A Method for Early Requirements Triage and Selection Utilizing Product Strategies

Mahvish Khurum, Khurum Aslam and Tony Gorschek
Blekinge Institute of Technology, APS, 372 25, Ronneby, Sweden
mkm@bth.se, aslam@spidexa.com, tgo@bth.se.

Abstract

In market-driven product development large numbers of requirements threaten to overload the development organization. It is critical for product management to select the requirements aligned with the overall business goals and discard others as early as possible. This paper presents a method that utilizes strategies for early requirements triage. The method presented is based on good practices from management literature customized for technical product strategy formulation. The creation of the method was also inspired by industry needs through exploratory interviews covering requirements triage and selection processes as well as strategy formulation. After creation, the method was subsequently validated in industry where the aspects of usability and usefulness were investigated, yielding promising initial results.

1. Introduction

Due to the emergence of markets for off-the-shelf or packaged software [1, 2], market-driven development is gaining increased interest in comparison to customer-specific system development [3, 4]. As a consequence a shift in focus is occurring, affecting software development in general and requirements engineering in particular [4]. In contrast to traditional requirements engineering, requirements in market driven requirements engineering (MDRE) come from internal sources like developers, marketing groups, sales teams, support groups, bug reports, as well as from external sources such as different users, customers groups from different and multiple market segments, and competitors (through e.g. surveys, interviews, focus groups, and competitor analysis) [5]. The result is a large amount and continuous flow of requirements that threaten to overload the development organization [3].

In addition, MDRE activities are not limited to one development instance but play their role continuously as a part of product management as products are developed and new releases come over time [3, 31]. Research and industry reports put emphasis on the selection of requirements based on product strategies, business goals and the overall vision of an organization as it enables optimizing both long term and short term perspectives as well as aligning the whole organization towards the same direction [4, 8, 16, 24].

From an MDRE perspective it is important to be able to handle large amounts of requirements continuously, performing early triage of requirements, selecting the ones aligned with a specific product's strategy. Early triage can be described as discarding "inappropriate" requirements at the product management level as early as possible, without expending large resources for the triage activity as the process has to handle large amounts of requirements.

However, in industry, while managers regard strategy formulation and use as the most important aspect of technology management [17], strategy formulation is usually performed ad-hoc, and a systematic approach for formulating strategies is often missing in practice [18]. Even if the formulation of strategies was pursued, the factors affecting strategy formulation differ between different stakeholders. Strategic and middle management and technical experts all need to share *one* vision. Strategic managers often overlook the technical perspective, and technical experts can be unaware of or overlook the strategic managers' perspective. This paper explores how the strategic and technical perspectives can be combined to formulate product strategies that are good-enough for early requirements triage and selection. A Method for Early Requirements Triage and Selection (MERTS) is presented. The method has two main purposes. First, it acts as a stepwise guide to creating product strategies taking both strategic and technical views into account. To the best of our knowledge MERTS is the first method of its kind in the area of software engineering. Vähäniitty [21] suggested "key decision areas" to be incorporated in a strategy but description of what factors to be included for each of the decision areas explicitly is rather abstract and how to weigh their relative importance is missing. Secondly, the strategies resulting from MERTS can be used by managers to perform requirements triage, in essence

selecting the "right" requirements for realization. The creation of MERTS was preceded by the study of traditional management literature covering strategy formulation, and complemented with exploratory interviews in industry utilizing two technology driven companies working in a market driven context. The goal was to develop a method that was usable and useful in a real industry context taking the companies limited time and resources to perform strategy formulation, triage and selection into account. Following the creation of MERTS the method was tested by interviewing industry practitioners to get an initial validation of the method's usability and usefulness in industry.
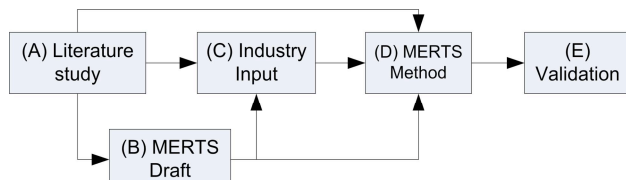

