REPATRIATION OF OUT-SOURCING

Integrating Mechanical Designing into Company X's Own Operations

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Abstract

The aim of this report is to have a strategical view and description of the progress of integrating mechanical designing into Company X's own operations. Mechanical designing had been outsourced since the company was established. It was a strategic decision and a good alternative to the situation at the time. When the company started growing there were need for standardized products which was solved by recruiting own Mechanical Designer.

The report is based on literature study and company research. Literature study includes theoretical aspects related to outsourcing and designing, which are referred to in the study. The practical study was done by interviewing the company members and using internet sources, such as news articles and information on the financial situation of the company. The literature study is public, and the practical study is confidential information and only available for the company.

Theory supported the decisions about outsourcing and repatriation. Having an in-house designer facilitated projects, decreased designing related costs and improved the product management of the growing company.

Keywords
Outsourcing, designing, Mechanical Designer, start-up company, technology development company, PDM

CONTENTS

1   INTRODUCTION

This thesis work was done for the company's needs. The topic was given by Companys X's COO, who was supervising the work form the company's side. Guidance was also offered by a recently hired Mechanical Designer. The objective of the report is to have an overview of the integration of outsourced product design into the company's own operations.

The theory part is published in Theseus. The practical study itself is left out from the public version at the request of the company.

Theory base includes four main topics related to the applied work: outsourcing, start-up company, adopters of an innovation and PDM. Outsourcing was self-evident for this work, but only with that the understanding of the nature and the strategy of the company was incomplete, theories about start-up companies and innovation adopters were needed. PDM chapters give guidance on data storing.

Company X's version includes reports of design related topics, such as history of the company, reasons for outsourcing and reversed transition, which are based on theory base. The history of the company is important, because it gives an answer to the question, why outsourcing has been a good strategic decision in the past. At the end there are conclusion of the report and integration, list of references and Company X's timeline as appendix.

2   THEORY BASE

Outsourcing chapters include general information about reasons, risks, the levels of outsourcing performance and transition. There is also a chapter about outsourcing designing and these are referred in the practical work.

Start-up company chapters include information about the phases of start-up company's life and agile operational model, which is typical for start-up companies. The chapter of adopters of innovation has a theory about how the innovation is adopted and the chasms related to those. With these it is possible to have a deeper understanding of the company's nature and reasons for the decisions.

In the end, there are chapters about PDM; what it is, items and how the work of an Engineer is related to product information management.

2.1   Reasons for outsourcing

The most common reason for outsourcing is saving costs. It is possible only if the service provider can produce the services or products in a more affordable price than the outsourcing company. To produce services or products with less expenses, the productivity of the service provider must be higher than in outsourcing company. Productivity can be added in many ways. The service provider can be specialized in some field, for example maintenance, and have an opportunity for better shift planning and using the working time for value adding functions rather than transportation or waiting. (Lehikoinen and Töyrylä, 2013, 16-19)

Another common reason for lower price is that the wages of the production's workers are less than in outsourcing company. This is usual, if the outsourcing is purchased from a country, where the rate of wages is lower, but is possible in Finland too. The career model and wage development can support short term employment, especially if the work is of routine type. (Lehikoinen and Töyrylä, 2013, 19-20)

Location based outsourcing is still immature in Finland. The number of selection and alternatives is low. It is easier to find a solution of a productized standard service than customized option, which is not probably cost effective. However, outsourcing can provide better quality of services or products. (Lehikoinen and Töyrylä, 2013, 17-18)

The reasons for outsourcing can be also internal recruitment ban, avoidance of fixed costs and problems within the work community or availability of the workforce. Start-up companies can use outsourcing to support the core business. Time and money can produce better in own field rather than for example in payment of salaries. (Lehikoinen and Töyrylä, 2013, 21-22)

When considering outsourcing the levels of current quality and costs must be understood. Definition of the objectives and the operational model, as well as the effects on economic and other issues, such as strategy, personnel, and risks, also need to be considered. (Lehikoinen and Töyrylä, 2013, 40-44)

2.1.1 Risks

It should be investigated if the considered outsourcing service has functional outsourcing markets and if these provide the service level so that the targets, such as lower costs, are reachable. If there are many options for service providers and competition is functional between those, outsourcing is more realistic. Still, according to Lehikoinen and Töyrylä the risks of outsourcing can be

- Losing control of expertise, especially when operations are near core operations

