

Design for six sigma and lean product development



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This study attempts to identify differences and similarities between these methodologies and the connection between them. This comparison is of interest to practitioners that must choose a strategy for their product development as well as to researchers. The aim of both methodologies is to reduce waste and time of development and to raise the quality of a product at the very roots of the product: its development.

LAP and DOFFS help development managers to structure projects and focus as much as possible on customer expectations and satisfaction. Key Words: DOFFS, Lean, LAP, Product Development, SIX Sigma

1. Introduction

This research began with the Initiation of a general discussion between customers, suppliers and scholars concerning the way product development (PDP) should be carried out to be most efficient and how a supplier can best respond to customers' expectations in PDP. This strategic sector is under increasing pressure for efficiency since many companies have increased their production capability (Liker and Morgan, 2006).

Two methodologies have helped manufacturing to reach satisfactory levels of competitiveness: Six Sigma and Lean Manufacturing (Woman, Jones and Ross, 1992, Harry and Schroeder, 2000). Six Sigma is an improvement methodology that guides companies toward achieving a six-sigma level of capability and Lean Manufacturing is a philosophy that guides a company toward reducing the wastes in manufacturing and streamlining processes. Two sisters' Annihilates have been decontrolling Author 24 created for PDP needs: Lean Product Development (LAP) and Design for Six Sigma (DOFFS) (Ernestine, 2005, Greyer, 2005).

This paper explores the two methodologies and tries to give a comparison in order to fill the lack thereof that seems to exist in the literature and provide insight to academicians and practitioners to perhaps find a hybrid" method.

2. Method This paper is based on a qualitative study of selected literature and empirical data. The empirical data collected were provided by semi-structured interviews with practitioners in companies using the methodologies. Eight companies were chosen, four for each methodology. Each uses one of the methodologies. The questionnaire used in the interviews is composed of open-ended questions.

As the questions in a survey of this kind influence the results, it is important to know what kind of questions are asked. The twenty questions deal with the opinion of the interviewee about the methodology and its application and the implications of its use in the company. While the character of the questions enabled a broad range of answers, the small number of interviews does not permit a generalization of the findings, even though they give general view of the methodologies in the companies. The respondents were practitioners trained in, or knowledgeable about the methodologies.

They received their knowledge in training sessions or studies they made: some of them taught one of the methodologies. They work in firms using the methodologies: General Electric (GE), Volvo Rare, Volvo Car Corporation (PVC) and Siemens, which use DOFFS and Shania, IF, Beach and Autodial, which use LAP. The literature chosen is mainly intended for managers of companies, who wish to gain knowledge of DOFFS and LAP. This literature is primarily positive about the methodology described. This positivism required a double check of the reading in order to validate the findings reported <https://assignbuster.com/design-for-six-sigma-and-lean-product-development/>

(Barman, 2004). . Lean Product Development LAP is a methodology that attempts to apply the principles learned in Lean Manufacturing in the PDP area. These are made to create a flow in PDP that will help the PDP process to go faster. This possibility to realize new product faster will enhance the reactivity of a company in the market (Ernestine, 2005). Visualization tools, such as process mapping, show the improvement opportunities in the PDP process and enable companies to make the PDP process more fluent. Based on continuous improvement and visual communication, its goal is The Asian Journal on Quality / Volvo. , No. 3 25 to enhance customers' values by developing top class quality products, increasing the quality from the start of a project (Liker and Morgan, 2006). The use of a common (Masticates, 2004) in term of reducing the price of development and insisting on pacific innovations focused on customer's satisfaction. Concurrent engineering, customers and suppliers' involvement, visual management, group work and cross- functional teams emerge as some of the techniques used to reach the purpose of LAP (Carlson and Γ? lastsΓ¶m, 1996).

