this criterion are : the way of Modeling, the way of Support, the way of Working and the way of Control.

Possible values

Possible values for this criterion {low, normal, high}

Team Size

Definition:

The fragment requires a low number (or top) of participants to perform the various tasks listed.

The Seligman's ways affected by this criterion are : the way of Working and the way of Control.

Possible values

Possible values for this criterion {low, normal, high}

User involvement

Definition:

Indicates the amount of involvement required by the user to perform the fragment of different tasks requested by the fragment or method.

The Seligman's ways affected by this criterion are : the way of Working and the way of Control.

Possible values

Possible values for this criterion {low, normal, high}

Table 1. Method quality Criteria

Criterion	Way of Thinking	Way of Modelling	Way of Support	Way of Working	Way of Control	Possible values
Adaptability			x		x	{yes,no}
Agility	x	x	x	x		/
flexibility	x	x				{yes,no}
speed				x		{yes,no}
leanness	x					{yes,no}
learning			x	x		{yes,no}
responsiveness				x		{yes,no}
Cohesion	x	x	x	x	x	{low, normal, high}
Completeness	x	x		x	x	{yes,no}
Complexity	x	x		x	x	{low, normal, high}
Composability	x	x	x	x	x	{low, normal, high}
Consistency	x	x		x		{low, normal, high}
Coverage	x	x		x		{yes,no}
Dependency	x	x	x	x	x	{yes,no}
Documentation			x			{yes:{graphic,textual,mix},no}
Ease of use				x		{low, normal, high}
End user implication	x			x		{low, normal, high}
Extensibility		x	x	x	x	{low, normal, high}
Fiability		x	x	x		{low, normal, high}
Functional capability	x	x		x	x	{low, normal, high}
Formalism		x	x	x	x	{formal, Semi-formal}
Granularity		x		x	x	{yes,no}
Non redundancy				x	x	{yes,no}
Reusability		x		x	x	{yes,no}
Satisfaction	x	x	x	x		{yes,no}
Scalability		x		x	x	{low, normal, high}
Scheduling/priority				x	x	{{(frag:pred/succ:frag), (frag:start), (frag:end)}}
Specific needs	x	x	x	x		{yes,no}
Tools support			x			{yes,no}
Time Pressure		x		x	x	{low, normal, high}
Size		x	x	x	x	{low, normal, high}
Team Size				x	x	{low, normal, high}
User involvement				x	x	{low, normal, high}

Discussion

The work that we have begun in this article is based on the concept of criteria. This is due to the lack of works covering this subject. At the same time, the question of quality was well fixed in software engineering world and this concept was defined and controlled at all levels.

Given that, methods are divided into several ways, for a certain way the quality is not assured optimally. For example, the working way that defines the process of operating a method, these mechanisms do not cover and we must ensure by other means.

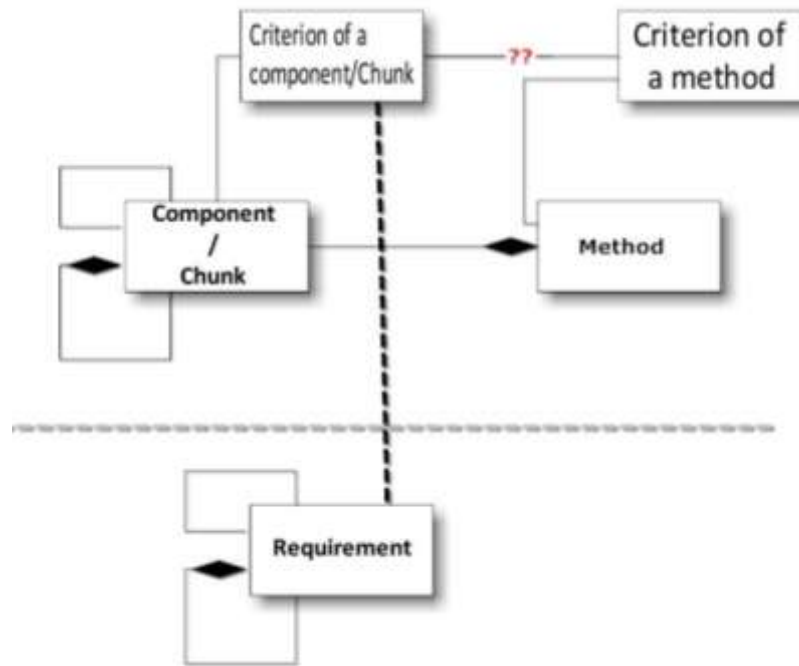


Fig 3 Relation between Component criterion and method criterion

Other point to raise is that we must ensure the kind of relationship that exist between a method criterion and a criterion fragment (fig. 3).

Conclusion and future work

As we have seen all along this paper, the concept of quality is a concept very coveted in the field of ME and particularly in SME. Having methods of quality, will guarantee a degree of satisfaction attained from the beginning of the use of this method and this satisfaction by maximizing gradually and as the method mastered.

Just like software, a method has to be designed to satisfy situational requirements including both NFR and FR.

In this paper, we propose the concept of quality of the method and we have defined with the way we understand the meaning of quality methods in the world. We intend to improve the way in which the operation is performed in decision making for the selection of fragments. We also plan to define an incidence matrix between the different criteria to determine if there is any relationship or influence between these criteria.

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