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EXCELLING IN PROCUREMENT:

IT Contract Management with Lean and Six Sigma

Case study on legacy contract management at Philips Global IT

Master´s Thesis
in IMMIT

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Piotr Olejnik
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1 INTRODUCTION

"The Chinese use two brush strokes to write the word crisis. One brush stroke stands for danger, the other for opportunity. In a crisis, be aware of the danger— but recognize the opportunity." — John F. Kennedy (quoted after: Cassidy & Cassidy, 2009)

In order to stay competitive in today's economy every company has to excel in its operations, should focus on its core competencies and outsource the rest for the sake of reducing costs and reinvesting profits for further R&D and market expansion to stay in a favorable position in the difficult times.

Over the years Information Technology function (IT) has evolved to become a key enabler of business. Its contribution to success or failure of all the enterprises has been visible over the years and lead to plenty of research being made. Legacy in IT is recently a buzz word, which everyone heard but no one gives it attention it requires: '*IT tends to be an aggressively anti-historical field, focusing instead on the Next New Thing*.' (McGee 2005). In big companies, managing IT legacy lies in between procurement and IT delivery departments.

In the world of IT procurement, managing old contracts is not a desired job, neither does renegotiating them with suppliers. Most of the people would like to focus on strategy, building close relationships with suppliers and announcing new, great deals. Few people see opportunities and threats coming from IT legacy in current world. On one hand, effective legacy management can bring substantial hard savings and smooth transition to the desired future state; on the other hand, its mismanagement contributes to serious operational business risks, as old systems are not as reliable as it is required by the business users.

There is very little research on the topic of interrelations between procurement and IT delivery departments. Therefore, this thesis' goal is contribute to better understanding of this field by explaining what the procurement excellence means, presenting good practices in IT contract management and evidence of achieving effectiveness and efficiency by implementing Lean and Six Sigma methodology, principles and tools.

Therefore this thesis will focus on finding answers to the following questions:

- Q1: What Procurement Excellence is with relation to IT?
  - What are the factors contributing to achieving excellence in procurement?
  - What are typical sources of value leakages with relation to IT contract management?
- Q2: What process improvement frameworks are being used in IT?
  - What is Lean Six Sigma?
  - Where Lean Six Sigma concepts can be applied in IT procurement?
- Q3: How and why to implement Lean Six Sigma in IT contract management?

1.1 Research methodology

First an exploratory research is conducted using literature review in the field of IT, as well as literature from Purchasing and Sourcing fields, that both relate to IT contract management.

Further, process improvement methodologies used in IT will be presented with a special focus on Lean and Six Sigma. Lean Six Sigma is among the most popular methodologies in many global organizations in their process improvement initiatives, including the organization where the case study is conducted. This will help to understand sources of value leakages in IT and procurement functions and ways to increase the efficiency of the process.

Exploratory research has been chosen because it will enable the author to present the complexity of managing IT contracts from both IT delivery and IT procurement perspectives, which existing theories do not cover as a whole.

This exploratory research will result in:

- Explanation of the factors contributing to achieving Procurement Excellence in an IT legacy environment, especially with regards to contract management, which answers Q1.
- Presenting frameworks commonly used for process improvements, with a special focus on Lean Six Sigma and its application to IT and procurement functions, which will answer Q2 and will lead to Q3.

Guided by exploratory research in literature, which includes good practices review, a case study research is conducted to answer remaining questions on how and why to use Lean Six Sigma, so will cover Q3. This method of research has been chosen because it is the most appropriate way to answer questions starting with “how” and “why” in research study that focuses on contemporary events (Yin, 2003).

Case study:

- By assessing the state of contract management during Lean Six Sigma project, will provide evidence that Lean and Six Sigma tools can improve efficiency of IT Procurement processes, which will give answer to the ‘why ‘ part of Q3.
- Thanks to following the Six Sigma methodology steps, will show how Lean Six Sigma can be implemented to analyze the root causes of problems leading to and coming from mismanagement of IT legacy contract. This will provide guidelines for achieving operational excellence through IT contract management process improvements, thus answering the how part of Q3.

The case study is performed in two ways:

- First part will be an example of implementation of Lean Six Sigma in operational supplier and contract management process. It is done by researcher by managing a Green Belt project on legacy contract management in Philips Global IT.
- Second part of the case study requires ongoing assessment of the contract management performance from a multidimensional perspective; therefore an evaluation tool will be introduced and used to monitor changes during the project.

Hence, the first part of case study research design will be following the Six Sigma DMAIC phases (Define, Measure, Analyze, Improve, Control), into which Lean concepts and tools will be incorporated where appropriate.

The phases described in the case study include the (D)efine, (M)easure, (A)nalyze phases and partially (I)mprove phase, given the long term nature of procurement processes and limited study time. The implication of this is that the results of the case study will help to identify root causes of bad performance and provide recommendations for improvements (solutions).

Data collection for the case study includes various method of data collection for Lean Six Sigma implementation, what includes usage of historical data, interactions with suppliers, conducting interviews etc.

In summary, the research framework as shown in the Figure 1 will be used.

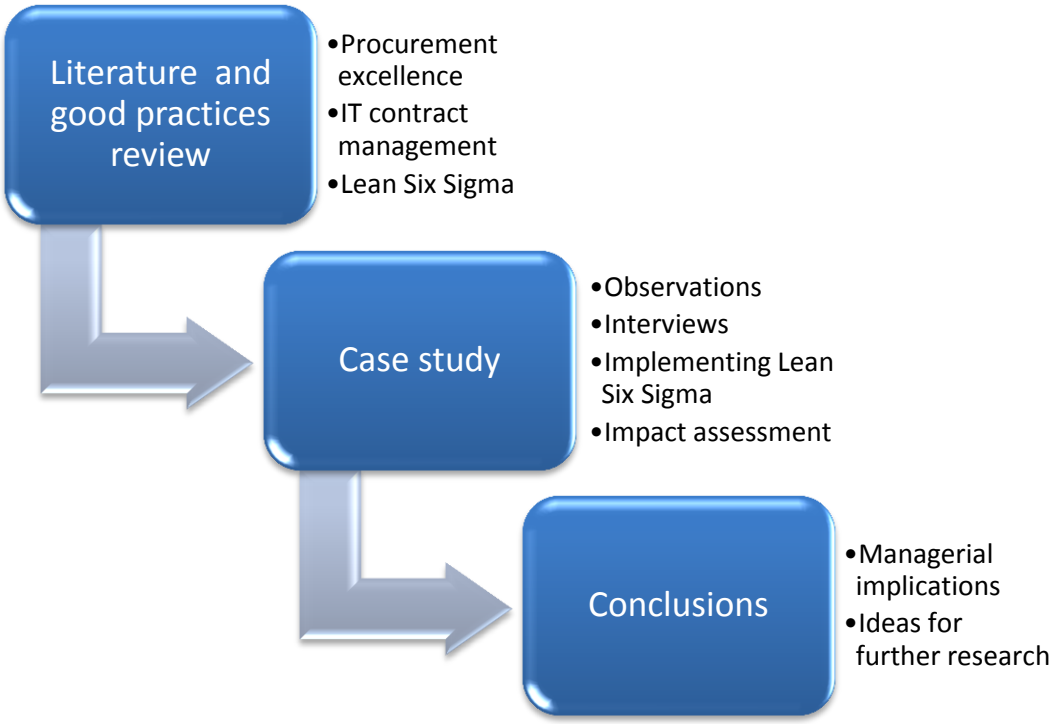

Figure 1: Research framework

1.2 Thesis structure

The remaining section of this chapter will provide more background information on what was the author's motivation to start researching the IT procurement and IT legacy topics. Chapter 2 will provide theoretical knowledge about Procurement Excellence in IT, including literature and good practices review, and will equip researcher with frameworks that can be used in the case study. In Chapter 3, author presents IT process improvement methodologies, in detail – Lean and Six Sigma, together with their application to IT and Procurement. Chapter 4 will be a case study. The primary objective is to provide the evidence that Lean and Six Sigma can be implemented to improve legacy contract management in order to achieve Procurement Excellence and a way to measure its impact. This is followed by discussion on results of the study in Chapter 5. Thesis is closed by conclusions in Chapter 6.

1.3 Motivation for research

Legacy is a buzz word in recent years; opportunity to work in Philips IT Operations and contribute to its transformation towards the new target architecture (Philips Integrated Landscape) in which there will be no place for legacy anymore, is of a great motivation to research this area. This also allows the researcher to get practical insights into Lean Six Sigma methodology (used by the Operational Excellence Team at Philips IT Operations, were author did the case study) and ways the IT departments operate in global companies. Although process improvement methodologies existed for many years already and were deployed in the IT world as well (Cassidy & Cassidy, 2009), there is very little information available about the improvements that need to happen on a cross-departmental level – IT Procurement, IT Operations, IT Delivery, Business Units, external Suppliers. Therefore, it is researcher's contribution to explore this area and build bridges between various functions in the organization for the greater good of the company as a whole.

2 PROCUREMENT EXCELLENCE IN IT

"We buy, we transform, and we sell" (quoted after: Russill, 2010)

In this chapter the researcher defines what constitutes Excellence in Procurement. To do this, first researcher discusses what procurement is. This is followed by review of main determinants of mature procurement departments and effective supplier management. The researcher then discusses the steps necessary to achieve Procurement Excellence, followed by detailed description of sourcing and contract management activities related to achieving best results. The last section of this chapter presents application of Procurement Excellence concepts to IT departments and IT services.

2.1 Procurement

Procurement is a function in any enterprise that focuses on all the activities and processes that lead to acquiring goods and services (www.purchasinginsight.com). Procurement goes beyond traditional thinking about simply buying goods or services, which is now referred to as 'purchasing'. Procurement involves all the activities from establishing the requirements, sourcing, negotiations and purchasing. However, the role of procurement does not end with signing contracts. It is also the responsibility of procurement departments to monitor goods or services delivery, evaluate suppliers and drive improvement actions together with entities directly responsible for those actions.

The role of procurement professionals has changed a lot over the years. In the past, key activity of the procurement professional was to efficiently process purchase orders. In today's world, the key areas of responsibilities expanded to the role of controlling the whole sourcing and acquisition process as well as a change manager and a person overlooking all existing contracts (Sollish & Semanik, 2012).