Fig 1 – Activities involved in MERTS creation

Fig 1 shows the activities involved in the creation of MERTS. Section 2 of this paper (A) gives an overview of requirements triage and product strategies formulation based on requirements engineering and product management literature study. Based on the literature study an initial draft of MERTS was created (B). Following this we elicited information from industry. The purpose of industry input (C) was twofold: (I) explore the requirements triage and product strategies creation process in industry and (II) ensure that the basic MERTS draft targeted the real issues in industry regarding the use of product strategies and requirements triage. Therefore, semi-structured interviews were performed based on the literature study and the initial MERTS draft to get input from industry. For detailed process refer to [23].

Section 3 (C) describes the initial input from industry. The input from the previous literature study (A) and industry interviews (C) was subsequently used for the creation of a final version of MERTS (D) which is presented in Section 4 along with the prerequisite and steps inherent to the method. In Section 5 (E), initial industry validation is presented and a discussion of lessons learned highlighting initial feedback is presented. Section 6 concludes the paper and discusses directions for future work.

2. Related Areas and Literature Study

2.1. Requirements Triage

"Triage" is a term used by medical practitioners to describe and prioritize treatment of patients based on their symptoms severity [14]. Triage attempts to optimize resource usage by balancing the need for treatment with the likelihood of a successful outcome [14]. In order to do this successfully a patient is assessed on criteria like "physiology", "injury anatomy", "mechanism of injury" and a decision is made whether to treat the patient, or in case of multiple patients, in what order to treat the patients. Inspired by this approach, Simmon [14] has suggested to measure different aspects of requirements e.g. requirements implementation cost, volatility, schedule slips, lack of domain experience to evaluate a requirement and decide about its selection or rejection.

Davis [10] suggests prioritizing requirements based on their interdependencies and estimated effort required, and then performing triage to select a set of requirements that optimizes the probability of product success in its targeted market.

The concept of triage is appealing as it addresses one of the main problems with MDRE, and can alleviate the risk of requirements overload.

2.2. Product Strategies

A broader definition of business strategy presented by Oliver 2000 [13] is as follows: "*the understanding of an industry structure and dynamics, determining the organization's relative position in that industry and taking action either to change the industry's structure or the organization's position to improve organizational results*". This is somewhat related to product strategy which is defined as: "*Product strategy begins with a strategic vision that states where a company wants to go, how it will get there, and why it will be successful*" [6].

In order to formulate a product strategy there are a number of questions that need to be answered. Below each key question is described and exemplified.

The question (1) "**where do we want to go**" requires finding out the right balance between the long term opportunities [6] or goals [7] and short term objectives [6]. The basic aim of the goals is to set the general directions of movement, whereas objectives specify specific measures of accomplishment [7]. Examples of goals are *profit*, *growth*, and *market share*. The product strategy normally has one of the above mentioned types of goals because these goals are potentially conflicting. If the goals/objectives revolve around increase in growth along with increase in profits, this is unrealistic because to attain reasonable growth increase in expenditures or decrease in profit margins is required [12]. Therefore depending on the product life cycle stage, one of the goals would have a priority.

The answer to (2) "**how will we get there**" formulates the core of the product strategy [15]. It

addresses aspects such as *customer targets, competitive targets*, and *differential advantage*.

The choice of *customer targets* depends on the nature of the goals and objectives selected when answering "where an organization wants to go". For example, if the goal is to increase profits, the customer targets are the existing customer groups [12]. On the other hand, if the goal is market growth, the customers targeted may be from a new segment [19]. Market segmentation with respect to *product's usage rates, customer/user capabilities, technology preferences, demographics*, and *purchasing power* are examples of important aspects to be considered when selecting customer targets. The choice of customer targets plays an important role in the requirements selection as the chosen customer targets set the boundaries of a product strategy.