Standardizing the PDP process, reducing the size of batches transmitted from one stage to another and a strong project leader who represents the customer and is capable of crystallizing his or her team members' capacities are all factors that make the stream of the process flow faster (Craftsperson and Lundeberg, 2006). LAP is based on continuous improvement, and its implementation takes time and requires humility and commitment to enable improvement in a company. Tools adapted from Lean Manufacturing e. G. AS, Kamikaze (Woman, Jones and Ross, 1991), process mapping, quality tools etc. Can be used as soon as they are made to fit PDP (e. G. AS would

focus more on the elimination of unwanted information than on cleaning the manufacturing environment). In addition, tools that help the visualization of a project and the communication inside the project team can be used to help the team members to know their role. In this way, they will feel more involved in the project (e. G. A dedicated room for each project, list of tasks that need to be done and prioritize, or a project chart at the beginning of the project, Liker and Morgan, 2006, Ernestine, 2005).

Finally, LAP does not propose a roadman for PDP but is an initiative that helps to improve and standardize the existing process in a company. 4. Design for Six Sigma DOFFS is a structured methodology for PDP that consists of a stage gate model, with deliverables and norms of robustness that must be approved at the end of each stage, before a project proceeds forward (Tenant, 2002). With this methodology, a company is supposed to be able to turn its PDP into customer satisfaction measurable factors (Tenant, 2002).

Greyer (2005) defined it as follows: “ Design for Six Sigma is a means of developing, or improving, products that enables Six Sigma levels of performance in production, while focusing on customer satisfaction and robustness. An outcome of Design for Six Sigma is that the product can be produced at predictable levels of costs and risks” 26 Design for Six Sigma and Lean Product Development According to Crockery (2006), every company adapts DOFFS for its own needs, which make its process different from one company to another. One roadman seems to be common to some industries: Define, Measure, Analyze, Design and Verify (ADMAN).

Each step is a memo for the project team members: a way to split PDP into different phases and to keep in mind the important phases of a development project. These phases enable a team to focus on each separate step of the process, to reduce the risks of going too fast during one phase, and to define deadlines for every team that is fit to PDP and that can be used during the different steps (Crockery, 2006). Some of them are taken from Six Sigma, which facilitates the implementation of DOFFS in companies already using Six Sigma. Quality and customer requirements are the heart of the methodology.

Innovation is controlled and needs to show its robustness for customer satisfaction (Tenant, 2002). It seems to be reduced by administrative tasks (e. G. Checklists to be filled in etc.) and every innovation has a level of robustness that must be attained that is fixed by customers' expectations (Tenant, 2002). DOFFS requires cross-functional teams (Chowder, 2002), where interaction between people can bring innovation. DOFFS turns the process of PDP from deterministic to probabilistic by giving to the PDP team the opportunity to use statistical tools, e. Design of Experiment (Groveling, Sluts and Ant's, 2003). Finally, DOFFS integrates the Six Sigma hierarchy, and its projects are generally assisted by ' Black Belts' educated DES (Tenant, 2002). 4. 1 Analysis In this section, DOFFS and LAP are compared by themes in the selected literature and practical insight is given derived from the practitioners' interviews. 4. 1. 1 Enabling DOFFS and LAP in a Company Philosophy LAP is founded on developing quality products by continuously improving PDP and creating a flow of value added activities (Ernestine, 2005).

DOFFS seems to be centered more on measurements of customer distraction and the robustness of the product (Tenant, 2002). The methodologies are linked by the fact that they emphasize effort at the beginning of projects in order to reduce later rework. Strategy The Lean and DOFFS methodologies have different effects on the strategy of the company. DOFFS gives a robust output, followed by a complete documentation: the idea is to promote the company as a leader in quality (Tenant, 2002).

The strategy behind LAP is a strong reactivity to market demands and positioning the company as a quality leader (Liker and Morgan, 2006, Ernestine, 2005 etc.). Implementation DOFFS and LAP differ from an implementation point of view. Where DOFFS seems to be possible to integrate quickly in some companies (e. G. Two years for PVC, already used working with Six Sigma methodologies), Alp's implementation never seems to end (Carlson and Lasts, 1996). However, both methodologies' implementation makes companies centre around the demand for knowledge (Harry and Schroeder, 2000, Liker and Morgan, 2006).