2.1.1 Procurement maturity

Procurement departments' maturity varies across the industries and within (KPMG report 2008). Depending on the level of maturity, procurement may tend to function in isolation from the business and focus on basic purchasing tasks without looking at the bigger picture. While Procurement department grows and becomes an integral part of a day-to-day life as well as long-term strategy development, Procurement becomes more

and more relevant and central to the business. Cooperation with different units across the business and being involved in the planning, sourcing, lifecycle management and spend analysis is what constitutes great companies – the holistic view on the procurement process, which starts when company determines its needs and ends when the contract no longer successfully delivers the value (KPMG report 2008). According to KPMG report (2008), factors that make procurement mature are:

- Capable and experienced team,
- Strong leadership,
- Top Management support,
- Good understanding of the business,
- Cooperation with different units across the whole organization,
- E2E Procurement thinking,
- Effective supplier management.

2.1.2 Supplier management

In current economy more and more of the value chain moves out to suppliers. Therefore suppliers' input to driving improvements in products and process performance becomes more important than ever. Suppliers' know-how and innovation processes when combined with company's business model can bring mutual benefits for many years (Laseter 1998).

According to Laseter (1998), "A core aspect of good procurement today is to find and build relationships with innovative suppliers, because these will contribute immensely to your competitive edge." Based on McKinsey's report (2011), activities related to developing suppliers' role in the business have the potential to bring up to 40% reduction in total costs. Such collaboration may also reduce overall supply chain and inventory costs by up to 20%, while at the same time increasing revenues.

In order to effectively manage its suppliers, procurement departments require professionals who possess cross-functional skills and can discuss technical decisions alongside with commercial priorities. Those kinds of skills are always in short supply; therefore it is necessary to use them wisely. To achieve that, the most successful companies segment their suppliers, prioritize them and develop a supplier management and supplier relationship strategy for each of them or for each of the groups (McKinsey's report 2011). In Table 1, a sample Supplier Relationship Management model developed by Purspective (www.purspective.com) shows the holistic approach to managing key sup-

pliers, which ensures efficient allocation of human resources. Its main advantage is that it enables organizations to focus on its key suppliers, while still optimizing the whole supply base (Pareto's 80/20 rule).

Suppliers		Building blocks	Actions
All suppliers		Supply base optimization	- Analyze total suppliers base - Rationalize supply base
		Segmentation and positioning	- Product positioning / Supplier preferencing - Organize executives workshop (not only purchasing) to brainstorm - Select the key suppliers' based on organization specific criteria
		Supplier performance	- Decide on type of supplier measurement (objective/subjective) - Supplier measurement system - Implement measurement system in organization structure (follow-up towards supplier; ensure alignment)
	Key suppliers	Relationship performance	- Assess relation based on management components - Relationship Performance Measurement - Use assessment tool to identify improvement issues (mutual assessment)
		Develop working relations	- Organizational structure for relationship management - Set-up communication matrix
		Continuous improvement and implementation	- Implement improvements in organization - Keep track of benefits

Table 1: SRM Model

The key to ensure efficient supplier management is the measurement system. By getting relevant data on the performance, improvement opportunities can be identified and further implemented. Suppliers have to be evaluated according to strict evaluation criteria, with extensive use of data (Laseter, 1998).

2.2 Procurement Excellence

In this part, researcher will explain what constitutes excellence in procurement, what are the factors that contributes to procurement efficiency in IT and will provide a guideline of where the value usually is leaking in IT Contract Management and how those challenges can be addressed.

2.2.1 Procurement Excellence

Excellence is a state that many companies try to achieve in order to stay competitive in the market. Most important is to create an excellence-seeking culture in the organization, because only that can bring sustainable long-term outstanding results. As Aristotle said: "We are what we repeatedly do. Excellence, then, is not an act, but a habit" (quoted after: Cassidy & Cassidy, 2009).

Procurement Excellence is a practice within the organization that enhances operational efficiencies by taking all steps necessary to eliminate value leakages in the procurement process that buying organization shares with the supplying organization. It is achieved by eliminating wastes and creating a seamless End2End procurement flow (Jivani 2013).

Figure 2 presents the steps necessary to achieve procurement excellence in a global organization (adapted from www.purspective.com).

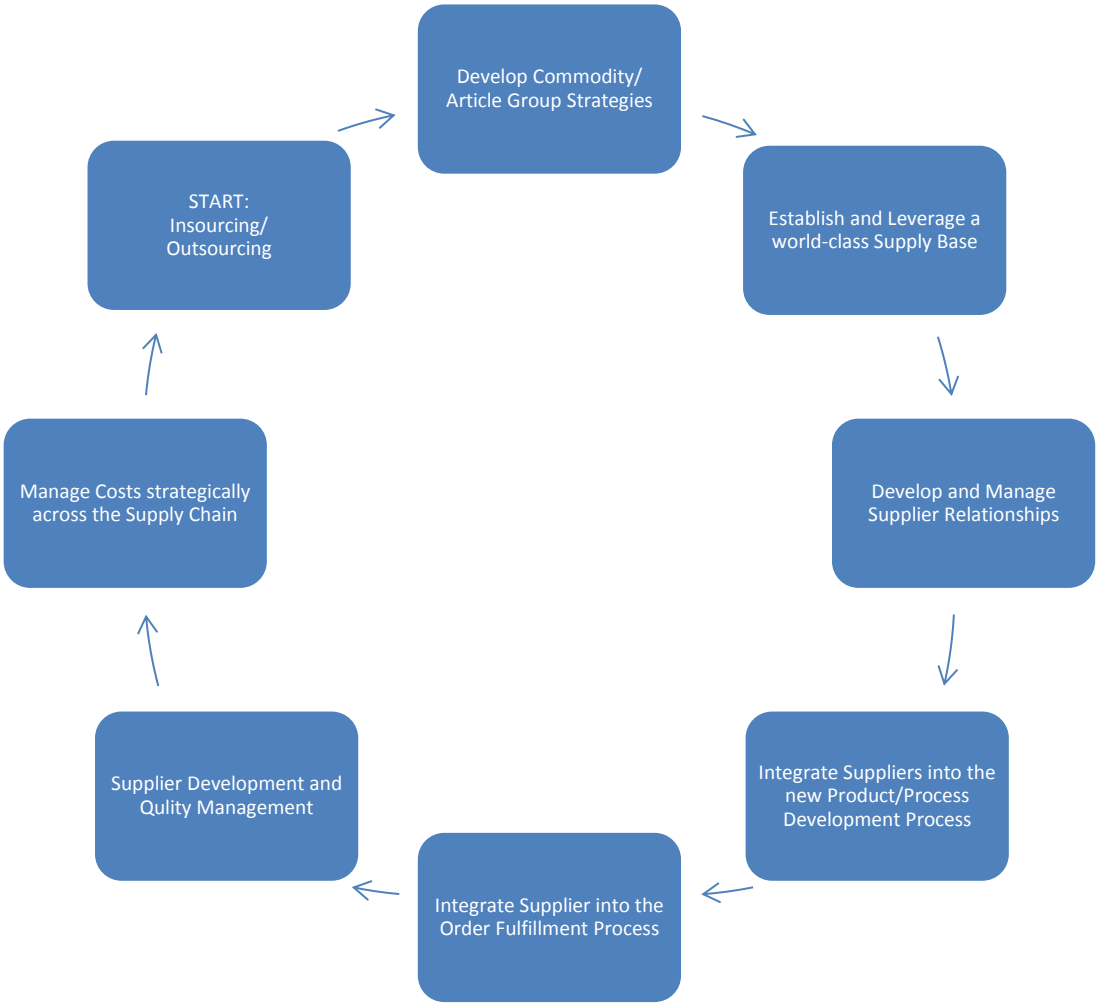

Figure 2: Achieving excellence in procurement

It is important to notice that, as was stated earlier, excellence is not a one-time project. Achieving excellence is an iterative process.

Procurement is a very complex process; therefore it can excel in its subparts:

- Sourcing and supplier risk analysis
- Contract management and spend analysis (http://www.emptoris.com)

Only excelling in both of them can bring substantial and long-standing results.

Next section will discuss how companies can excel in sourcing and after that researcher will focus on the main topic of the thesis – efficient and effective contract management in IT.

2.2.2 Excelling in sourcing

According to Walker and Hampson (2008), the key to successful sourcing, and procurement excellence, is effective cooperation with key suppliers (SRM). Over the years, researchers identified many critical success factors for effective cooperation with suppliers; those are summarized in three essential features of effective partnering between companies, as presented in Figure 3 (Walker & Hampson, 2008).

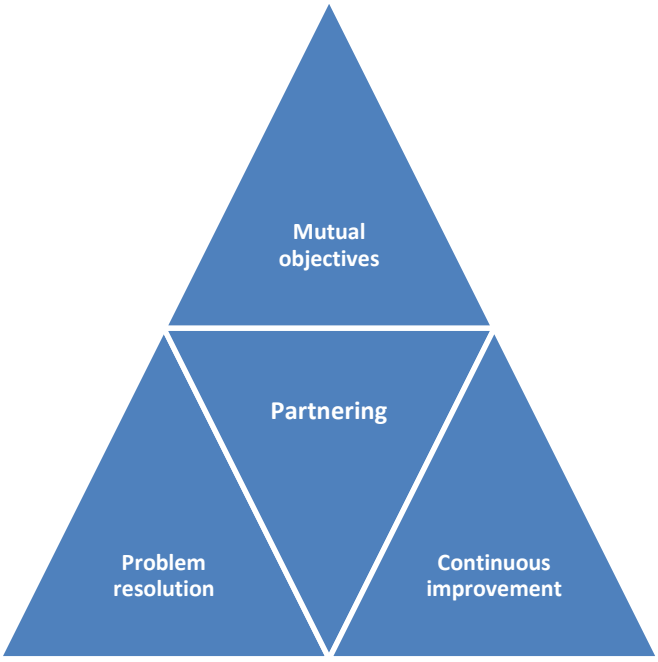

Figure 3: Three essential features of partnering

Mutual objective: Guarantees objectives of both companies are aligned and concentrates on overall success of a relationship, creates a win-win situation. It leads to discussion on trust and commitment.

Problem resolution: Ensures that companies have escalation procedures in place, ready to be followed to solve problems at the very beginning, preferably at the lowest organizational level possible. This leads to trust and performance expectations and guarantees.

Continuous improvement: Linked to the way organizations learn. This requires measuring performance, openness to change and trust in good faith of the other side. The successful partnership should be transparent and gains of both sides during improvements should be clear and attractive to both partners (Walker & Hampson, 2008).

Other factors of a great importance in sourcing include:

- Cost is a factor of a great importance in procurement. Price is considered as the key factor, but nowadays responsible sourcing managers looks for Total Cost of Ownership (TCO). They consider the total cost of doing business with

a given supplier – on top of the price, considered as costs are also: quality control, delivery, purchasing administration and inventory. The goal is to achieve the lowest total cost, which can be achieved through excelling in e.g. purchasing administration and dealing with smaller number of suppliers. In many cases the price is not the most influential factor. This concept of hidden costs is often referred to as 'the priceberg' (price + iceberg) (Cassidy & Cassidy, 2009).