In order to answer "how will we get there", it is important to select *primary competitive targets,* thus prioritizing competitors [11, 12].

For determining a product's position in the market it has to be differentiated based on either cost/price or value of product offering. This means that the product has to be either low priced backed by low costs or better than competitors' products as seen by customer.

The question (3) "**what to do**" addresses specific programs, "rules of the road" or tactics to be used to achieve goals and objectives established in the light of "how will we get there". This deals with the *product, pricing, promotion, distribution*, and *service* [12]. This can also be in the form of specific considerations posed by upper management. The answer also decides the selection of *strategic drivers*, whether the strategic driver is *technology-push* or *market-pull* or both.

The most important question to answer is (4) "**why would we be successful**". It needs to be clearly answered to produce a competitive product strategy [6]. The answer to this question is basically related to the differential advantage aspect of the product positioning. A solid product strategy needs to provide concrete arguments for the reason of its success in the light of customers' preferences and competitive targets. For example, if the strategy is low price, this has to be proven to be an adequate differential advantage with regards to competitors.

Roadmaps can be used to support the answering of (5) "**when will we get there**". A roadmap is a relatively common way of representing targets based on development in the context of time and releases [15]. In this paper we highlight the role of product-technology roadmaps when it comes to defining the moving targets of strategy.

The five questions explored above (based mainly on product management literature) were used as a tentative base for the first draft of MERTS (Fig 1 – B)

3. Initial Input from Industry

In order to explore if and how requirements triage, product strategies formulation were performed and used in industry within software development organizations working in a market-driven context (Fig 1 – C) two case studies were performed. The development departments of two telecom organizations were investigated. Since the organizations preferred to remain anonymous they will be referred to as CompanyA and CompanyB.

CompanyA is a leading mobile media organization with 200,000 employees worldwide offering a convergence of communications, entertainment and information. CompanyB is leading in the area of cellular network planning and optimization with specialization in mobile network design tools having 750 employees worldwide. They have many products but ABC3G is their matured product with a large customer base.

One strategic manager and one technical manager were interviewed from each organization to capture both the strategic and technical perspectives. A constructivist perspective [20] was utilized implying that interviews were conducted with the aim of exploration and without set ideas on requirements triage and product strategy formulation practices in industry. The four subjects were interviewed separately to avoid them influencing each other. During the interviews, the interviewees did not know anything about MERTS as it was not shown to them at this stage. Below the study results are summarized:

- There was no formal method for formulating strategies, explicitly stating directions for the products. However, from the four interviews it was evident that the five strategic questions (Section 2.2) were answered implicitly while selecting requirements. The interviewees agreed that a requirement needs to be evaluated against organization's long term goals, marketing and technical concerns. The interviewees emphasized that it is important to decide where to fit a specific requirement in relation to the moving targets of the organization on the time axis. This showed that the five questions proposed in literature could be considered good-enough, and in fact are used implicitly in industry to set products' directions.

- People within the same organization did not share the same vision about a product or the organization's mission statement, primarily due to a lack of formal and explicit statements/specifications, and the information available was not disseminated effectively.

- The requirements selection process could take 1-2 months of analysis and feasibility study due to numerous discussion sessions between strategic and

technical management in the absence of formal strategies.

- Highly experienced people are pressed by time constraints and do not see writing long strategic documents as feasible. That is why they preferred to keep the strategies in their minds.

The initial input gained during the explorative interviews confirmed many of the problems described in literature.

4. MERTS

MERTS is centered on ensuring that the five strategic questions for a product are answered explicitly. Fig 2 gives an overview of MERTS and the three main parts of the method. The goal of MERTS is to offer a clear method detailing how to reach consensus and a homogenous understanding of a product strategy.

The technical product managers using the method are required to follow three parts. Each part has several steps as shown in Fig 2 (see also the exemplification.