- Negative impact on the company's employees and image

- The level of service weakening after outsourcing

- Divided processes between the company and one or more service providers. This might cause slowness and bureaucracy in the processes

- Ability to integrate the company's and service providers functions

- Ability to reach the benefits of outsourcing in practice

- The effects of failed outsourcing to the core processes

- The leakage of confidential information to competitors or publicity

- The costs of cancelling the outsourcing

- The inability to change the service provider when outsourcing has been accomplished

- Political risks in public sector

Staying in a competitive position requires constant prioritizing and re-evaluation. Then the less important, but still essential operations for the success of the company can be left without proper attention. The risks of not outsourcing can be

- The lack of sufficient know-how

- The lack of effectiveness in the company's own operations

- Poor quality level compared to competitors and other options on the markets

- The huge amount of fixed costs

- The inability to proportion the size of organization in the changing markets

(Lehikoinen & Töyrylä, 2013, 35)

2.1.2 Outsourcing Designing

When considering outsourcing, it should be done for the right reasons, such as a strategic need instead of short-term cost saving exercise. In Figure 1, can be seen the spectrum of possibilities of collaborating with other organizations. Here "virtual company" is outsourcing. The Figure suggests that a fully integrated approach is advisable when there are no incentives to take risks. (Von Stamm, 2003, 425)
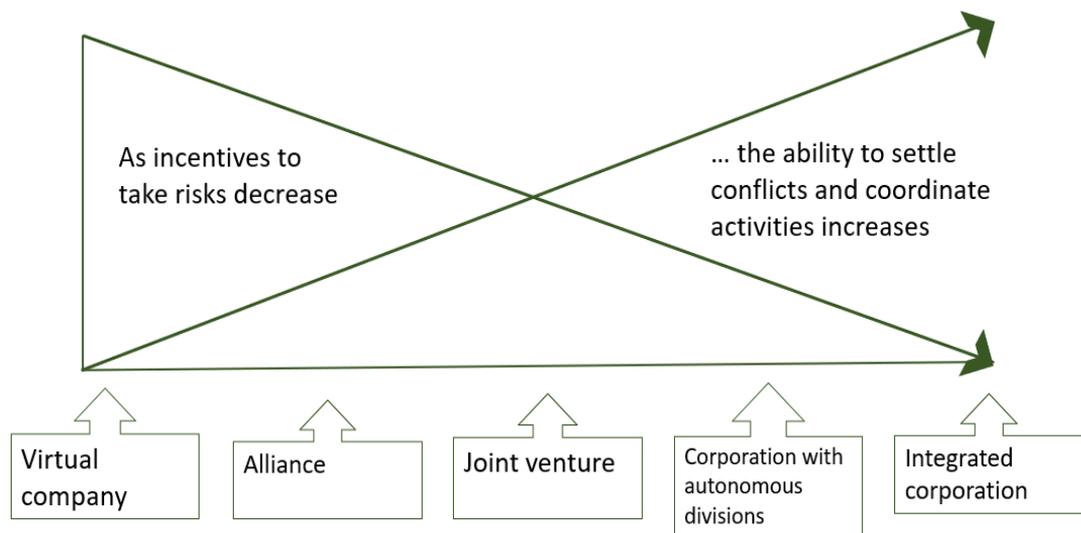
FIGURE 1. Finding the right degree of centralization (Original: Chesbrough, H.W. & Teece, D.J. 1996)

Basically, managers have three options for the location of the designer: developing the design in-house, employing an external designer or design consultancy to develop the design and using a combination of in-house and external design. Small and medium sized organizations in the UK have identified the reasons for the treatment of design. The reasons are listed below.

- Company size – A small company might not have enough work for its own designer.
- Radical – Company can use external design for "thinking outside of the box", when developing new product concepts.
- The market segment – If designing is not one of the value-adding factors of the product, it might not be wise to use a lot of money on it.
- Innovator or a follower – When a company is copying what other companies develop, they did not feel they would need help of any designer.
- Commodity or customized – There can be several perspectives, which affect the treatment: how different features affect the purchasing decisions, is purchasing done repeatedly or once, can the purchasing depend on reputation and is the product which distinguishes one product from the other. (Von Stamm, 2003, 429-431)

It should be remembered that there is not only one right solution, and each company needs to make decisions about whether to outsource design. In Figure 2 can be seen the advantages and disadvantages of both in-house and external designer and it can be used as guidance in the decision making process. (Von Stamm, 2003, 431-432)