People need to want change and improvement and to learn by means of the way they do things; otherwise, their application will not create value. Process and Communication DOFFS and LAP emphasize group work to facilitate communication in PDP teams (Chowder, 2002, Liker and Morgan, 2006). LAP does not use any standardized process whereas DOFFS uses standard roadman that guide project leaders, e. G. ADMAN (Greyer, 2005, Woman and Jones, 1996). According to increases administrative tasks in order to protect the PDP process against unwanted variation (Tenant, 2002).

LAP seems to be used to improve the former PDP process or to try to standardize the way of doing things in the company (Woman and Jones, 1996), whereas DOFFS seems to take the place of the former way of doing things at mom of the interviewed company (PVC, GE). Communication is eased in both methodologies for different reasons: reduction of batch sizes, process mapping etc. , in the case of LAP (Liker and Morgan, 2006) and process mapping, stage gate models etc. , in the case of DOFFS (Groveling, Sluts and Ant's, 2003). There is also a difference between the size of the batches of information in the two methodologies.

LAP seems to have as a principle to reduce those batches in order to give greater flow to the process (Ernestine, 2005) while DOFFS requires for robust and documented deliverables. Finally, practitioners and reports in the literature, such as Liker and Morgan (2006), Classing (1994), Tenant (2002), agree that putting more effort at the beginning of PDP will make it faster and more efficient at the end, and both methodologies use this assumption to emphasize the first important actions to take: understanding the customers and writing a detailed project chart.

4. 1. Uses of DOFFS and LAP

Management and Teams LAP and DOFFS have two management styles. First, they are methodologies that help project leaders to accomplish their tasks of developing, but offer no training on management skills to a project leader. Nevertheless, some tools exist, e. G. Process mapping (Groveling, Sluts and Ant's, 2003, Ernestine, 2005), explicitly to support project leaders. DOFFS seems 28 to be there to help leaders to be more secure about the outputs of their projects (PVC, Volvo Rare and GE), whereas LAP is supposed to enable

management to see the faults in their PDP process and give them the opportunity to improve it.

Secondly, LAP and DOFFS use cross-functional teams, trying to integrate people from different departments in the projects in order to create interaction between them and to give to the project the insights of their functional organization's requirements. This will increase the efficiency of the later phases of development (Liker and Morgan, 2006, Tenant, 2002). LAP and DOFFS differ in their ways of empowering top management.

DOFFS uses the stage gate model, which gives managers an opportunity to request changes during the project, while LAP has no model that includes specific stages (Carlson and Γ? lastsΓ¶m, 1996): it is thus harder for management to get involved. Some managers (Beach, Shania, and Autodial) nevertheless said that visual management enabled them to be regularly updated about the advancement of PDP projects. Organization In a DOFFS project, everyone knows what to do and what deliverables are expected. A parallel hierarchy is also needed with the " belt hierarchy" (Bergman, Crossed and Magnusson, 2003).

LAP concentrates the efforts on continuously improving the PDP organization, on showing the opportunities for modifying the organization and on giving deadlines to project workers (defined e. G. By project owners. In DOFFS, the project leader can be outside the belt hierarchy if a tier's process helps the team to follow the methodology (e. G. T PVC) or if everyone before has received training in Six Sigma and DOFFS, as is the case at GE. They are both demanding cross-functional interactions. DOFFS gives a structure and a

clear picture of the work approach through its roadman (e. . ADMAN) whereas this vision can be blocked with LAP. Tools There are no rules for tools to be used in the two methodologies. DOFFS uses a stage gate model in which tools known from the quality and robustness areas fit to PDP (Groveling, Sluts and Ant's, 2003, Wilson, 2005 etc.). However, e. G. PVC gives the freedom to project leaders to choose the tools they think the team needs. LAP does not give a toolbox, even though the same tools are used by most of the interviewed practitioners because they answer to the needs of communication and visualization of the projects, e. . Process mapping. The tools should also correspond to the team demands for continuous improvement (Ernestine, 2005). Innovation and Creativity Even though some authors (Chowder, 2002, Tenant, 2002 etc.) and some of the practitioners interviewed (e. G. At Volvo Rare) argue that innovation tools fit the structure of DOFFS and that innovation is only limited by the robustness and quality requirements, it is possible 9 to assume that innovation will depend on the company and the way it uses DOFFS.

