Lean Solutions to Software Product Management Problems

Andrey Maglyas, Uolevi Nikula, and Kari Smolander,
Lappeenranta University of Technology

// Although the discipline of software product management plays an important role in the development of successful products, each company adopts its practices in its own way. This article identifies five problems that lean principles to software product management can help an organization avoid or solve. //

THE CONCEPT OF product management was introduced in 1931 when Procter and Gamble hired a specific person to take the responsibility for managing one product.[1] After this successful experience, other companies began adopting the practice of assigning product managers. Software product management (SPM) is "the discipline and role, which governs a product (or solution or service) from its inception to the market/customer delivery in order to generate biggest possible value to the business."[2] SPM has a positive effect on software products' quality, profitability, and predictability and plays a critical role in managing and achieving business goals by providing practices for winning strategies.[3] For example, Christof Ebert reports that emphasis on SPM helped a telecommunications company reduce its release cycle time by 36 percent and improve quality by 80 percent compared to the initial estimates.[2]

SPM covers many disciplines, such as strategy, release planning, pricing, software configuration management, and road mapping.[4] Implementation of SPM practices suggest a long and thorny road in adopting many processes, tools, and components with results in a distant future. We studied 13 software organizations that had already started adopting SPM practices. By observing these organizations, we identified some of the common problems they face and concluded that implementing lean principles would make SPM adoption easier.

Lean Principles

Lean management philosophy focuses on increasing value by eliminating waste. The five principles of lean philosophy are value, value stream, flow, pull, and perfection.[5] These describe the central concepts of lean thinking for implementing a way to deliver products that satisfy customers while using fewer resources. These principles have been developed on the basis of the 14 original principles of the "Toyota way"[6] and provide a straightforward mapping to continuous process improvement. Other research has adapted the original principles to software development,[7] but because SPM isn't limited to development only but also covers disciplines such as product management, business development, marketing, sales, and support,[2] we wanted to take a broader view of lean. Scrum-based agile product management has also gained increasing interest in industry lately;[8] following the theme of this special issue, we offer a complementary view on SPM from the lean principles

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viewpoint that we hope will fill the gap in current literature.

Value

The main purpose of each product or service is to provide additional value to a customer. Identifying product value for a specific customer is coupled tightly with the product development vision and strategy. It's also the first step in understanding why a company exists in the market. A company's lack of understanding its own business and the value it provides to customers leads to it focusing on short-term issues and minor cost-cutting actions.[5] As the company grows, these actions will take more and more time without providing additional value to customers.

Value Stream

After the value has been identified, it's necessary to establish a value stream map that includes all the steps from concept to delivery. Mapping the value stream aims to identify and remove any steps that don't create value. It allows the company to eliminate superfluous steps and decrease the cycle time. Eventually, the company's efficiency grows, and it can provide more value to customers using fewer resources.

Flow

After the steps that don't create value have been eliminated, a company must smooth out the value creation process. To achieve this, lean suggests focusing on the whole value creation process instead of working in isolated departments. Reorganizing the production from a department and batch-and-queue fashion to a continuous flow increases productivity and decreases errors and the amount of resources needed. The main problem here is that "flow thinking is counterintuitive"[5] because we're used to working in departments with function separation. This leads to a situation in which each department works as effectively as possible on its own batches, but the whole production efficiency is defined by the least efficient link of the chain, manifested by intermediate storages between the departments.

Pull

Pull means that the customer sends a product request and the company provides the product, satisfying the customer's needs as soon as possible. Adopting the flow process reduces the time from concept to delivery. Moreover, because of customer pull, the company avoids production and storage of unwanted products. As a result, the company's products satisfy the customer's needs and wishes.

Perfection

The final step is to analyze the results and plan for any implementation. Whereas the other four lean principles focus on what to do, this fifth focuses on how to actually do the actions. The lean philosophy suggests concentrating on a set of principles and a way of thinking to increase efficiency and profitability gradually and incrementally with a long-term focus.