Design route	Advantage	Disadvantage
In-house	Cost efficiency	Lack of creativity/ new ideas
	Accessibility	Keeping the design team busy, e.g. ongoing development work
	Easier coordination with other in-house departments	Losing touch with external developments
	Company retains control	
	Designer develops intimate understanding of the company	
External	New inspiration	Lack of understanding of company specific issues
	Access to specialists' expertise	Problems of ready accessibility
	Relieves workload	Problems in the coordination within house design and/or other departments
	Accessibility of additional skills/staff	Potential lack of confidentiality
	Speed	Company needs skills to evaluate the design work
	Options of changing and exploring different options	Not-invented-here syndrome
		Problems with industrialising the externally developed design
		Loss of control
		Credibility gap if design is too far removed from company's own style

FIGURE 2. The advantages and disadvantages of in-house and external designer (Original: Von Stamm, 2003, 432)

2.1.3 Levels of outsourcing performance

Outsourcing can be divided into four sections based on the performance. Those are poor, doing okay, good, and world-class (Figure 3). It is estimated that approximately 15 per cent of outsourcing relationships have poor performance, 40 per cent are doing okay, 25 per cent are good and 20 per cent are world-class performers. (Lacity & Willcocks, 2015, 3-4)

World-class
- Cost savings/ SLAs improved each year
- Business benefits innovations delivered
- High client satisfaction

Good
- Cost savings delivered
- Meeting SLAs
- Good client satisfaction

Doing Okay
- Marginal cost savings delivered
- Acceptable service performance
- Marginal client satisfaction

Poor
- No cost savings
- Poor service performance
- Low client satisfaction

FIGURE 3. Levels of outsourcing performance (Original: Lacity & Willcocks, 2015, 4)

The performance is measured by cost savings, the customer satisfaction, the quality of services determined in SLA (Service Level Agreement) and effects to KPI's (Key Process Indicators). The levels are not stable. For example, in first phases of transition (see chapter 2.1.5 Transition), the level can be poor but improve as the project proceeds. (Lacity & Willcocks, 2015, 4-5)

2.1.4 Transition

The meaning of the transition project is to transfer the responsibility from the outsourcing company to the service provider, which is the opposite of this project. The duration of the project depends on the character of the service and companies' capability of co-operation. The managements support for the transition is important and it can be seen as investing in equipment and personnel. (Lehikoinen and Töyrylä, 2013, 86-88)

The phases of the transition project are shown below (Figure 4). (Lehikoinen and Töyrylä, 2013, 86-107)

Preparing the project
1. Project plan
2. Project resources and organizing subprojects

Project management and execution
3. Project management
4. Personnel and resources
5. Communication
6. Development of the processes
7. Infrastructure
8. Organizing the supply chain
9. Ending the transition phase

FIGURE 4. The transition phases

1. The project plan

Project plan includes schedules and the content of the requirements from both companies. Those are aligned with each other and the dependencies and tasks are determined. The plan contains also commissioning and decommissioning of information systems.

2. Project resources and subprojects

Project managers, subproject managers and the project organization are determined. Responsibilities about communication, personnel, contacts, invoicing, service functions, business premises, IT and management model are shared within the organization.

3. Project management

Project management is based on the responsibilities, tasks and schedules previously determined. The project starts with a kick-off -meeting, which shows the support of management and is a chance for the project organization to get to know each other. It is important to understand the sensitivity of the situation and use the adaptive manner of approach with practical realities.

4. Personnel and resources

Introduction and finalizing of the necessary organization, resources, adjustment operations and other changes. Collective bargaining requirements and legislation need to be considered. For motivating, the personnel need to be informed about the outsourcing and how this is going to affect in individual level.

Resource planning includes recruitment and/or layoff of the personnel and planning the amount of fulltime and parttime workers. The differences in skills and productivity of the company personnel need to be concerned.

The legal position of the companies needs to be recognized. This means the responsibility areas.

The personnel should be motivated to have a continuity of the services. Management level can be changed to another, or they can leave of their own choice, but it is important to keep the key personnel in the company.

The length and the way of building the competence depends on the character of the outsourcing. If the work stays relatively the same, the introduction part can take only a few weeks. If the job description changes a lot, it can take a few months. The risk for training employees by the employer, is that the employees quit after training and take their competence to a competitor.