- Quality – is often the main focus of sourcing activities – integration of internal quality standards with those of suppliers, can reduce costs while at the same time ensuring good quality. Receiving goods or services of agreed quality reduces the need of quality inspections and wastes on the production line or service maintenance (Lal 2008). Organizations may implement continuous improvement strategies, that includes suppliers and thus they become an integral part of company's own quality process
- Risk – procurement requires effective risk management as it is dependent on external factors, suppliers, market conditions and behaviors. The procurement process itself is a great source of risk, no risk management in place may cause poor supplier performance, losses in profits, helplessness in dealing with suppliers changing prices, damage to company's image or loss to negotiating leverage, as well as exposure to internal and external frauds (Russill 2010).
- Relationships – long–term relationships ensure stability and cost benefits for both sides. It allows companies to create trust between each other and drive improvement changes together for a greater good of both companies. Long-term relations allow creating special arrangements and therefore reducing administrative costs. Price setting in many cases is also preferential (Walker & Hampson, 2008).

2.2.3 Excelling in contract management

Contract management is the second phase of a procurement process. It starts with a signed contract, defined supplier, product or service, procedures to deliver it, and a customer in place.

Contract lifecycle management "is the process of systematically and efficiently managing contract creation, execution and analysis for maximizing operational and financial performance and minimizing risk" (Office of Government Commerce 2002).

Nowadays it is widely recognized that complex contractual processes need to be automated and improved to satisfy increased compliance and analytical needs. This leads to more formalized and structured contract management process procedures (Elsey 2007).

Figure 4 shows disciplines covered by contract management (KPMG report 2009). Those disciplines represent all the necessary areas of activities in the contract management process in which organization has to excel. In order to succeed in that, formal responsibilities have to be assigned to achieve more efficient process. Those disciplines will be used in the case study (Improve phase) to develop contract ownership matrix (as in Appendix E) – to set for each of them a person responsible, accountable, checked with, and informed (RACI structure).

Figure 4: Disciplines covered by contract management

Reviewing good practices, gave the researcher a framework for assessing the contract management process performance in the case study. Compared to framework presented above (in Figure 4), it focuses on overall state of the process, while the previous one is useful to define roles and responsibilities (internally in the organization). According to KPMG report (2010), organizations must manage five key areas in order to have successful contract management process:

- Relationship governance,
- Commercial management,
- Service definition,
- Performance management,
- Demand management.

Those areas are further explained in Table 2 (adapted from: KPMG report, 2010) and will be used in an empirical research to assess the contract management performance throughout the case study (as in Appendix A).

Area	Objective	Explanation
Relationship governance	Review relationship and contract performance	Fundamental to manage risk, performance and value. Includes sponsorship from executive management and formal involvement of the supplier. Internal governance structures may be created if necessary – especially with complex and global supply arrangements.
Commercial management	Manage cost, pricing, and compliance	A well-prepared platform for delivering addition value from the relationship reduces risk and provides information for price renegotiation. Characterized by fixed output-based pricing, high degree of transparency and periodic audits. It should be supported by a robust risk framework.
Service definition	Define and communicate the scope of services in the contract	Well-defined scope of services provided by the vendor within the contract, characterized by clear communication of services and ordering mechanisms, easily accessible business services catalogues.

Performance management	Control if the service provided meets specified requirements	Effective performance management ensures that the services provided meets specified requirements, has clearly defined Key Performance Indicators (KPIs), is supporting existing Service Level Agreement compliance procedures.
Demand management	Control spend development and minimize scope creep	Drives contract compliance and minimizes scope creep. Controls spend development and ensure actions are taken in time to avoid overspend. Characterized by specific procurement policies which are enforced throughout the entire organization. Controls are in place to challenge and make non-compliant spend visible.

Table 2: Framework for assessing contract management process performance

2.3 IT Procurement Excellence

Previous sections defined Procurement Excellence and all its parts. Theoretical frameworks and good practices have been identified. The following section presents how Procurement Excellence can be achieved with regards to buying and managing IT services.

Information Technology is not only about automation and replacing human labor; IT is used also for informational purposes (Mooney, Gurbaxani & Kraemer, 1996). Over the years, IT increased its value for the business through increased productivity, operational efficiency and improved quality (Amit & Zott, 2001).

Together with becoming more and more capable of supporting business processes the value of IT and its importance for company's performance increases significantly. Increasing complexity of Information Systems, like ERP, requires even more efficient IT-related business support processes as business is relying more and more on systems performance (Bates, Kendall & Haynes, 2003). In recent years we observe a strong move towards digitalization and reducing operational costs with the use of information systems. To achieve that IT delivery department has to catch up and be efficient itself. With that condition fulfilled IT can bring competitive advantage to any industry (BCG report 2005).

IT contracts are usually about providing service or access to IT resources in a longer term, continuously, instead of one-time product delivery. Even if a certain system is

developed by an external vendor, then it has to be implemented and has to be supported. In many cases, those actions are performed by the vendor in collaboration with the client organization. IT services consumes a significant amount of most companies' budgets. Together with its increasing importance for business continuity and value delivery, effective contract management becomes a must for every company that wishes to remain competitive.

IT Procurement Excellence focuses on two areas:

- Sourcing and supplier selection,
- Contract life cycle management:
    - Managing the contract,
    - Managing the SLA,
    - Managing the relationship (Kendrick 2009).

Therefore in this matter the guidelines used in previous sections can be applied for IT services as well. However, those services are on a daily basis handled by IT departments in the organization and IT service delivery managers are responsible for operational supplier and contract management processes, not by the procurement department itself. That implies that, in order to effectively manage contracts, IT has to communicate and collaborate with Procurement professionals. It potentially creates an area of diluted responsibility and inefficiency in change implementation. (Gulledge & Deller, 2008).

The following section will provide a more detailed view on most common IT contract-related problems and potential sources of value leakages in IT Contract Management that prevent organization from achieving Procurement Excellence.

2.3.1 IT contract-related problems

IT problems are mostly an effect of dysfunctioning organization and its procurement related processes (BCG report 2001).

First dysfunction is lack of transparency. Companies simply do not know what they are getting, what they are paying for and how much. This problem may be resulting from a variety of reasons, including poor data, no consistent performance evaluation standards, bad controlling mechanisms and lack of attention from top management that may incentivize the action to increase the transparency.

Second dysfunction is lack of business orientation within the IT departments and sub-optimization. IT efforts are not aligned with company's strategy; on contrary, IT projects are driven by technological development and current trends in IT instead of being driven by business needs. It creates systems and applications that add little or nothing to the business, but are very costly in development and in maintenance (Cassidy & Cassidy, 2009).

Third dysfunction is lack of governance. In many cases, there is either no person responsible for IT strategy creation and implementation or this person lack authority and incentive to eliminate inefficiencies and put contract management back on the right track. Such situations leads to inefficient environments, where contracts scopes are overlapping, contract life cycle is not monitored and corrective actions are not undertaken in time, vendors' performance is not monitored and therefore evaluated, making any complaints or improvement actions impossible.

2.3.2 Sources of value leakages in IT Contract Management

In order to achieve IT Procurement Excellence, a practitioner should assess any potential sources of value leakages. Four common challenges are presented in a Table 3 below (adapted from: Jivani 2013).

Challenge	Value leakage	How to address it?
Compliance with agreed financial terms	- maverick spend - price and payment term discrepancies - limited spend visibility - poor invoice management	Implementing a compliance program which will improve spend development visibility and documentation flow to ensure transparency and immediate reactions to noncompliant behavior

Supplier Performance	- low quality performance - safety procedures are not in place - services performance is not traceable - delivery time breaches agreed terms	Deploy within the organization a comprehensive supplier management framework, in order to apply a uniform assessment tool among the entire organization and to develop and integrate suppliers through clear and robust performance metrics that helps in sourcing activities by optimizing supplier base and reducing risks.
Process Inefficiencies	- poor process design - no standardization of products, processes and behaviors - limited use of new tools	Applying process improvement frameworks to standardize and optimize processes will ensure maximum value is realized. Leverage procurement processes with the use of payment tools such as ePayables to lower transaction costs.
Supply Risk	- inadequate risk management cause volatility in the supply chain - disruption in service delivery causing inefficiencies on the business side	Develop risk management capabilities to measure current state, assess potential risk and create plans for mitigating costly disruptions in the supply chain

Table 3: Sources of value leakages in IT Procurement

Table 3 above presents potential sources of value leakages in IT Contract Management. Tackling those issues is a key to achieve Procurement Excellence. The way how company deals with those challenges can separate industry leaders from laggards and create an edge that will allow company to move ahead of competitors by achieving significant and sustainable cost savings and improvements in quality.

2.3.3 Value leakage in IT caused by legacy systems or services

In this chapter researcher will introduce the concept of legacy systems and services in IT and why does history matter in rapidly changing world of technology from the per-

spective of value creation and value leakage. The last paragraph will present generic strategies for dealing with legacy in the organization.

According to Skalle et al. (2009), over 70% of the typical IT budget is spent on overcoming the limitations of existing systems, while less than 30% is spent on acquiring new capabilities that can provide a competitive edge to the business. If company recognizes also business costs related to additional workarounds required to keep legacy running on an acceptable level and impact of imperfect data on decision-making processes, the problem with legacy in IT becomes crystal clear.

Legacy systems and services are considered to be potentially problematic for several reasons (Bisbal et al., 1999):

- They often run on obsolete hardware and uses software that already for some time is out of support. Maintenance for such systems and services is difficult to be found and may cause increased costs, business risks and may create a situation, if provided by an external party, of a lock-out with a supplier that dictates conditions of contract extensions.
- It is possible that organizations lacks of understanding of a legacy they have, as people who created and maintained them for years are now retired and new employees never fully understood the way old systems worked or why old services were delivered in a way they were. Often when job rotations take place, documentation is lost and learning curve starts from the beginning for the new person handling legacy.
- Legacy systems may not be compatible with new systems; therefore working with both of them creates process inefficiencies for people in the business support functions.

IT is an industry driven by constant technological change and therefore is focused very much on the future, instead of on the past. The Moore's law about doubling the amount of data every 12-18 months also focuses on the future, leaving coping with old things untouched. IT looks towards the Next New Thing instead of looking behind and trying to learn from previous mistakes (McGee, 2005). Disregarding history leads to repetition of mistakes. Therefore, history matters, or at least should matter for companies that wish to be industry and market leaders.