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Software Product Management in 13 Organizations

We studied 13 organizations to get a general understanding of how SPM practices are adopted. The organizations varied in size from 15 to more than 10,000 employees and represented the telecommunications, software product, or software service sectors. All the organizations were Russian R&D units of international corporations except in two cases where only marketing and sales offices were available. The study was based on 17 interviews and 12 documents from the studied organizations. We started the interviews with operational personnel (from Organization K in Table 1), but because their knowledge of product management issues and processes was limited, middle and top management became the key informant group for the study.

We audio recorded the interviews and transcribed them for qualitative analysis using the grounded theory method.[9] The interviews lasted from 40 to 80 minutes, averaging 52 minutes. The 12 documents included descriptions of strategies, release planning, positioning, road mapping, and other SPM-related activities.

Our first analysis focused on the main problems in adopting SPM practices. The analysis indicated that the problems weren't company specific, so we continued with a root-cause analysis, using the current reality tree (CRT) technique from the theory of constraints.[10] Compared with other root-cause analysis tools, such as cause-and-effect diagrams, CRTs make it easier to follow "if-then" logic to precisely identify root-cause

TABLE 1

Organizations studied for software product management–related problems.

Organization size	Organization and business domain	Interviewee role(s)	No. of employees
Extra large	A. Business and operational support systems	Product manager	10,000 +
Large	B. International developer and supplier of software, integrated solutions, and hardware technologies	Deputy managing director for R&D	1,001–5,000
	C. Internet applications	Two product managers	1,001–5,000
	D. Security solutions	Product manager	1,001–5,000
Medium large	E. Storage-management solutions	Product manager	501–1,000
	F. Developer and provider of telecommunication solutions, software, and hardware	Department manager	501–1,000
Medium	G. Data security and storage management	Product manager	101–500
	H. Integrator and developer of software for small- and medium-sized enterprises	Deputy director of software development	101–500
	I. In-house development of IT solutions	Senior business analyst	101–500
	J. Developer of software tools	Product marketing manager	101–500
	K. Provider and developer of interactive media solutions	Team lead and project manager	101–500
	L. Banking software	Two product managers	101–500
Small	M. Developer of software products for servers	Sales director and technical director	11–50

problems. Our analysis showed that the main problems that we addressed with lean principles are typical.

Problems in Software Product Management

Our problem analysis surfaced five problems that lean principles can address.

Problem 1: Long Release Cycle

Even product managers had difficulties describing the product life cycle from concept to delivery. The companies were organized as separate departments, contradicting the lean principle of flow. Because an organization can't easily change its existing structure,[11] the first step in implementing lean principles is to effectively organize collaboration among units. The main source of waste here is the sequential nature of work in units, which leads to constant switching between activities for each department. One product manager described the product life cycle as follows:

> *When the product is accepted for implementation, the next step is release planning. When all this preliminary work has been done, the product manager initiates development and waits until the product is ready. When the product is ready, marketing starts to prepare the positioning strategy. Then, support and analytics provide feedback about the product.* —Product Manager 1, Organization C

In the described situation, every department was an isolated unit acting independently and focusing on its own work instead of thinking about the whole product. We observed a lack of understanding on how the product life cycle worked and where the main sources of waste were hidden.

The most common bottleneck was development. For people outside the development department, it looked like a black box with a feature list as an input and the product with partially implemented features as an output. Our interviewees mentioned several times that the development process was unpredictable. Therefore, development prevented other departments from proceeding, because they didn't know the product they would get after development:

> *Toward the end of product development, product marketing starts to work because they have to describe what was developed. During the development, many features are cut off, changed, or skipped, and that is why they cannot start their work earlier.*

They just do not know the outcome of the development stage. Even predictions look like speculations here because, in our experience, it has never worked. The product always changes very much before the release compared to the initial estimations.
—Product Manager, Organization D

Altogether, these issues lead to a long release cycle (see Figure 1). Out of the 13 organizations, we found this problem in all the organizations except G, J, and M, which were small- and medium-sized companies. In small Organization M, all the processes were chaotic and immature, which led to short-cycle parallel activities of product analysis, development, marketing, and sales. Moving from sequential to parallel implementation of activities would improve the situation in large organizations as well. For example, regarding the quote from the product manager of Organization D, marketing wasn't able to do its work because it didn't know which features would be implemented in the next product version. In general, this problem can be solved by applying the lean principle of flow, which underscores the importance of a smooth value creation process.