LAP integrates innovation depending on the company: order in PDP is good for innovation according to the LAP practitioners interviewed since it will come from the interaction of specialists. DOFFS has an innovation toolbox, with tools like TRIG, brainstorming sessions etc. (Groveling, Sluts and Antis, 2003), whereas LAP project innovation does not necessarily come from the methodology itself but from the flexibility it provides (Liker and Morgan, 2006, Ernestine, 2005). 4. 1. 3 Dealing with External Factors

Customers and Suppliers LAP and DOFFS are two methodologies driven by and towards customers' satisfaction (Chowder, 2002, Carlson and Γ?
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lasts (Liker and Morgan, 1996). In this area, both methodologies apply the same quality tools, e. G. Quality Function Deployment. The team members are asked to keep customers in mind throughout a project. In LAP, team leaders usually represent the voice of the customer in the project team, which thus gives customers a representative throughout the project (Liker and Morgan, 2006).

This has to be taken delicately, because it could be restrictive if the project team relies only on this person. LAP and DOFFS also give tips to help the teams to understand their customers. Visiting the customers' life area is one of them: all the developers should go there in order to understand what kind of product the customers would ask for and how they would use it (Tenant, 2002). Finally, LDAP sometimes includes suppliers in the process.

DOFFS does not always include them but, to evaluate what capability it is possible to achieve, it is strategic to know what suppliers' capabilities are. Hence, according to Expected Results of the Methodologies DOFFS and LAP have two distinctive ways of attaining their goal. The first gives a standardized structure (Crockery, 2006). The second seems to enable the creation of a standard by making the problems-and their solutions-in PDP apparent (Ernestine, 2005). This makes possible an improvement and its standardization. In practice, both methodologies also seem to have results that are indirect consequences of their application.

The first one is the commitment of team members. Driven by a charismatic leader, by the vision they may have of the project or by the definition of their role in the team with deliverables and deadlines, all the team members can feel their responsibilities (Tenant, 2002, Liker and Morgan, 2006). Beach for

example even has employees that are disappointed not to be more involved in some projects according to the definition of their roles. The second result is a healthy pressure put on employees, who know what needs to be done and when.

A pulse meeting can be held every week in LAP projects, and deadlines for DOFFS projects put the necessary pressure on the employees, hopefully without being either inhibitory, or overwhelming. Lastly, both methodologies increase the demand for knowledge in the groups (Liker and Morgan, 2006, Tenant, 2002). DOFFS helps PVC teams to know more about their product, LAP helps Shania, Autodial and Beach to know more about their processes, and both methodologies, as described in the literature (Masticates, 2004, Wilson, 2005, Crockery, 2006 and Groveling and Sluts and Ant's, 2003), should help the companies to know more about their customers.

This last point has nevertheless not been verified in all of the companies.

Table 1 summarizes the synergies and the differences (given as an attachment). The synergies are listed in one column and the differences specific to either DOFFS or LAP are given in separate columns. Table 1 .

Comparison of the methodologies Synergies ; Top class?

Quality ; Understanding of customers ; Commitment of project team members ; Healthy pressure DOFFS LAP ; Fast flow ; Robust design ; Quality ; Results official to ; Visual management -?+ perceive Opportunity to correct ; Quality errors ; Knowledge about product ; Standardize product development process Expected results ; Need to show value ; Adaptation to needs of added on product ; Independent from ewe product development New ;

Robustness of technology technologies ; For people not instead of technologies once implemented ; Have to bring knowledge people ; Increase the knowledge of companies ; Reduction of batches for ; Customer focus, analysis, better integration in the measurement project.