Defining legacy

Legacy can be defined as an old technology, systems, service, or method remaining from the past. It can be remain actively used or can be no longer used but still stored or maintained (e.g. to provide historical data or for legal purposes). (van den Heuvel, 2007)

Understanding of legacy and its definition vary among organizations. The term 'legacy' may have little or nothing to do with the size or age of the system or service use volume. Although the term is mostly used to describe software, it may as well be used for tools and materials in use, as well as human behaviors ('dinosaurs').

According to van den Heuvel (2007), for a variety of reasons legacy can be kept within the organization, sometimes well beyond its lifecycle, what results in hardware and software support and maintenance problems. Such a system may become not reliable, thus risky for company's business operations.

Dealing with IT legacy

There is no one perfect approach to dealing with legacy, their effectiveness varies case by case. In some of them, a combination of several strategies might be very beneficial. Table 4 describes generic strategies, as seen by Lavelle (2005), which organizations can choose in order to deal with legacy.

Strategy	Characteristics	Downsides
Wait	If company is considering abandoning a product or a line of business and until that moment nothing is expected to happen and there are no serious risks attached to such a behavior, organization might decide to leave the legacy system or service the way it is and wait until the expiration clock runs out.	Can make it difficult to ensure service quality level, regulation compliance and may prevent organization from benefiting from existing customer relationship.

Wrap	In some case when legacy works reasonably well, according to its initial purposes, it might be reasonable not to replace is by new system, which might provide small marginal improvements. Reasonable approach is to wrap it up into middleware that will provide legacy system or service with connectivity or functionality that was missing before, e.g. graphical user interface. Wrapping can extend the life of a legacy system or service.	Maintenance becomes even more expensive. Organization leaves not solved the inflexibility problem.
Renovate	Renovation is a conversion of old legacy system into a modern form using a variety of tools, designed for that reason. As it is conversion, not rewriting, it can be done mechanically. Although IT department and end users will have to learn how to use new, converted system, the logic behind will remain the same.	Large scale, expensive project. System remains what it used to be and serves the same needs as the moment when it was originally designed, for less demanding times.
Replace	If previous strategies cannot be applied or expected gains are too small, system or service may be entirely replaced with a new system. Such a system should be carefully planned, both on the technical (requirements, functionalities, demand assessment) and commercial (payback period, NPV, risk avoidance) sides.	Replacement project may take 3-5 years and be very costly.
Outsource	If company does not wish to deal with legacy internally, it may decide to outsource it – delegate any or all of the development, conversion or operational tasks to an outside expert. Thanks to that internal IT resources can be allocated to other, more future-oriented tasks.	Outsourcing brings issues of trust and reliability.

Table 4: Generic strategies for dealing with legacy

3 PROCESS IMPROVEMENTS WITH LEAN SIX SIGMA

"What you get by reaching your destination is not nearly as important as what you will become by reaching your destination." — Zig Ziglar (quoted after: Cassidy & Cassidy, 2009).

Despite the fact that initiatives to improve quality have been undertaken in businesses for many years already, Information Technology, as a relatively young but very dynamic field, opened new opportunities for business practitioners. Therefore, any organization seeking new competitive advantages, turned its focus to process improvements in IT. First moves towards quality improvements can be observed in Europe in early 1990s and in the United States in late 1900s and early 2000s (Cassidy & Cassidy, 2009).

IT delivery department is a one with a huge variety of processes and each of them is a potential candidate for improvement actions. Therefore, over the years, many frameworks were created and deployed by practitioners to serve to optimize processes' performance.

After presenting and shortly describing each of the common improvement frameworks in IT, author will focus in the next sections on Lean Six Sigma and its application in IT delivery and procurement, which is within the scope of this research.

3.1 Process improvement frameworks

Over the years, practitioners developed a variety of frameworks, which are currently, in most of the cases, combined and adapted to company's culture. In order to be effective companies tend to focus on one or two of them and adopt its principles and company's improvement philosophy.

Table 5 below presents the most common frameworks being used in the industry. Please note that this table is not exclusive, and its goal is to shortly introduce different frameworks and how they differ from each other. Table 5 is adapted from the book of Cassidy & Cassidy (2009).

Framework	**Main characteristics**
ITIL – Information Technology	High-level framework of recommended practices used by IT operations. According to the needs of the organization it

Infrastructure Library	can be customized and adapted to show best fit. It serves as a set of checklists and procedures regarding service strategy, service design, service transition, service operation, and continual service improvement. www.itil.co.uk
COBIT – Control Objectives for Information and Related Technology	Similar to ITIL, COBIT is a set of recommended practices for controlling IT processes and its governance. COBIT is an audit framework providing a set of key indicators of performance and control objectives, as well as critical success factors for each of the processes. COBIT covers 4 domains: planning & organization, acquisition & implementation, delivery & support, monitoring & evaluation. Therefore, COBIT leverages ITIL by adding control features to it. http://www.isaca.org/cobit.htm.
ISO – International Organization for Standardization	ISO set standards for quality management systems, recognized internationally. It specifies requirements which products (goods and services, materials, systems) and processes have to meet. It was created to ensure quality, ecology, safety, economy, reliability, compatibility, interoperability, efficiency, and effectiveness. http://www.iso.org/
CMM – Capability Maturity Model **CMMI** - Capability Maturity Model Integration	CMM is a framework used for evaluating and measuring the maturity of software development process, which can be categorized as: initial, repeatable, defined, managed, and optimizing. Related CMMI provides guidance for improving processes to manage the development, acquisition, and maintenance of products or services. http://www.sei.cmu.edu/cmmi
SOX – Sarbanes-Oxley	Accountability standards in business practices for highly-valued public companies. SOX is an additional work when looking at the process efficiency improvement, but is a compulsory methodology that has to be integrated with processes in the whole organization. http://www.soxlaw.com/
Lean IT	Adapted from manufacturing to services, Lean focuses on customers' needs and operational efficiency. It looks on the processes from the value creation perspective and aims

	to eliminate waste in every form. http://www.leaninstituut.nl/artikelen.html
Six Sigma	Data-driven approach meant to improve quality by removing defects and process variation. Six Sigma uses advanced statistics to analyze root causes of broken processes and to improve its performance ensuring long-standing breakthrough results. http://www.ge.com/sixsigma

Table 5: Process improvement frameworks

What can be noticed is the fact that those frameworks are complementary. Each of them looks on the operational excellence from slightly different perspective and uses its own tools for improvement actions. However, wisely used together, can increase the efficiency and compliance of IT processes greatly.

ITIL, COBIT, ISO and CMM (CMMI) focus on auditing and evaluating compliance with a pre-given set of standards. Lean aims to improve operational value and performance (e.g. time-to-market) (Capgemini 2007) and Six Sigma aims at identifying root causes of so called "broken processes" to ensure long-term breakthrough improvements.

Lean and Six Sigma are commonly used, easy to deploy on lower than C-level management level (COO, CFO, CIO, CMO), and have record of great quality and cost savings impact. Therefore, they will be discussed in next sections, together with its application to Information Technology and Procurement functions.

3.2 Lean Six Sigma

3.2.1 Lean

Lean, as by definition developed by the National Institute of Standards and Technology (http://www.nist.gov/mep/), is the pursuit of perfection via a systematic approach to identifying and eliminating waste through continuous improvement of the value stream, enabling the product or information to flow at a rate determined by the pull of the customer (Kilpatrick 2003).

Although Lean originated in the factory and traditionally is used to increase process efficiencies in the manufacturing environment, it can be deployed across the entire organization.

Lean differs from other approaches because it challenges accepted truths, takes the most granular view on processes and follows the activities flow and value creation along the process to draw real situation and have the possibility to spot areas of wastes. Lean promotes teamwork by listening to employees and identifying pain points of their work in order to 'make their life easier', what directly brings significant improvements in the process (Capgemini Consulting 2007).

Lean is not only a set of tools. Lean is about creating a new culture, a new mindset, which aligns to one objective: continuous and bottom-up improvements. Lean is a philosophy that over the last decades transformed many organizations into efficient enterprises. According to Flinchbaugh (2012), 'Lean starts with rules, not tools'.

Fundamental principles of Lean include:

- Flow – striving for optimal flow and no interruptions in the process is one of the main principles of any lean organization. In most of the cases a chain of activities is needed to accomplish given task. If the work is done fluently enough, it can be done without waiting times or (intermediate) stock. Excellence requires specifying and simplifying every flow (Flinchbaugh, 2012).
- Pull – lean focuses on customers and therefore every activity in the process has to have a reason that relates to the customer. No action can be taken in the process if it was not signalized on the customer's side – production or delivery rate is determined by market demand. All in all, making products or delivering services which have not been ordered yet is also a form of waste.
- Value – lean distinguishes three types of activities: value-adding activities, non-value adding activities (business requirements), and waste. During process mapping – value stream mapping, practitioners defines which activities adds value to the customer and which are not. Based on this, improvement plans can be created (Womack & Jones, 1996).

Lean methodology differentiates eight types of waste. They are defined in a universal way and therefore can be easily applied to any industry or process type. Table 6 presents eight wastes with their definition and an example for better understanding (adapted from: Womack & Jones, 1996).

Waste	Definition	Example
Transport	Moving goods or services unnecessarily	Moving prisoners around the country
Inventory	Work waiting to happen, normally in a queue	Email inbox, prisoners waiting to be processed, telephone queues
Motion	The workplace environment has an inefficient layout, which causes extra work.	Officers returning to station to call Crime Recording Bureau when it can be done via their Airwave radio
Waiting	A delay in the process means you wait for something to happen	Waiting for secondary investigation to be carried out before proceeding
Over production	Producing too much of something	Providing more evidence than is required to charge an offender
Over processing	Additional activities being carried out unnecessarily	Inputting the same information into different data capture systems
Defects	Errors/mistakes that cause additional work	Incorrect information being processed
Skills	Wasting the abilities or innovative capacity of your people to solve problems	Administrative tasks done by officers, that could be done by police staff

Table 6: Eight wastes

Lean equips its practitioners with a huge set of tools that can be used to analyze broken processes, improve them or sustain improvement results. Lean tools will not be discussed more in-depth at this point, as the merit of this paper is to show how Lean Six Sigma combined can change organization mindset and drive it towards operational excellence, not to analyze the tools themselves. Some lean and six sigma tools will be introduced in the case study.