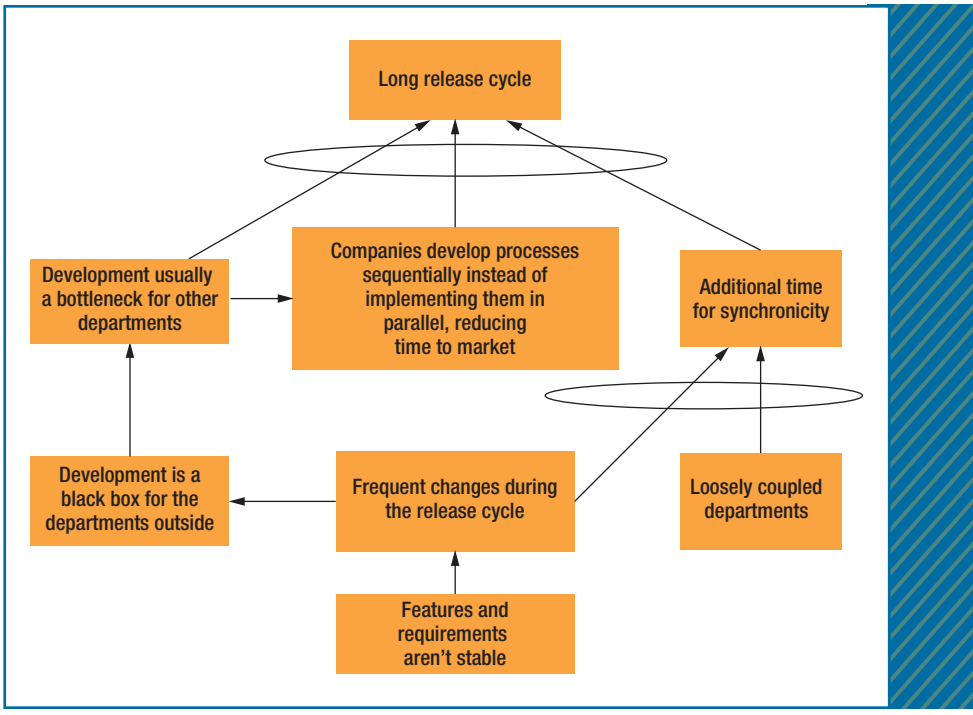

FIGURE 1. A current reality tree for the long release cycle problem. Arrows indicate causality, and ellipses represent the logical AND operation between them.

Solution 1: Using Flow to Decrease Time to Market

Lean practices can make the development process more predictable in terms of implemented features at the end of iteration, because iterations are short, features for implementation are known at the beginning of the iteration, and adding new features during the iteration is forbidden.[7] This knowledge helps the marketing department start its work earlier without needing to wait until the end of the iteration. Consequently, the time to market is reduced. Therefore, lean practices at the enterprise level allow a smooth flow for each product in which all units work together. The main problem of such adoption is the necessity for synchronization among all the units; the product manager can solve this by acting as a release-planning specialist.