4.1. Prerequisite of MERTS

Requirements need to be comparable to the strategies formulated. The reasoning is that MERTS is meant to assist in early requirements triage and selection. In case of requirements being too technical or too detailed method usage will not be efficient because it will be difficult to compare detailed technical requirements with strategies as strategies are formulated on a higher level of abstraction. Even if there is some process to compare detailed technical requirements with strategies they will still be too many detailed requirements to be compared against strategies. Often many detailed requirements form one product level feature/requirement therefore it is pointless to compare every detailed requirement against the strategies.

Any method for abstracting the requirements can be used, e.g. the RAM model by Gorschek and Wohlin [4], as long as it produces requirements on an abstraction level comparable to product strategies. However, the abstraction of requirements is not the focus of this paper and will not be investigated further.

4.2. Part One – Early Requirements Triage

This part provides steps to create an initial product strategy for use in requirements triage.

4.2.1. Step 1 – Specify. In order to explicitly state the goals and objectives of a product, it is important to specify the directions of movement for the product deduced from the organization's mission statement. Thus it is important to answer the three strategic questions (**(1)**

Where we want to go?, (2) How to get there?, (3) What will be done?) for each product.

The output of this step is an explicit understanding of goals and objectives associated with a specific product which can be used to perform requirements triage and selection for individual products.

To answer (1) "**Where to go**" the organization's directions of movement have to be clearly stated. An organization can have one or many directions of movement. For example, shareholders' revenue (as mentioned in the interviews), profit, growth, and market share (Section 2.2). The answer to this question depends on identified directions of movement and their relative importance.

The answer to (2) "**How to get there**" will bind the strategy in terms of customer segments and competition targeted and differential advantage of the individual product providing a unique selling point. In order to answer this question there is a need to specify:

- Different **customer segments targeted** by a specific product, e.g. one customer segment can be the Asian market and another can be the European market. By explicitly specifying customer segments, relative priorities can also be assigned, helping in the selection of requirements. Customer segments can be defined either on a higher level of abstraction or refined (Section 2.2) depending on the needs of the organization.
- **Competitors** to a product to show which ones to target. This enables features provided by relevant competitors to be included in the product offering. Just as customer segments, competitors can also be prioritized relatively, giving more importance to features provided by high priority competitors.
- **Differential advantage(s)** of the product that makes it unique in the market place in relation to competitors. The differential advantage can be based on any one (or combination) of technology, pricing, strategic alliances and non-functional requirements. These can also be prioritized in relation to each other depending on their importance to offering the advantage. By identifying the differential advantages and prioritizing them, it is possible to ensure that all requirements are weighted against them and requirements providing unique differential advantages are not missed.

For the answer to (3) "**What to do**" a more management centered perspective can be used, focusing on product pricing, promotion, distribution, and service (Section 2.2). However, since MERTS is targeted towards early requirements triage and selection, answers to this question will focus on the abstract technical considerations of a requirement. Some of the possible considerations rated highest by the technical experts during the interviews have been taken as example here,

i.e. innovation, core assets, architecture stability, market-pull, technology-push, customization flexibility, and use of COTS [23]. Priorities can be assigned to each of these factors showing their relative importance with respect to each other.

Table 1 illustrates an example of Step 1. The columns "Questions", "Factors" and "Sub-classifications" in Table 1 show the three strategic questions and their answers.

4.2.2 Step 2 - Assign Weights. The answers from Step 1 are assigned weights. The answers of each question have a total weight of 100 (Table 1) and the total weight of the three questions is 300. The rule is to assign weights to each of the factors based on their relative importance in a way that total weight remains 100. This way has been reported to be one of easiest and quickest prioritization methods [22].

In Table 1 the answers to "Where to go?", are the factors "market growth" (assigned 60), "market share" (20), and "profit" (20). Similarly for "How to get there?", each of the three factors are assigned weights based on their relative importance, e.g. for an organization targeting growth, customer segments are more important than competitors or differential advantage, thus a higher weight is assigned to the customer segments factor compared to the competitors or differential advantage factors.