3.2.2 Six Sigma

Jack Welch, a well-known CEO of General Electric, said: "What gets measured, gets done!" (John et al., 2008)

Six Sigma is a process improvement methodology, which originated in Motorola in the United States. It was developed from the perspective of quality and its main goal is to maximize the likelihood that products and services will be in line with customer expectations or requirements. The term Six Sigma itself refers to the probability of error occurrence of only 0.00034%. Although Motorola was the first one to use it, only after General Electric successfully implemented it throughout its entire organization and delivered great results, methodology became very popular. General Electric, together with Motorola, introduced judo terms like Green Belt and Black Belt, which identifies the level of knowledge and experience of Six Sigma project managers (Capgemini Consulting 2008).

The strongest point of Six Sigma approach is its reliance statistical tools that can measure the process using gathered data. All the decisions are data-driven; therefore they cannot be influenced by emotions and human bias. Having the data behind your analysis and proposed solutions helps in managing the change within the organization (Ponce & Zahaf, 2004).

Six Sigma is very suitable for solving complex problems with no obvious solution at hand. Six Sigma is then used to identify factors that influence the end result of the process and tackling exactly those root causes, instead of firefighting their outcomes. After this is done, those factors are kept under control to ensure the sustainable high quality of the process (Tjahjono et al., 2010).

The most well-known Six Sigma project methodology is DMAIC. DMAIC, which stands for the steps: Define, Measure, Analyze, Improve and Control. As DMAIC methodology will be used in the case study, the five steps will be shortly described here for better understanding (Costich-Sicker et al., 2002).

- Define

  The main objective of the Define phase is to clarify the problem organization wants to deal with and create a focused project charter. In order to do this, project manager is responsible for determining the voice of the customers; translate their complaints to specific and measurable metrics (only those which are critical to quality - aspects that customers find important, attractive or distinc-

tive) and link project to higher business strategy. At this point, project manager needs to focus his project, gather the team and create a plan for managing stakeholders and change. A key for successful Six Sigma implementation is the presence of a Champion – a senior manager who supports the project and to whom project manager can escalate problems with resources and who determines the direction towards which the project will be going (Sharma & Chetiya, 2010).

- Measure
  The outcome of the Measure phase is a well understood process, which as-is performance is measured. In order to do this, Green or Black Belt needs to map the process, confirm operational definition of a y-metric (process performance metric that needs to be improved), determine process stability and capability, if applicable.
- Analyze
  This phase is considered to be the most difficult. Its objective is to analyze the process in order to determine potential root causes of the problem and verify them with data. The first step is the Cause and Effect Diagram, known also as Ishikawa or fishbone diagram, brainstormed together with the team. Afterwards, root causes are being validated using statistical tools. At this point verified root causes, if applicable, should be quantified with regards to its impact on a process performance.
- Improve
  The fourth phase goal is to improve the process and implement best solutions. In order to do that team generates solution ideas which are later verified with tests and data. New to-be process is designed and risks related to that are well-managed using e.g. FMEA (Failure Mode Effect Analysis) and new solutions are being piloted and performance improvement s tracked.
- Control
  The Control phase objective is to maintain the gains achieved through implementing best solutions. At this moment permanent control methods and standardized control plan are created, improved long-term stability and capability are tracked and confirmed in order to validate financial results and hand over the project to the process owner who can leverage its results to other areas that were out of scope of the original project.

Six Sigma, initially deployed by manufacturing companies who wanted to be seen on the market as offering superior quality products or services, now becomes one of the main philosophies and methodologies (DMAIC) used to become cost-efficient in its

operations (Tjahjono et al. 2010). DMAIC is used to achieve breakthrough process improvement. If not a priority for the organization, methods like Plan Do Check Act (PDCA) can be used.

3.2.3 Combining Lean with Six Sigma

"The whole is more than the sum of its parts" – Aristotle (quoted after: Cassidy & Cassidy, 2009)

For the last half a century Lean and Six Sigma philosophies (way of improving operations) was evolving separately (Salah, Rahim & Carretero, 2010). Lean started with Ford production line and Toyota Production System, developed the whole new system of manufacturing, especially in the automotive industry. At the same time, Six Sigma originated from the works of Deming and was developed by Motorola and General Electric to help create a methodology and tools which will focus on improving product quality. The simplified history of Lean and Six Sigma is presented in the Figure 5 below (Byrne, Lubowe & Blitz, 2007).

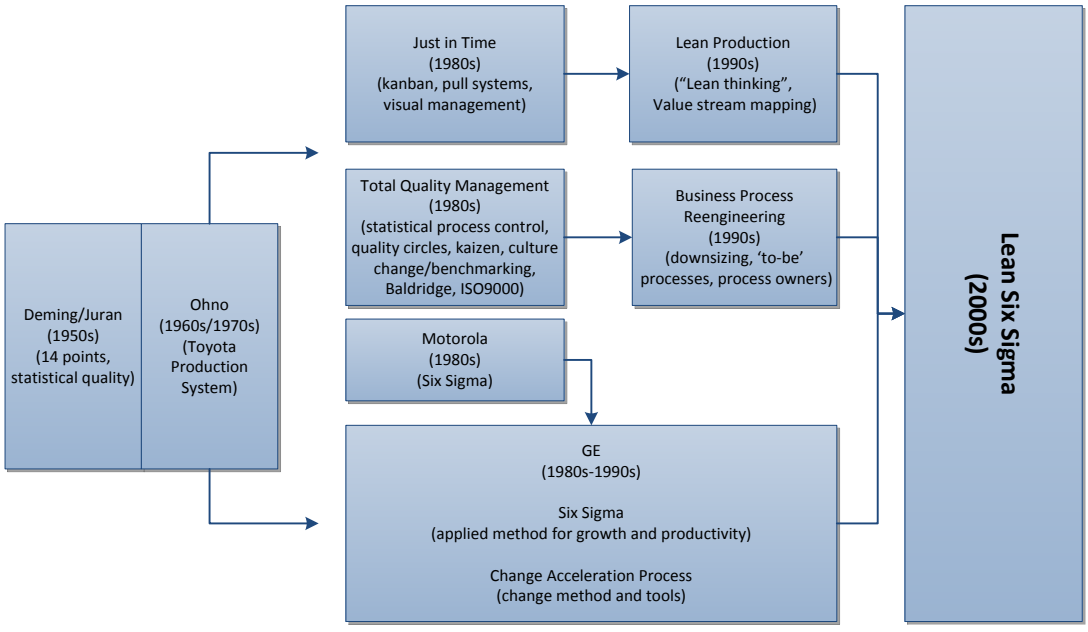

Figure 5: Development of Lean and Six Sigma

In recent years more and more companies decided to combine Lean and Six Sigma (Breyfogle 2012). Lean is applied to reduce wastes – in time and materials, Six Sigma is

applied to achieve good and constant product quality. Combining those two, results in an improved business process which is more efficient and delivers highest quality to customers (Swartwood 2013).

Six Sigma complements Lean by adding statistical analysis that can improve the reliability of standardized, repetitive and high volume processes (Snee 2010). It is not in any way an alternative or a substitute for Lean. Instead Lean Six Sigma is a highly effective set of tools, which is particularly suited to data-rich environments (Capgemini Consulting 2007).

While Lean focuses on efficiency (reducing complexity and eliminating waste), Six Sigma focuses on quality (process variation and reliability). Having those two combined, company can overcome the issues of IT legacy management – cost, quality, and required support time (e.g. time spent by IT delivery department solving incidents and managing escalations). Applying Lean Six Sigma will allow company to achieve better quality at a lower cost, with less time effort (George 2003).

3.3 Lean Six Sigma in IT and Procurement

Lean Six Sigma combined, outside of manufacturing environment are still to be explored. For many years there were companies trying to apply Lean or Six Sigma (or combined) to the Information Technology function. Based on those experiences, an approach will be developed in the case study, showing how to deploy Lean Six Sigma in the IT Operations/IT Procurement environment, and more specifically IT Contract Management. The following sections will present problems with applying Lean Six Sigma to IT and to Procurement and typical areas where waste can be found in both cases.

3.3.1 Lean Six Sigma in IT

The main obstacle towards applying Lean Six Sigma in IT is the need to understand the interdependencies and interconnections between IT activities, as well as root causes of misalignment between businesses and IT. Deployment of Lean Six Sigma in IT function will result in reducing wastes, eliminating complexity, and much higher fit between business needs and IT supply (IT procurement and delivery departments), as well as internal information systems quality and cost efficiency.

Internal IT complexity

When information systems become a crucial part of any business environment, its reliability and impact of low quality becomes more and more important for any organization. More and more business transactions are done electronically and impact of properly operating Information Technology function increases proportionally.

Having that said, a survey was made among 2001 Annual Quality Congress participant (Divoky 2008). 80% of interviewed attendees stated that the IT operations departments in the organization advised them not to apply quality initiatives to the IT function. In their opinion, quality is important, but the tools and techniques of Six Sigma are not fit for the IT function, therefore they should not be used in IT operations departments.

The key to the successful implementation of Lean Six Sigma in IT is better understanding of the interdependencies and interconnections of IT departments' activities. Those processes include stand-alone services (e.g. help desk), development and deployment of hardware and software across the entire organization. Within IT departments, problems are generated also by maintenance activities of long standing applications and systems, which are commonly referred to as 'legacy systems' (Divoky 2008). All those IT processes require special attention and customized approach, as differences between them are significant and root causes will differ as well.

IT-Business misalignment

Over the years, Gartner, a global IT research firm has been asking CIOs of biggest companies to identify their top priorities (Gartner 2009). Nowadays, it is alignment between IT and business - businesses want IT departments to drive growth and create value through alignment.

Lean thinking stresses that every problem is an opportunity for improvement (Womack & Jones, 1996). IT and business stakeholders often find it difficult to find a common ground for successful cooperation and problem solving or even speaking a common language. That resulted in lack of alignment or synchronization of IT departments with business for supporting continuous improvement of business processes. IT, as a critical support function for any business, has to be in line with changing non-IT environment (BCG report 2012). Research made by Boston Consulting Group (BCG report

2013), showed that it is unnecessary complexity - of processes, landscapes and procedures, that causes lack of integration and synchronization between the business and IT.

Lean IT engages people to integrate and align the IT organization with the business, in order to provide best quality information and effective information systems (Bell & Orzen, 2011), which enables the continuous improvement and innovation of processes (Hoerl & Gardner, 2010). Together with Six Sigma and its statistical analysis, IT processes can be improved significantly, what will result in better alignment between business and its enabling function, IT in this case, creating a sustainable advantage for the company in the market.

Wastes in IT

Waste refers to any expenditure of time, effort, or money that does not result in value increase from the customer perspective (Cassidy & Cassidy, 2009).