Problem 2: No Metrics for Evaluating Work

In all the organizations, the product managers responsible for the whole product had no key performance indicators (KPIs). Some used a related practice, management by objectives, but the procedure of identifying these objectives was open for speculation. The most common comments can be summarized by the following two quotes:

I do not have any KPIs for evaluating my work. My work is about preparing everything on time and on budget… mean[ing] product releases and technical specifications of the product and everything that is connected with it.
—Product Manager 2, Organization C

Nobody thinks about our performance. It is not estimated. Our main goal is to release the product on time. I was responsible for that, together with the project manager. When we failed the release, nothing awful happened. We have continued to work without any penalties. So, in reality, no KPIs are used. I think that the KPIs should be related to the financial indicators.
—Product Manager, Organization G

Although the product managers were positioned as product owners, in reality, their authority was limited. Moreover, it's difficult to evaluate product managers' performance because there are no generally accepted measurements for their work and their effect on the developed product:

There were people doing a lot of work in small and difficult projects. There were also people who did little work, but [whose] projects were already

successful in the market. From the higher management perspective, they could not measure anything because both products were successful. It did not matter for them that the amount of work differed by a factor of five; they did not even realize it. No, we did not have universal KPIs. —Product Manager, Organization D

Solution 2: Using Value to Identify Key Performance Indicators

Lean thinking advocates the use of metrics for evaluating and improving activities and the whole value stream.[5] The product manager's KPIs should represent the company's goal for the product in a numerical form and should show the performance of the whole team that the project manager orchestrates. Concerning these two criteria, the product managers' KPIs are related to their products rather than to their personal characteristics. Therefore, the steps in identifying the KPIs include understanding the company's goals, identifying numerical indicators for tracking goals, performing as a team, and succeeding with the product.

Problem 3: Collaboration between Organizations and Customers

Some of the organizations were very customer oriented, but not all of them. In an extreme case, we observed speculations about customers' needs and wishes when there was no collaboration with the customers at all:

The decisions about new product development were made internally. Development was based on our own assumptions about the customers' needs. We did not test this product with the customers. We did not conduct surveys; we did not speak with the focus groups. We did not do anything to understand the customers' requirements and the niche for this product in the market. We hoped that when we released the product, someone would buy it and provide feedback. Based on this feedback, we would fix the product so that it fit the customer. —Product Manager, Organization G

Consequently, fitting customer needs takes a lot of time. The product release will possibly be delayed, and the organization might lose the opportunity to hit the market earlier than its competitors. We found this problem in eight of the 13 organizations, which were all small and medium sized, but not in the five large organizations (A–E).

Solution 3: Using Pull to Develop Products Faster and with Fewer Resources

According to the lean principle of pull, a product's life cycle starts with a customer request. Relatively new organizations usually indicated that product analysis takes too much time. They considered it a waste, because they thought it would be easier to fix and tailor the product after the first release, based on customer feedback.

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More mature companies knew that this is a myth. Their representatives reported that it is much faster and easier to start working with customers from the beginning, understanding their needs, and developing a product based on the design developed in close collaboration with them. It saves time, the product will be delivered faster, and there will be more functionality to satisfy customers. As an experienced product manager noted, "Each euro invested in the product analysis saves 5–10 euros in the following development and support steps"—(Product Manager 2, Organization C).

Problem 4: Short-Term Thinking

We expected to see problems in organizational visions and strategies, but we didn't realize how common these issues were. Almost all the studied organizations concentrated on short-term actions, such as implementing trendy, new, and modern development processes without a deep analysis of their outcomes, or developing many products in parallel without understanding the company's core business. Even the top managers weren't ready to discuss their plans on the one-year horizon:

Frankly speaking, I have never seen road maps that would have lasted for over a year. I do not know of such examples. By the way, a road map is always an assumption, and it has its own credibility. In our dynamic internet environment, the product plans change every week, but they consist of small tasks. This has an impact on the major releases. The environment is so dynamic that you should react to it immediately. You do not have six months or more for a major release. Therefore, you have only a week to implement something and you do not have time for detailed analyses. —Product Manager 1, Organization C

All but one of the studied organizations (F) developed strategies for one year only. Consequently, the organizations frequently change their vision and strategy, trying to match it with external conditions. Therefore, they lose the opportunity to create a niche, to fill it,

to get expertise in it by protecting the intellectual property, and to achieve excellence in the chosen field, leaving competitors behind.