The factors mentioned in the second question's ("How to get there?") answer have sub-classifications. Similarly the targeted competitors are Comp1, Comp2, Comp3 and so on. Each of these sub-classifications is assigned weights so that sub-classifications within one factor have a total weight of 100. This has been suggested to keep the procedure straightforward and easy for the person assigning weights. Later the weights of the sub-classifications are normalized with respect to the weight assigned to the corresponding factor by multiplying the weight assigned to each of the sub-classification with the weight of the corresponding factors and then dividing by 100.

In the same way, weights are assigned to each of the factors in the last answer. The first six columns from the left in Table 1 show "Questions", "Factors", weights of each of the factors, "Sub-classifications" and weights of each of the sub-classifications, and normalization of the weights.
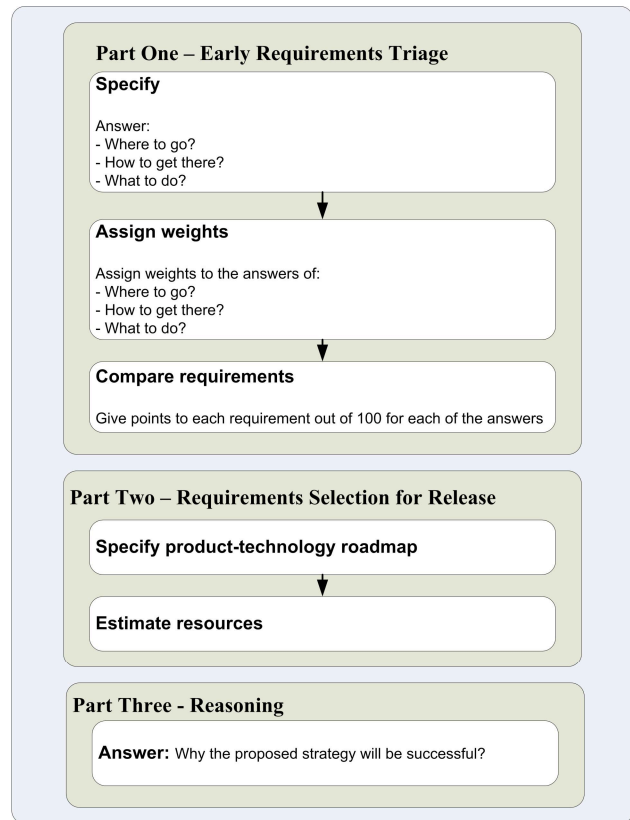

Fig 2 – MERTS steps

The number of columns used is flexible, and depends on the level of detail of a certain product strategy. This makes MERTS adaptable depending on the users (companies) preferences.

4.2.3. Step 3 - Compare Requirements. Table 1 exemplifies how a requirement is assigned points (max 100) against each factor and sub-classification based on how much the particular requirement contributes to the factor or sub-classification. The motivation being that the person performing triage (requirements comparison) does not need to worry about relative weights and normalizations. The normalization can be done automatically by the tool used (e.g. an excel sheet) after the points have been assigned against each requirement.

Requirement: Japanese Language Support in Product XYZ. Table 1 shows that the requirement is given 70 points out of 100 against market growth factor as it is estimated to increase growth in new markets. However, the requirement is given 0 points out of 100 for both the markets of USA and Europe as the requirement is not targeting these markets. It is given 100 out of 100 points for the Asian (Japanese) market demonstrating that this requirement is targeting the Asian market. The less the points against a factor or sub-classification the less the requirement is aligned against that particular factor or sub-classification and vice versa.

As the current targeted customer segments is the Asian (Japanese) market, this requirement gets higher points when multiplied with the weight of the Asian market sub-classification.

In total the requirement got 168.4 out of 300 points when measured against different strategic factors and sub-classifications. By running this step for all requirements, points for all the requirements can be obtained and a threshold can be defined. Requirements with points above this threshold get selected.