The Table 7 below presents combined information from Cassidy & Cassidy (2009) and Capgemini (2007), on where wastes can be typically spotted in IT organization.

Issue	**Resulting waste**
Repeatedly fixing the same incidents	Duplicating effort and time spent
Reworking failed changes	Cost of bad quality (errors)
Solving problems and writing software that already exists elsewhere	Overproduction and wasting resources
Maintaining data in multiple places	Increases data inventory level
Maintaining assets (e.g., software, applications, network lines) that are not used by the business	Defects – legacy resulting from misalignment between business and IT
Late detection of errors	Time, effort, and money in remediation
Unreliable service, poor system availability and performance	Business disruptions: lost revenue, lost opportunity, or lost productivity
Demotivated employees	Not utilized skills: not achieving full productivity

Table 7: Wastes in IT organization

3.3.2 Lean and Six Sigma in Procurement

This section will look holistically on what is necessary for successful Lean Six Sigma implementation in procurement environment. Following discussion about empowering people, typical areas where wastes exist in procurement, in order to set a basis (together with typical wastes in IT organization) for root cause analysis in the Analyze phase of the case study.

Empowerment of procurement professionals

A continuous improvement mindset needs to be embedded within the organization and procurement professionals need to be genuinely empowered to make changes to activities. A lean culture where there is top management focus, and cross-functional collaboration across the entire organization, is a key to achieving great results in procurement with Lean (Griffin-Cryan et al., 2011). In many cases procurement acts in an organization as a side-support function and cannot influence process and product owners. This initiative has to be organized in collaboration with all involved parties and with full support of top management that can empower procurement departments to drive changes in the organization (Rudzki & Trent, 2011).

With deployed Lean principles, in procurement chain of activities, value is added at every step in process depending on the requirements of the customers. Procurement professionals require data with high accuracy and at the right level of aggregation, in order to make best decisions, while keeping in mind the voice of the customer. That creates a great ground for Lean Six Sigma deployment.

Wastes in Procurement

Procurement departments are not exceptions in the organization and also exist in inefficient environments. Such a situation creates a place for improvements. Over the years, Capgemini Consulting developed a guide (Williams 2012) for looking for wastes in procurement. The common areas where wastes can be found are summarized in the Table 8 below. Those will be helpful in the case study to determine potential root causes in the Analyze phase.

Waste type	Area to examine
Transportation	Invoice management (flow, accessibility)
Inventory	Purchase Orders (backlog, combining several POs)
Motion	Contract Negotiation (documentation exchange)
Waiting	Contract Negotiation (duration of negotiations)
Overproduction	Reporting
Overprocessing	Contract's level of detail
Defects	Contract changes

Table 8: Wastes in Procurement

4 CASE STUDY: LEGACY CONTRACT MANAGEMENT AT PHILIPS GLOBAL IT

The case study is conducted in Philips for a period of six months from February to July 2013. The main objective of the case study is to provide evidence that Lean Six Sigma can be successfully implemented in IT Contract Management area. In order to assess the impact Lean Six Sigma project, ongoing monitoring of the contract management process performance will take place using predefined framework (see Chapter 2.2.3 and Appendix 2). Of secondary importance is to demonstrate the difficulties Lean Six Sigma practitioner has to face while running an improvement project in IT environment. Following a brief case study background, section 4.2 will describe steps taken in each phase of Lean Six Sigma implementation and section 4.3 will present results of the ongoing assessment of the contract management in Philips.

4.1 Case background

Philips is a Dutch company, established in 1891 as a light bulb manufacturer. Nowadays business of Philips has expanded, resulting in global presence in three key sectors: Healthcare, Lighting solution and Consumer Lifestyle products.

In 2011, Philips adopted the New IT Operations Operating Model, which changed its structure and defined the goal for the next years – build the Philips Integrated Landscape (PIL). PIL looks far to the future and is a long term architecture development strategy. In short term, the objective of Philips IT is to provide best quality support to the business, while at the same time trying to reach operational excellence. As a result of a bad economic situation in the world, Philips was forced to look at its own cost structure to find significant savings, what would help to keep Philips in the position of the market leader. In order to achieve that an Operational Excellence Department was created within Philips IT Operations, which goal is to standardize processes, monitor performance and optimize spend.

Focused Service Improvement programme was introduced to implement Lean Six Sigma in IT Operation, with the short term objective to identify and harvest cost savings opportunities. Appropriate project methodology is selected based on the nature of the problem and scale of improvements (look at Appendix B). In 2012, more than 20 Lean Six Sigma projects were run, which brought savings of 10% of the planned IT Operations department budget for coming 2013 year. In order to explore the full potential of

improvement in IT Operations, external Lean and Sourcing consultants were hired in the period of December 2012 - February 2013 to identify areas in which there are opportunities for further improvements. This opportunity scan set up a base for running a Lean Six Sigma projects on contract management process with a special focus on legacy contracts/services with 'Supplier A'. It was estimated that improvements in this area can save up to 25% of costs, under the precondition that business cooperates with IT to rationalize demand. The researcher, also involved in this scan, decided to follow up on this topic and started a DMAIC project on the broken contract management process. DMAIC is used to achieve breakthrough process improvement. If not a priority for the organization, methods like Plan Do Check Act (PDCA) can be used.

The following section will present the project run by the author of this thesis in a Green Belt role. Due to time limitations and time consuming nature of implementing changes in procurement processes that involves IT and Supplier, it will describe D, M and A phases of the Lean Six Sigma implementation, as well as will give recommendations for process improvement as part of I-phase.

4.2 Implementation of Lean Six Sigma

In recent months, initiative was taken within Philips sectors Lean Six Sigma practices to come up with the same methodology, tools, templates and certification requirements. This was achieved and Figure 6 presents the DMAIC methodology deployed across the entire Philips organization. Appendix B presents where DMAIC methodology is applicable. During the case study the project will follow the same steps and in the same order. Each phase will be shortly described and 'learning boxes' will be added at the end of each section to provide real, practical experiences for future projects on implementing Lean Six Sigma to contract management in IT environment.

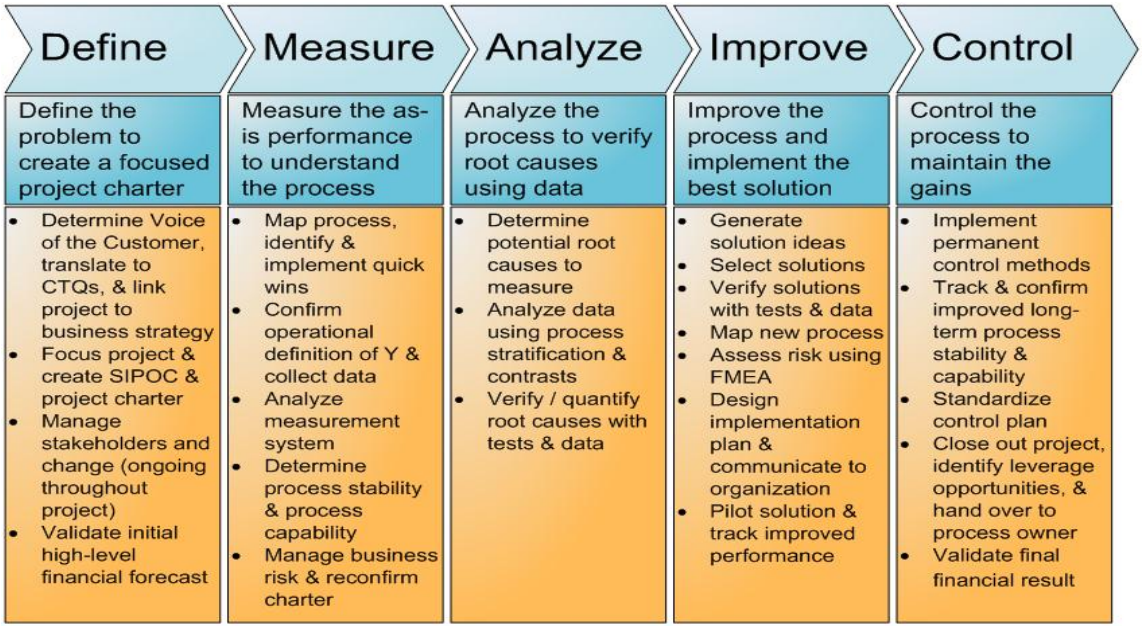

Figure 6: DMAIC methodology deployed at Philips

For the case study and Lean Six Sigma project a significant number of people across the organization were interviewed, which list can be found in Appendix C. Interviews had a semi-structured form, example of which can be found in Appendix D.

Define phase: Definition of the problem

This project was performed as the first one of the whole stream of projects on contracts with Supplier A, therefore, no previous information was available and good practices in contract management in IT Operations at Philips did not exist in practice.

Having at hand a set of areas to examine as a base for the project, Voice of the Customer was further obtained by interviewing Philips IT managers, in order to better understand the nature of the problem. Discussions with Philips managers helped to understand factors and measures that really matters to the IT Management Team – those, identified in the Define phase, set up a set of results top management would like to see at the end of the project:

- reduced operational costs,
- eliminated legacy in order to prepare for PIL introduction,
- added transparency to the contractual spend,
- created visibility in the process.

Having such a variety of goals to achieve, decision was made to focus on the content of the contract as the best way to measure contract management performance. Primarily effective legacy contract management goal is to reduce the usage of legacy or its total replacement. Therefore number of billable items in the contract have been chosen as a primary metric (y-metric). Achieving this requires also efficient and transparent processes.

Legacy discovery: in order to narrow down the project to the manageable scope, 15 managers of contracts with Supplier A were interviewed (structure of those interviews can be found in Appendix D). This helped to discover the potential for savings in those contracts and to spot the biggest pain points and mismanaged contracts. Therefore for the project and case study, the worst-managed contract (‘Contract B’) was chosen, using problem/project definition tree, as it will highlight all the process problems. Contract content is about Output Management services for Philips Lighting sector in EMEA region

Interviewing contract managers made it clear that a state, in which contracts lack attention and control, creates a situation where performance is not reviewed, there are no initiatives for improvement and as a result no changes for better are implemented.

During the interviews and scoping the term ‘legacy’ had to be defined. Therefore the team came up with its own definition:

IT Service is 'legacy' if the IT Service is reaching end of contract period and

- Either it does not align with actual strategy anymore (business and/or IT), so becomes obsolete,
- And/or could be replaced by alternative (cheaper) solution.