Solution 4: Using Perfection to Adopt Long-Term Thinking

The topic of long-term thinking versus short-term actions for gaining quick profit is widely discussed in the lean literature.[5,7] Adopters of lean thinking[5] as well as the classics of strategic management[12] have discussed the advantages of long-term strategies. Short-term actions often occur as reactions to external conditions, such as new features implemented by competitors. When a company follows its competitors closely, it finds it difficult to achieve its own excellence in any area. A long-term strategy lets a company simultaneously deliver unique value to the customer, reduce its own costs, and increase efficiency. More importantly, the company acts independently according to its internal goals, rather than just reacting to its competitors.

Problem 5: Trying to Change Instantly

Product management is a complex discipline consisting of many activities. For example, the Pragmatic Marketing Framework (www.pragmaticmarketing.com) consists of 37 activities, but, in reality, each product manager is only responsible for three to five of them, according to the annual survey. Hans-Bernd Kitlauss and Peter Clough's Software Product Management Framework includes 49 activities orchestrated by a product manager.[3] Although small, medium, and large organizations have many differences in their adoptions of SPM practices,[13] the decision to introduce all SPM activities at once causes many difficulties regardless of the company size. In one interview, a department manager mentioned the following:

> *We have just hired product managers, but we have not defined their activities yet. Our main area for improvements is to tune our production processes based on the customer and market needs…. We also have to implement software product management in a new way, because currently we have only a business team consisting of about 10 people who are responsible for all business, marketing, and sales issues.* —Department Manager, Organization F

The problem of radical changes didn't come up in extra-large and large organizations (A–D). It seemed that they know from previous experiences that radical changes are risky.[11,14] Therefore, they're more comfortable with carefully planning and preparing for each initiative for a change, and even learning to manage the increasing complexity of SPM within their large organizations.

Solution 5: Using Perfection for Incremental Changes

Although radical changes, or *kaikaku*, can sometimes be necessary, lean doesn't advocate it. Instead, it suggests *kaizen*, or small, simple, incremental changes that allow the organization to identify existing problems early and nip future problems in the bud. Large organizations might have the necessary resources to do this, but could lack the ability to react effectively to external changes. Moreover, for large organizations, changes in business models, values, and especially in culture are difficult or even impossible.[11] Therefore, radical changes can have critical

ABOUT THE AUTHORS

ANDREY MAGLYAS is a doctoral student in the Department of Information Technology at Lappeenranta University of Technology, Finland. His research interests include software product management, process improvements, and management methodologies. Maglyas has an MSc (Tech) in software engineering from Lappeenranta University of Technology and an MSc (Tech) in management of information systems and resources from Saint-Petersburg State Electrotechnical University, Russia. Contact him at andrey.maglyas@lut.fi.

UOLEVI NIKULA is an associate professor of software engineering in the Department of Information Technology at Lappeenranta University of Technology. His research interests include organizational and technological change, software process improvement, and requirements engineering. Nikula has a PhD in engineering from Lappeenranta University of Technology. Contact him at uolevi.nikula@lut.fi.

KARI SMOLANDER is a professor of software engineering in the Department of Information Technology at Lappeenranta University of Technology. His research interests include architectural aspects of systems development and the organizational view of software development. Smolander has a PhD in computer science from Lappeenranta University of Technology Contact him at kari.smolander@lut.fi.

negative consequences, whereas practicing kaizen philosophy allows the organizations to manage small changes more smoothly and carefully.

In the competitive software market, it has become increasingly important to deliver products on time and to decrease the cycle time from customer request to delivery. SPM suggests practices, methods, and tools for achieving these goals, but the adoption of SPM includes challenges that are common for most organizations. Using lightweight lean practices for SPM enables companies to concentrate on the most important and easy-to-implement practices of product management with constant incremental improvements.

Product management and lean have similar features, such as the central role of value and attention to customer needs. Thus, the unification of these two approaches could benefit the software industry. If your organization already practices lean software development,[7] we invite you to extend this approach in the broader context of SPM, including strategy, marketing, sales, and support activities, to achieve excellence in the marketplace.

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