The first three steps of MERTS should be performed at product management level supporting the triage of requirements (aiding in the selection). The purpose of step 3 (Section 4.2.3) is not requirements prioritization which is usually associated with early project activities during release planning. The points assigned to each requirement, against each factor or sub-classification, show the level of strategic alignment.

4.3. Part Two – Requirements Selection for Release

After a set of requirements (deemed to be aligned with the strategy) have been selected, the question in focus is "when to get there". This activity consists of two steps described in sections 4.3.1 and 4.3.2

4.3.1. Step 1 - Specify product-technology roadmap. It has been emphasized in literature [15] to chalk out a product-technology roadmap to get an overview of the relationship between product releases (product evolvement) and successive technology generations. This means specifying what a product tends to achieve along the time axis in term of its evolvement and technology trends. This enables placement of requirements in appropriate intervals planned in a roadmap. For example, if a requirement requires expertise in some new technology to be explored in the future and this has been planned in the roadmap, the requirement can be postponed or depending on the urgency of the requirement, the roadmap can be altered.

4.3.2. Step 2 - Estimate resources.
In order to determine the feasibility of the requirements, the organization needs to explicitly state financial and effort allowances against each interval in the roadmap. Several methods can be used to estimate cost, effort and time, e.g. feature points, function points, lines of code, and methods like e.g. COCOMO [19] can be used to support the efforts. An alternative could be to perform estimates based on previous development efforts. Additionally, requirements prioritization techniques [22] can be used to plan releases for the product.

4.4. Part Three – Strategy Rationale

Once the strategic questions have been answered, it is important to document the reasoning behind the decisions. This way if the decisions (and indirectly the answers) result in success (of a product) replication can be achieved, and the organization has good examples to follow for future efforts.

In addition, the strategy formulated through MERTS should be used to share product and organizational visions across the organization. In its simplest form it can mean writing a paragraph explaining the reason behind the answers, keeping in view the organization's long term goals, financial plans, technology trends and marketing trends.

5. Industrial Validation of MERTS

After the creation of MERTS an initial validation of the method was performed in industry utilizing the same resources as described in the exploratory study (Section 3). The company representatives tested the method and were asked to render their opinions from different aspects listed below.

Practicality and Applicability of the Method. All the four interviewees were of the opinion that the method is practical and easy to use once it is clearly understood. They agreed that the method is customizable based on the organization's individual goals and objectives. All four interviewees showed interest in implementing the method. In fact, CompanyB mentioned that they would be considering MERTS for helping them with requirements triage for their next product.

Method Implementation. The prerequisite (Section 4.1) for implementing this method was not considered as an overhead. This is because the interviewees realized the need of requirements abstraction for early triage and selection.

From the method implementation perspective, it was agreed that the method provides a starting point to formalizing and documenting aspects of the organization's directions of movement, i.e. strategies. It was agreed that it is very important to think and align requirements with the organization's product strategies. The existing processes in the companies did not achieve this, thus MERTS was considered a pragmatic start that required a reasonable effort investment.

It was suggested that technical product managers assign the weights because currently mostly they do this already although ad-hoc without using MERTS.

Table 1 – Example demonstrating MERTS steps

Questions	Factors	Weightings of Factors	Sub classification	Sub classifications Weightings	Normalized Weightings	Requirement (Japanese language support)	Normalized
Where	Market growth	60			60	70	42
	Market share	20			20	70	14
	Profit	20			20	50	10
		100			*100*		
How	Customer segments	40	*USA market*	20	8	0	0
			European market	30	12	0	0
			Asian market	50	20	100	20
				100			
	Competitors	30	*ABC company*	70	21	100	21
			HIJ company	20	6	0	0
			Others	10	3	0	0
				100			
	Differential advantage	30	*Innovation*	60	18	70	12.6
			Pricing	5	1.5	0	0
			Strategic Alliances	10	3	0	0
			Non functional requirements	25	7.5	0	0
		100		*100*	*100*		
What	New Technology	40			40	80	32
	Use of core assets	11			11	0	0
	Architecture stability	20			20	40	8
	Market pull	10			10	80	8
	Technology push	15			15	0	0
	Customization flexibility	2			2	0	0
	COTS	2			2	40	0.8
		100			*100*	Total	**168.4**