5. Communication

It has to be decided whether the outsourcing made public. Stakeholders, such as customers and unions, should be informed about the process.

6. Development of the process

Service, management, and support processes and the responsibilities should be developed by a seamless integration with redesigning and automation. This can be done with benchmarking (comparing the strongest process maker into own), digitalization, automation, standardizing, process models and user training. Support processes can be invoicing, reporting, quality assurance, satisfaction surveys, recruitment, and orientation.

7. Infrastructure

Business premises should be prepared. It has to be decided whether there will be used new premises or old ones will be used. Machines and hardware should be prepared to fit to the premises.

Information systems can be developed as subprojects. The simplest way of developing information systems is giving the access rights to the subcontractor. Also, telecommunication connections and the firewall should be concerned.

8. Organisation of the subcontracting chain and suppliers

Contracts for machinery and leasing equipment are organized. Some of those might need changes and some can be terminated.

9. Ending the transition phase

When services can be provided fully functionally and the criteria are achieved, the transition phase can be finished. The continuous service phase begins, and the project organization has done its work.

2.2 Start-up company

Start-up company is defined as company, which is targeting fast growth and scalability. Scalability means increasing the profit without raising the production costs in the same relation. (Herranen, 2020, 38) There are six different opportunities for a start-up company, which can be parallel to each other. (Laukkanen, 2007,31-37)

An innovation-based company has two paths. It can start from an inspirational idea which is productized and offered as a service or a process. The other is to have a problem, for which the solution is invented and then commercialised. It takes a lot of effort to develop a functional prototype in the technological field. That is why there is usually a university or a venture project of a big company supporting the process. Risk financing can be used as well. For continuity, product offering needs to be renewed regularly.

Managed business dissemination is like Innovation based, but on a smaller scale. The business idea is continuing the previous operations of a company.

A previous company or business departure as a platform is similar with Managed business dissemination, but here the business unit is ready. For example, if a big company is outsourcing part of its operations into a new department or a side business is operating independently after it is purchased by management.

Growth through acquisitions is typical for big companies. It can be used to raise the capacity level of production and development. Other reasons can be interesting products, rapid market access or buying a competitor. Also, smaller companies can join and become stronger and more successful wholeness to the markets.

Portfolio growth is when multiple local companies are established by the same entrepreneur. The reasons can be such as reaching for wealth, increasing the number of jobs, an entity that can withstand surprises and cyclical fluctuations, spreading the risks, it is interesting to manage and for status.

Increased external control by pull can be temporary or occasional caused by a huge customer or absence of a competitor. Long term increasement can be reached if, for example a product, is set on the markets while the demand is high. In outsourcing companies, the reason can be the growth of a customer company, which is known as "Nokia effect".

2.2.1 Phases of a start-up company's life cycle

There are three major phases in a start-up company's life cycle: early stage, growth, and maturity. In Figure 5 are the basic elements of every phase. (Laukkanen, 2007, 250)

	Early stage	Growth	Maturity
Guiding values	Learning, experiments	Expansion, growth	Profitabililty, effectivity, market share, superiority
The role of the management	Entrepreneur	Integrator, coordinator	Administrative
The type of innovations	Huge product innovations	Small product innovations/ huge process innovations	Small product and process innovations
The source of innovations	Entrepreneur	Marketing/ manufacturing	Production
The key factor in competitiveness	The functions of the product	Product differentiation/ price	Price, image, small changes
Manufacturing process	Short series	Production units	Assembly lines, continuous flow
Key function	Entrepreneur	Marketing/ manufacturing	Manufacturing/ sales
The structure of the organization	Loose	Function, project or matrix structure	Bureaucracy/ project, process and network structure

FIGURE 5. The phases of a start-up company's life cycle (Original: Laukkanen, 2007, 250)

The early stage lasts until the product and sales volumes are significant. When the company reaches to the growth phase, it is time to systemize its operations and adopt standardized, repetitive practices. Improvisation and constant changes in solutions do not work anymore. In company's maturity phase the main challenges are usually related to efficiency of production. (Laukkanen, 2007, 246-249)

Organization must adapt to the growth but also develop the organization for the next phase of growth. One of these challenges is recruitment. New personnel is hired in a relatively short period. Newcomers must have the necessary skills and ability for their position, but also an attitude, which fits to the company. Without those, the management of productivity and growth are more difficult to maintain, because work ethic and commitment are endangered. (Laukkanen, 2007, 149-150)