Developing SIPOC (supplier, input, process, output, customer) and plan for managing project stakeholders brought up to light the fact that IT contract management at Philips is clearly a cross-departmental issue, that will require cooperation between various actors within IT Operations, Philips Purchasing Group (PGP) and Supplier A. Also the right level of sponsorship within the organization had to be secured. For that reason, Head of IT Operations has agreed to act as an Executive Sponsor for improvement actions on contracts with Supplier A.

The Define phase has been concluded with a business case, stating that mismanagement of the contract causes significant reoccurring costs every year and that improving the process and lowering the y-metric by 30% is in line with higher level strategy to replace legacy with target architecture in near future (PIL).

Figure 7 below presents lessons learned about implementing Lean Six Sigma for contract management in IT Operations in the Define phase.

Definitions – carefully focus the project, set the right primary process performance metric and ensure that everyone uses the same definitions, e.g. for the term ‘legacy’.

Resistance – in order to break resistance from the people in the organization, the right level of executive sponsorship has to be secured, project champion needs to have the whole process in control, project team needs to be cross-departmental and expectations towards the project have to be clearly defined from the very beginning.

Focus – contract management process has to be in the center of improvement initiative/Lean Six Sigma project, project manager needs to be very careful not to fall into improving the content of the contract, just because this can bring savings in the short term, the role of Green/Black Belt is to improve process to enable follow-up contract content improvements.

Figure 7: Learnings (D-phase)

Measure phase: Looking at the process and measuring its performance

The goal of the Measure phase is to understand the process and measure as-is performance of contract management.

In order to understand the process, one has to go to the Gemba – an activity originated in the Lean environment. That means that Lean Six Sigma practitioner has to follow all the activities involved in the process, look from behind actors' shoulders on the actions they perform, documents and information being transmitted and measuring the time of each and every activity, if applicable. Significance of the Gemba walk for mapping the process, understanding its flow, people complaints and bottlenecks, cannot be overestimated. That way a Green/Black Belt can acquire valuable knowledge that further might be crucial for the understanding of the root causes. At the time of the Gemba walk, project manager works with all the actors involved, creates relations with them and get insights into the problem.

Gemba walk for contract management process with regards to 'Contract B', showed significant differences between process map that can be found in the GSOP (Global Standard Operating Procedures) repository and the actual process map. It showed that process is not performing according to the procedures; many steps are overlooked, therefore showing the problem of the process deployment in the organization.

Once the as-is process is mapped, measurements need to take place. For that purpose operational definition of a primary metric has been created, as in Figure 8. The primary metric defined on such a level (billable items) will be used for assessing the stability and capability of the process and can later be reused in other projects. However it brings the focus of the project also to the content of the contract, it was decided that it will well represent the strategic goal of Philips to replace the current legacy technology (and contracts) with a new target architecture, and therefore bringing the number of items in the legacy contracts to zero (in the long-term).

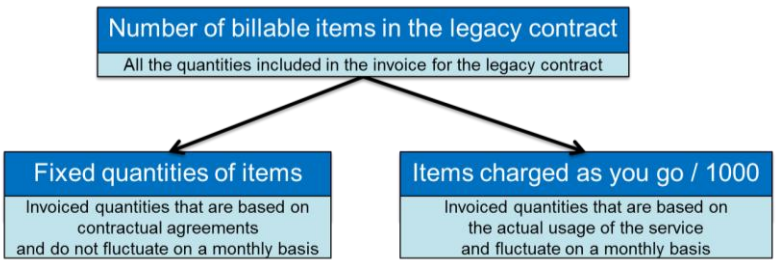

Figure 8: Operational definition of primary metric

Having a proper definition of the primary metric and a data collection plan (what involved supplier), reliability of the metric had to be assessed. For that reason, Measurement System Analysis was performed. Drilldown showed only one potential risk of y-metric inaccuracy – risk that variable quantities are not measured properly by the Supplier A. In order to assess this inaccuracy Supplier A was requested to provide details of the usage of those items. The data received was then compared with the data in the invoices for the respective periods. Six Sigma offers its practitioners several ways to use statistical methods to assess accuracy of the data, as presented in Figure 9. Sources of variability within the measurement system can be attributed to either accuracy – measurement system averages; or discrimination – measurement system resolution; or precision – measurement system variability. In described project the only issues may occur with regards to the precision problem. Therefore Gage R&R study is applicable, however could not been performed due to lack of data. Therefore comparison was made for two measurements periods between the data in the invoices and in the reports provided by the Supplier A. It showed less than 1% mismatch between them, what was explained by the supplier by the differences in invoicing and system reporting periods. Therefore measurement accuracy was concluded to excellent (noise <1%) and measurement system to be reliable.

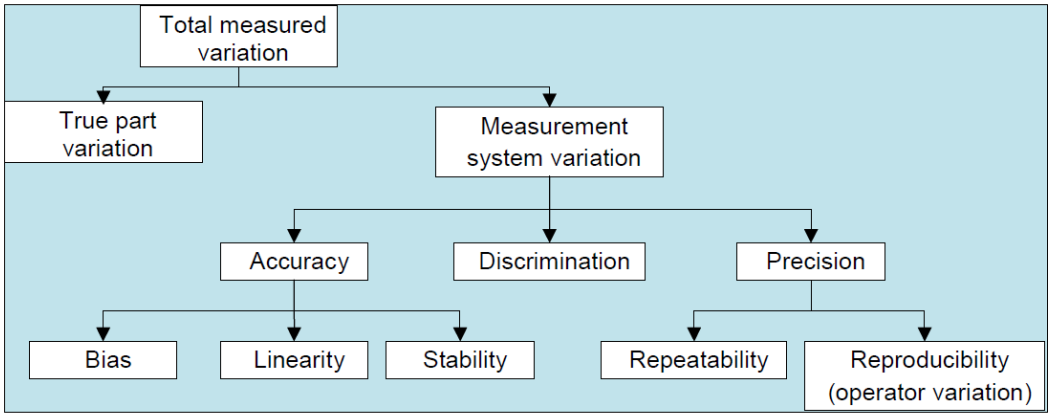

Figure 9: Measurement system analysis (MSA)

Next step, after assuring common understanding and level of detail of the primary metric, collecting the data and its reliability, is to defining process stability. Stability refers to the stable mean and standard deviation. In order to asses this, a trend chart and I-MR chart (using statistical analysis software – Minitab) have been created using the gathered data for the last 12 months. It showed very small downward trend, stable mean and relatively low variation.

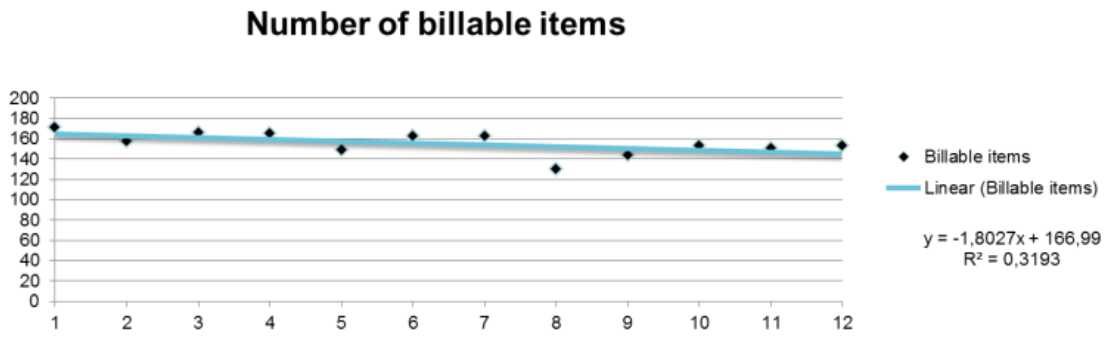

Figure 10: Process stability (trend chart)

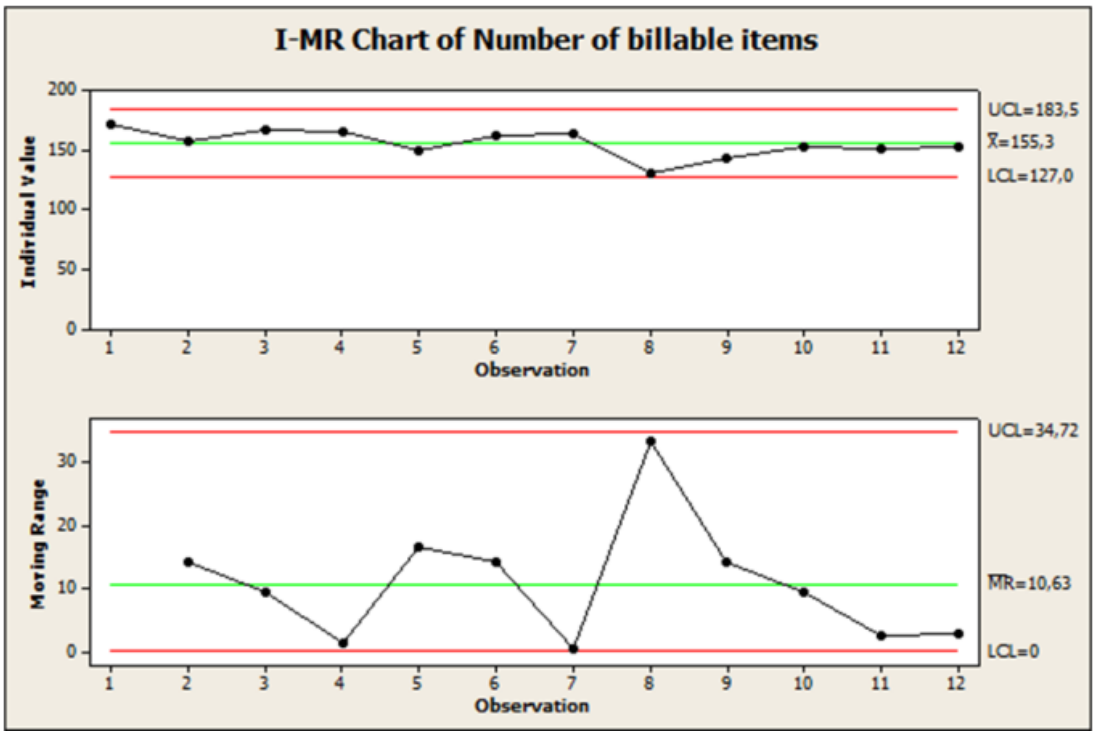

Figure 11: Process stability (I-MR chart)

The Measure phase has been concluded with a reconfirmed project charter, well understood and documented process and accurately measured (<1% of noise) as-is performance. Stability of the process was assessed and proved to be stable in the observed period (one year) – therefore any sustainable changes in the performance can be claimed as results of the improvement actions of the Lean Six Sigma project and Green Belt himself.