The method would offer decision support and structure, as well as clarifying business goals, objectives, and enable requirements triage. However, it was also recognized that it would be a time consuming and resource intensive process to gather different aspects of the business goals from different stakeholders and formalizing them to a common agreed upon set. Similarly, assigning weights to selected factors would require substantial discussion among stakeholders. But the interviewees agreed that once the strategies were made available in the suggested format, the time to select requirements would definitely decrease, in addition to making the choices more aligned with the goals. Moreover, the interviewees liked the method as it could provide a common understanding of strategies and organizational direction thus reducing communication gaps, especially between managers and technical experts.

Step by step requirements selection, resources estimation and then road mapping were thought to be logical steps for requirements realization.

6. Conclusion

This paper presents MERTS, developed using well established concepts for formulating strategies

inspired by good practices in management literature. In addition a set of interviews were conducted with industry managers and technical experts in two organizations to explore important factors affecting the formulation of strategies from an industrial perspective. The factors affecting requirements triage and selection were also explored. With these factors identified, it was concluded that a gap between strategic managers' and technical experts' perspectives existed, as well as there was lack of a structured approach to agree on goals and the ability to perform requirements triage following these goals. MERTS enables professionals to work with organizational directions of movement (strategies) in a structured manner. The benefits are many as described and confirmed during initial validation (Section 5).

It has to be realized though that the use of MERTS requires an investment of time and resources to formalize the strategies and homogenize understanding. Although, the investment is not continuous but mostly initial, and should be alleviated by the improved triage, not to mention the benefit of having goals explicitly shared and understood in the organization.

During the creation of MERTS we did not adopt a one-size-fit-all philosophy with regards to strategies, but rather by modifying the factors chosen, a "tailoring" towards a product (or organization) can be achieved prior to use in order to adapt to organizational and product specific goals and objectives. This makes it possible for any organization to use MERTS to the degree needed, making it suitable for larger companies as well as small and

medium sized enterprises. The contribution of MERTS is to support explicit discussions, and the formulation and documentation of strategies, enabling requirements triage.

Feedback regarding MERTS was obtained, but it was limited in time and scope, thus can be described as an artificial environment from the construct validity perspective. Using the same subjects for validation and initial industry input could result in a bias towards MERTS. This risk was alleviated through the fact that MERTS was not shown to the subjects.

At present the validation of MERTS has been limited in scope. Future work involves additional validation, both static through interviews and brainstorming with industry professionals, but also dynamic validation in the form of industry piloting. In addition it is important to validate the method against additional domains (in addition to the telecom domain). Further validation will investigate issues such as scalability, usability and usefulness.

With the help of further static and later dynamic validations, efforts will be made to reduce the subjectivity in steps "Specify" (Section 4.2.1) and "Assign weights" (Section 4.2.2). Moreover, MERTS has to be refined to take requirements dependencies into consideration during triage.

7. References

[1] E. Carmel and S. Becker, "A process model for packaged software development," *IEEE Transactions on Engineering Management,* vol. 42, pp. 50-62, 1995.

[2] K. El Emam and N. H. Madhavji, "A field study of requirements engineering practices in information systems development," in *Proceedings of the Second IEEE International Symposium on Requirements Engineering*, 1995, pp. 68-80.

[3] L. Karlsson, Å. Dahlstedt, G., J. N. o. Dag, B. Regnell, and A. Persson, "Challenges in Market-Driven Requirements Engineering - an Industrial Interview Study," in *Eighth International Workshop on Requirements Engineering*, Germany, 2002, pp. PP 101-112. [4] T. Gorschek and C. Wohlin, "Requirements Abstraction Model," *Requirements Engineering,* vol. 11, pp. 79-101, 2006.