2.2.2 Agile operational model

Agile operational model is natural for start-up companies. In the beginning, when the company might not have proper profit, products, manufacturing processes or even factors of productions, such as personnel, equipment, financing, or business unit, it is mandatory to be creative and agile for surviving to the next week or month. The term "pivoting" means that there is trying, learning, and the direction might change strongly. This is the usual way of managing a start-up company. (Herranen, 2020, 38)

Crucial for agile start-ups is continuous learning, courage to try new things and acceptance of incompleteness. If the company is ready to turn around the business idea multiple times in year, it is easy to understand, how everything else in business can change during weeks or even days. Such as own working station, business units, personnel, operational models, meeting practices, tools, earnings logic, and partners are examples of changes. (Herranen, 2020, 40)

The strength of agile projects is to have a lighter project plan and start executing it flexibly and adaptably, using methods or tools such as Scrum, Kanban, and Sprints. With these the planning

phase is faster, agile and many times the scope is better for the intended use. (Herranen, 2020, 37) Kimmo Herranen (2020,15-35) has developed an agile start up model, which can be applied in sales, creating a business, nonorganic growth, managing the growth and even in spiritual growth.

Step 1. What is the problem? – Identifying the problem, which causes trouble for customers

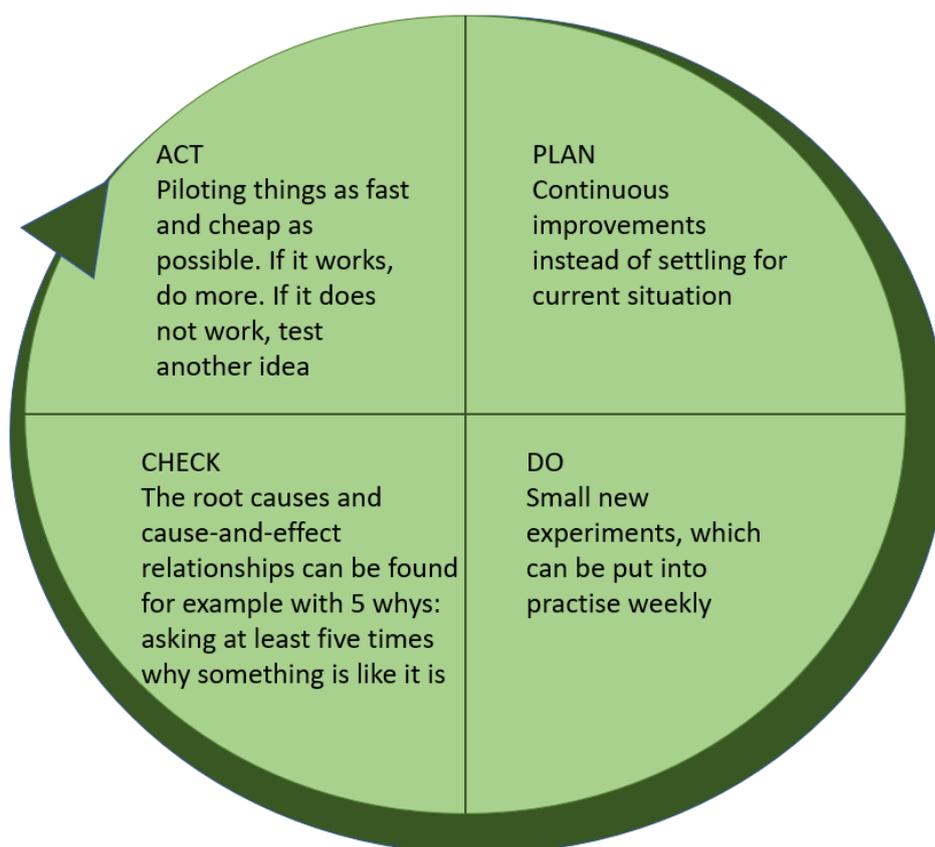**Step 2. Continuous development** – Using PDCA cycle (Figure 6) for planning, doing, checking, and acting.

FIGURE 6. PDCA cycle (Original: W. Edwards Deming, 1993)

Step 3. Finding the bottle neck – Discovering the process which is blocking the maximum flow.

Step 4. Innovation – The innovation ideas can come from any part of the organization if the management level has supported that. With this, it is possible to stand out from competitors.

Step 5. Testing – This can be done with MVP (Minimum Viable Product), which can prove assumptions to right or wrong.

Step 6. Conclusions – Did the test work or not? If not sure, test more.

Step 7. New testing – If the test failed, it can be done again with small changes. For example, the target group of the questionaries can be changed. If it was a success, the test can be developed to the next level.

Step 8. Start again from the Step 1 – This keeps the personnel innovated and eventually lead to the next step.

Step 9. Success – Enjoying the success caused by good job and achievements, but not for too long. It is important to show gratitude to the people who have contributed to the success.

Step 10. Looking outside of the box – At the latest when the business is mature, it is hard to develop new innovations with reasonable investments. Then it is good to look outside of the box. Are there other business areas, where expertise could be applied?

2.3   Adopters of an innovation and the theory of chasm

Rogers's (2003) findings suggest that diffusion of innovation can be expressed as a wave curve (Figure 7). The very first group of individuals who are adapting the innovation are Innovators and those present 2,5 percent from the total adapters. Those value venturesome and are stable enough financially to invest in innovation. The next 13,5 percent are called Early Adopters. Those are so called pioneers, which people want to copy. Early Majority represents the next 34 percent of the adopters. They adopt new ideas just before the innovation becomes mainstream. Individuals in Late Majority also represents 34 percent, and they adopt the innovation just after the average target group member. The last 16 percent to adopt the innovation are called Laggards. They might have limited resources for adopting the innovation therefore they want to be certain that the new idea will not fail. (Rogers, 2003, 280-285)
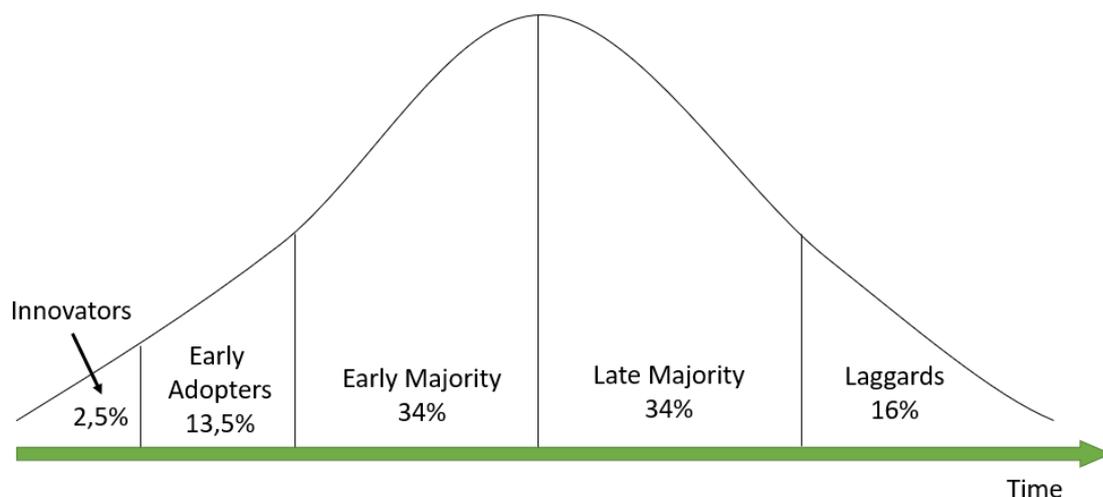

FIGURE 7. The groups of individuals who are adopting the innovation (Original: Rogers, 2003, 281)