[5] C. Potts, "Invented requirements and imagined customers: requirements engineering for off-the-shelf software," in *Proceedings of the Second IEEE International Symposium on Requirements Engineering,* , pp. 128-130, 1995.

[6] M. E. McGrath, *Product Strategy for High Technology Companies*, 2nd edition ed.: McGraw-Hill Professional Book Group, 2000.

[7] M. Crawford and A. D. Benedetto, *New Products Management*, 7 edition ed.: McGraw-Hill/Irwin, 2002.

[8] A. Aurum and C. Wohlin, "Aligning Requirements with Business Objectives: A Framework for Requirements Engineering Decisions," in *Proceedings of Requirements Engineering Decision Support Workshop*, Paris, France, 2005.

[9] J. Vähäniitty, "Product Strategy Decisions in Small Software Product Businesses – A Framework and Experiences," in *Institute of Software Business and Engineering.* Master thesis, Helsinki University of Technology, 2003.

[10] A. M. Davis, "The art of requirements triage," *IEEE Computer,* vol. 36, pp. 42-49, 2003.

[11] J. M. Utterback, *Mastering the Dynamics of Innovation*: Boston: Harvard Business School Press, 1994.

[12] D. R. Lehmann and R. S. Winer, " *Product Management*, 3rd edition ed.: McGraw-Hill Irwin, 2002.

[13] R. W. Oliver, "Real-time strategy: What is strategy, anyway?," *The Journal of Business Strategy,* vol. 22, pp. 7-10, 2001.

[14] E. Simmons, "Requirements Triage: What Can We Learn from a "Medical" Approach?," *IEEE Software,* vol. 21, pp. 86-88, 2004.

[15] T. A. Kappel, "Perspectives on road maps: How organizations talk about the future," *The Journal of Product Innovation Management,* vol. 18, pp. 39-50, 2001.

[16] T. Gorschek, and A. Davis, "Requirements Engineering: In Search of the Dependent Variables", *Accepted in Information and Software Technology* (can be obtained by email) N/A, (N/A), 2006, N/A

[17] G. M. Scott, "Top priority management concerns about new product development," *The Academy of Management Executive,* vol. 13, pp. 77-84, 1999.

[18] V. Krishnan and T. U. Karl, "Product Development Decisions: A Review of the Literature," *Management Science,* vol. 47, pp. 1-21, 2001.

[19] N. E. Fenton and S. L. Pfleeger, *Software Metrics - A Rigorous & Practical Approach*, 2nd Edition ed.: International Thomson Computer Press, 1996.

[20] J. W. Creswell, *Research Design - Qualitative, Quantitative and Mixed Method Approaches*, 2nd Edition ed.: Sage Publications, 2002.

[21] J. Vähäniitty, "Key decisions in strategic new product development for small software product businesses," in *Proceedings of 29th Euromicro Conference*, 2003, pp. 375-383.

[22] P. Berander, "Evolving Prioritization for Software Product Management," in APS, PhD thesis, Ronneby: Bleking Institute of Technology, 2007, p. 250.

[23] M. Khurum and K. Aslam, "A Model for Early Requirements Triage and Selection Utilizing Product Strategies," in APS. Master thesis 2007:01, Blekinge Institute of Technology,2007,http://www.bth.se/fou/cuppsats.nsf/1d345136c 12b9a52c1256608004f0519/986067aa8859ae27c125726d00326 120!OpenDocumenthttp://www.bth.se/fou/cuppsats.nsf/1d34513 6c12b9a52c1256608004f0519/986067aa8859ae27c125726d0032 6120!OpenDocument

[24] B. Regnell, H. O. Olsson, S. Mossberg, "Assessing Requirements Compliance Scenarios in System Platform Subcontracting", in *Proceedings of* 7th International Conference on Product Focused Software Process Improvement, Amsterdam , 2006.