Moore (2007) developed the curve to one, which explains the life cycle of adopting technology especially when the product is so called discontinuous innovation (Figure 8). It means, that the end users needs to change their behaviour to use the product. When moving from left to right the market share rises. The highest margins of the life cycle can be found from the middle and late stages. The chasms between psychographic groups illustrates the difficulties to move to the next segment. The longest chasm can be found between Early Adopters and Early Majority, but countless companies have already fallen into the first chasm. (Moore, 2007, 38, 42, 45-46, 48)
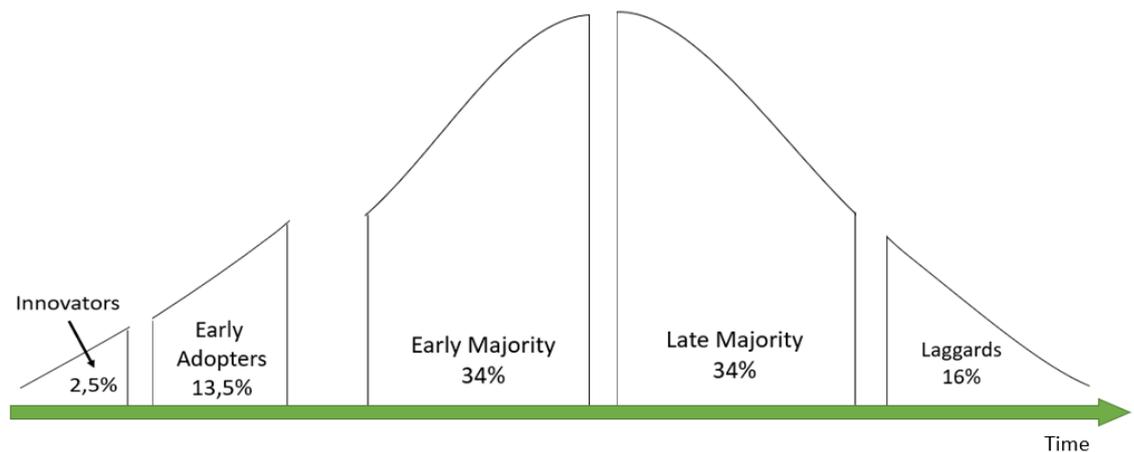
FIGURE 8. The chasms between the adopters

2.4 PDM

In an ideal situation PDM system is a company-wide information system, which is used to manage product information, such as creation, processing, distribution, and storage. It connects, integrates, and controls company's business processes through products to be manufactured and information closely related to them. One typical feature is item management. The system manages product data and lifecycle, and controls item registration and processes related to administration. (Sääksvuori & Immonen, 2002, 18-21)

The system retains information about the actions taken on the documents such as

- Viewing
- Copying
- Changes
- Commenting
- ECR (Engineering Change Request)
- ECO (Engineering Change Order)
- Printing

(Sääksvuori & Immonen, 2002, 34)

2.4.1 Items

Items are a systematic and standardized way of identifying, coding, and naming a physical product, part of it or component, material, or service. (Sääksvuori & Immonen, 2002, 192) Those can also be documents, resources, and activities. The company's operational management has the responsibility of defining the information, which are treated as items and which are left outside of the product data management. (Peltonen & Martio & Sulonen, 2002, 45)

Item includes identification or a code and a description. Attributes (or parameters or metadata) are a group of specific information related to the item. Those can be identification, description, or the date of creation, which every item is having. It is also possible to define a specific attribute for a

specific item, for example a file of "drawing" can have an attribute of the "size of drawing". (Peltonen & Martio & Sulonen, 2002, 16–17,20)

Item identification can be significant, where the identification itself tells something about the item or non-significant, which can be as simple as running number. Both options have their pros and cons, but many recommend the use of unclassified codes. (Peltonen & Martio & Sulonen, 2002, 17) Figure 9 includes comparison of these two.

Significant	Non-significant
Describes part	No significance
Is a class code	May need separate class code
Must publish code book	No code book
Misinterpretation likely	Eliminates interpretation
Security may ne breached	Security better
Often variable length and alphanumeric	Uniform length numeric
Less compatible with MRP/ Info systems	More compatible with MRP, etc.
Check digit use not practical	Lends itself to check digit
Longer, harder to memorize	Shorter, easier to memorize
More error-prone	Fewer errors
Probably separate document number	Document number part of the part number
Categories usually break down – limited life	No categories, lasts longer

FIGURE 9. Comparison of significant and non-significant identification (Original: Watts, 2012, 59)

When an item is modified so, that the new version replaces the old version, a new revision of the item is created. If the item has alternatives, similar but slightly different options, then those are called variants. In practise, an item can have multiple sequential revisions and parallel variants at the same time (Figure 10). (Peltonen & Martio & Sulonen, 2002,33,36)
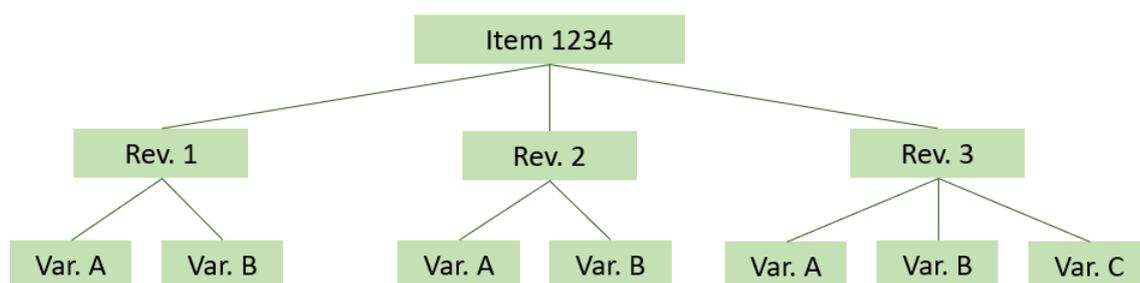

FIGURE 10. Item-revision-variant-hierarchy (Original: Peltonen & Martio & Sulonen, 2002,38)

For a successful item management, PDM should support five different perspectives

1. Life cycle view – showing variations and revisions.
2. Classification view – search function with attributes
3. Language view – item description in used languages
4. Status view – usability of the item
5. Structural hierarchy – showing the parts, which the product consists of

(Peltonen & Martio & Sulonen, 2002, 45-46)

2.4.2 Product information management and the work of an Engineer

Changes in business environment make it hard to maintain, find and store information. Without proper tools it is hard to discover the original source of information and ingredients of the unwanted thread is ready. A huge number of items and the maintaining related to those are problems, which are feeding each other. Users are figuring out their own ways to store data, separating the data to different systems or into users' computers. It makes the information retrieval even harder and slower, causing inaccurate and irregular updating. The solution to prevent this is to improve and standardize procedures. This can be done with PDM system. (Sääsvuori & Immonen, 2002, 97-98)

One of the main single advantages of a PDM system might be improved communication between different departments of the organization and other stakeholders. The system can be used to improve direct data transfer, file transfer and conversions of various storage formats, such as CAD files. With better communication the quality, efficiency and rapidity of the operations can be reached. Also, waste work disappears when well done work can be better utilized. (Sääsvuori & Immonen, 2002, 99)

Engineering is a small part of the actual work of an Engineer. From that, 24% goes to data searching and sharing. 20% goes for the work, which has been done already, because it is faster to do the work again rather than search for earlier work. 14% goes to different meetings, the meaning of which is to share and get project related information (Figure 11). PDM system is a company's tool, which the employees and other organizations members can use to optimize their work. It offers opportunities to develop the rationality and cost efficiency of the supply chain. (Sääsvuori & Immonen, 2002, 99-100)
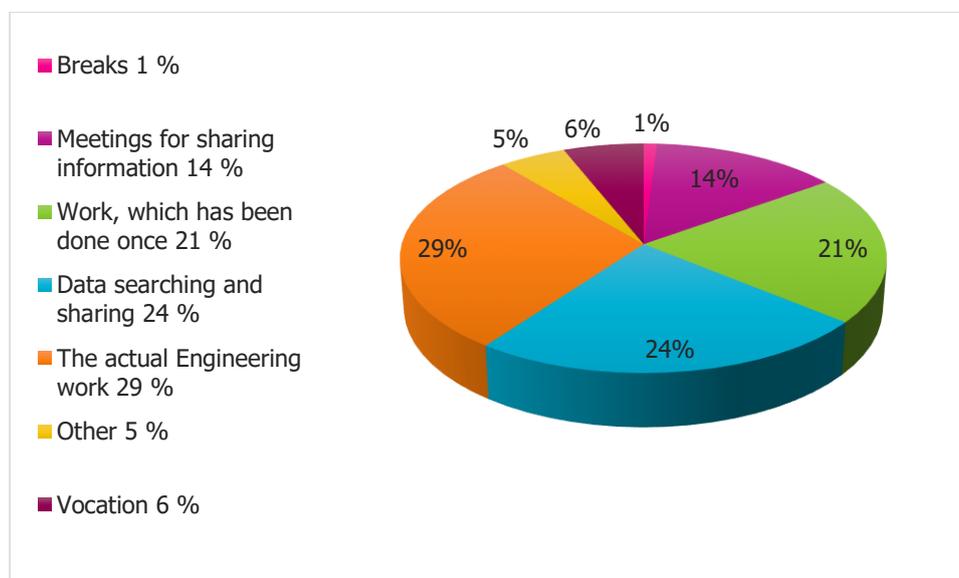

FIGURE 11. The work of an Engineer (Original: Sääksvuori & Immonen, 2002, 100)

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