Figure 12 below presents lessons learned about implementing Lean Six Sigma for contract management in IT Operations in the Measure phase.

Process mapping – probably the most important part of any DMAIC project, without proper understanding of the process, factors and actors, no serious analysis can be done and proposed solutions might be very unrealistic (good only on paper). Every process activity has to be understood and mapped, every assumption challenged, each and every actor involved in the process should be contacted to give his or her input for improvements and to provide explanation (with proofs) of current situation. Process mapping has to be executed during the project, cannot be copied from the past, process maps soon become outdated. Going to Gemba / walking the process is a source of a great value and a must-do for any Lean Six Sigma professional.

Primary metric and data availability – one of the biggest advantages of Six Sigma is its focus on data and statistical analysis. In order to perform analysis on mean and variation, data has to be accessible and at the right level of aggregation. This requires preparation and collaboration with supplier (if no internal measurements are available). Make sure that y-metric truly represents process performance and is well-understood by the whole team.

Figure 12: Learnings (M-phase)

Analyze phase: Identifying root causes of bad process performance

The objective of the Analyze phase is to analyze the process, brainstorm potential root causes and verify them using data (statistical hypothesis testing, if data is available). As a result of the A-phase a list of proven root causes together with their impact on primary metric is delivered.

A-phase is often considered as the most difficult, and yet most insightful, part of the DMAIC project. The common practice among IT employees is to jump directly from the problem to the solution, without investigating what is really causing the problem. In many cases such actions are only 'firefighting' the actual problem and are neither effective, nor efficient, nor sustainable in the long term.

The primary tool used for brainstorming about potential root causes is the Cause and Effect (C&E) diagram – also known as Ishikawa diagram or fishbone diagram. It is a useful visual tool for organizing information to establish, clarify, and explore the relationships between an effect and its main causes. C&E Diagram assists in reaching a common understanding of a problem and its potential root causes/drivers. There are three high level steps to create a C&E diagram:

1. Write the problem statement at the head of the fish,
2. Determine the major categories (causes) of the effect,
3. Identify potential root causes.

C&E diagram developed for the case study project is presented as Figure 13. It was developed using an affinity diagram approach: team brainstormed and listed all potential causes on sticky notes, clustered them, and found a meaningful name for each of the categories. It focuses on four main categories of the effect, which is mismanagement of the contract that results in excessive amount of billable items in the legacy contract. Four categories presented are:

- Poor invoice management,
- Degrading quality of service,
- Misuse of contracted service,
- And ineffective governance structures.

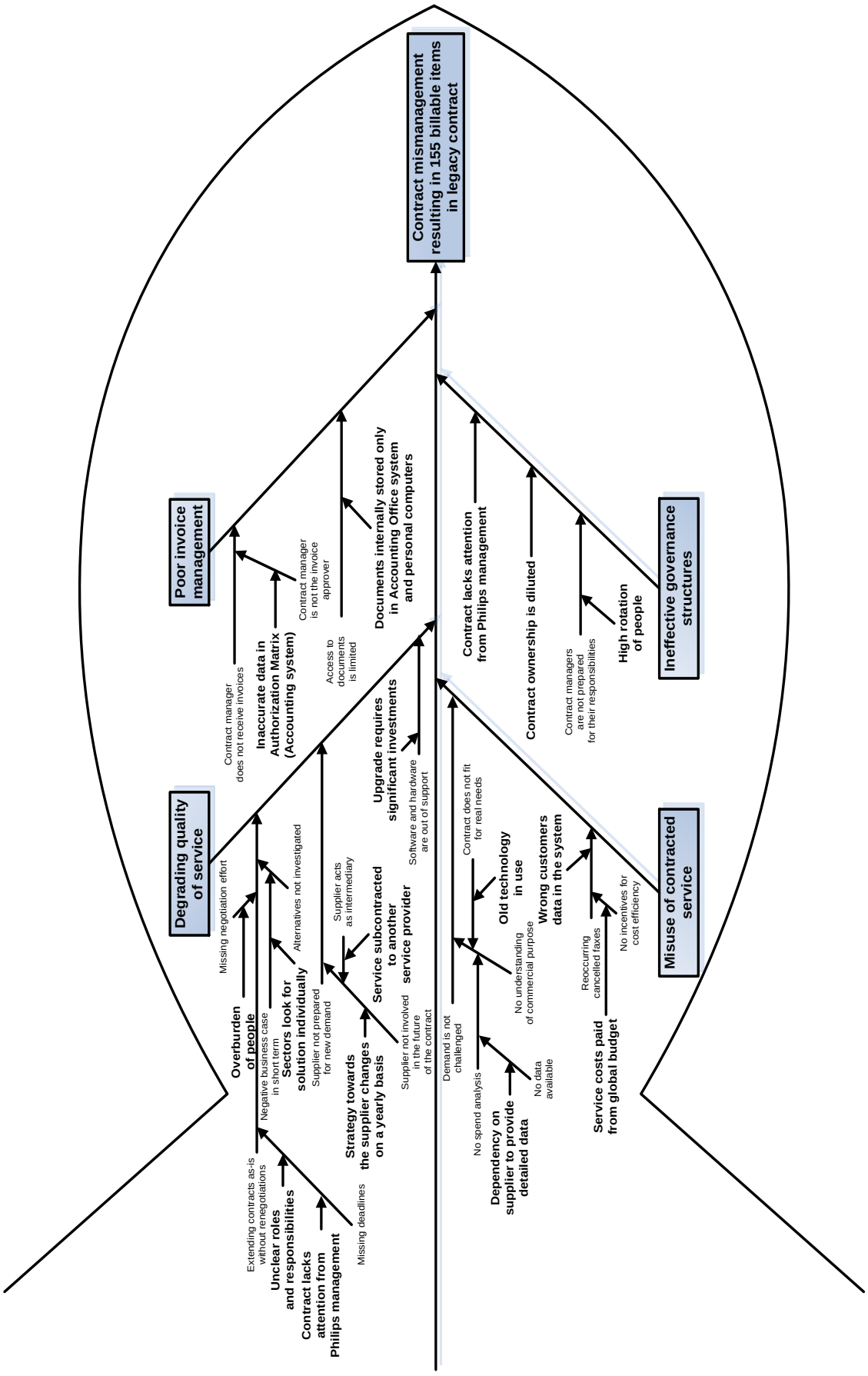

Figure 13: Cause and effect diagram (Ishikawa diagram)

Thanks to asking several times ’Why?’ team was able to discover the real root causes of the visible problems. Potential root causes of bad performance of contract management process in Philips IT were as follows:

- Inaccurate data in the accounting system causing poor invoice flow,
- Storing documents only in Accounting Office systems causing retrieving them highly problematic,
- Overburden of people causing simple extensions of the contract instead of putting effort to renegotiate it,
- Unclear roles and responsibilities and lack of attention from Philips management also contribute to contract extensions,
- Sectors looking for solutions individually stops from aggregating the demand for the service and therefore stops the process of looking for alternatives to the contract (negative business case),
- Upgrade of the legacy technology requires significant investments
- Strategy toward Supplier A changes on a yearly basis,
- Dependency on external partner to provide detailed for analysis and to help understand the commercial purpose of the service usage,
- Having and using old technology that no longer fit the reality and needs of the business (customer),
- The situation in which service costs are paid from the global budget causes business units to have no incentives for cost efficiency,
- Wrong customer data causes defective service to be delivered by the supplier,
- Contract ownership is diluted,
- Rotation of people, on both Philips and Supplier A side, is very high, causing discontinuity.

Having more than a few potential root causes, it was decided to prioritize them to focus the efforts and use resources efficiently. For that reason the Cause and Effect Matrix has been deployed. C&E matrix is a simple Quality Function Deployment (QFD) that uses people’s subjective knowledge of the problem and/or process to make logical decisions. It is used to relate and prioritize a set of inputs to a set of outputs through numerical ranking, the results of which will be a prioritized set of inputs with which to focus our data collection efforts.

A C&E matrix is a converging tool, used here by the team to help narrow the focus of which potential root causes to measure. After the selection was made, data will be used to validate the results of the C&E matrix, using statistical hypothesis testing if applicable. A great advantage of the C&E matrix is that it forces the team to discuss how

each input can affect each output. Many times a team member will have special knowledge about how a particular input can influence a particular output that can significantly affect solving the problem, therefore it must be a group exercise, especially if the process to be improved is contract management - experienced contract managers are a must.

A prioritization for the potential root causes discovered is presented in the Figure 14 below. Prioritization matrix helped to narrow down the number of potential root causes by one third, what helped to focus efforts on most influential ones.

2. Rate importance of each output to the customer →	6	8	4	10	
1. List outputs - project CTQs, primary and secondary metrics →	Performance management	Cost management	Relationship management	Impact on Y-metric	
3. List inputs - input/process indicators, potential root causes ↓	4. Rate the strength of the relationship - the effect of each input on each output ↓				5. Prioritize on total score ↓
Sectors look for solution individually	5	9	5	9	**212**
Old technology in use making contract not fit for business needs	9	5	5	9	**204**
Wrong customers data in the system	9	5	1	9	**188**
High rotation of people	5	9	9	5	**188**
Contract ownership is diluted	3	5	9	9	**184**
Inaccurate data in Authorization Matrix (Accounting Office)	0	9	3	9	**174**
Documents internally stored only in Accounting Office system and personal computers	0	9	3	9	**174**
Dependency on supplier to provide detailed data	3	9	5	5	**160**
Strategy towards the supplier changes on a yearly basis	5	5	9	5	**156**
Service subcontracted by supplier to another service provider	5	5	9	3	136
Unclear roles and responsibilities	1	5	5	5	116
Overburden of people	5	5	3	3	112
Service costs paid from global budget	0	9	0	3	102
Contract lacks attention from Philips management	1	3	5	5	100

Figure 14: Cause and effect matrix

Following the prioritization, each of the selected potential root causes was being investigated in order to provide the evidence of it being an actual problem or not. For that reason, various methods were used – statistical testing, clear logic backed up with data, organizational knowledge, etc. Results of the validation of potential root causes are presented in Figure 15.

#	Root Cause	Proven?	Type
1	Sectors look for solution individually	Yes	Directly affects Y-metric
2	Old technology in use making contract not fit for business needs	Yes	Directly affects Y-metric
3	Wrong customers data in the system	Yes	Directly affects Y-metric
4	High rotation of people	Yes	Showstopper
5	Contract ownership is diluted	Yes	Showstopper
6	Inaccurate data in Authorization Matrix (Philips IT Accounting Office)	Yes	Showstopper
7	Documents internally stored only in Philips IT Accounting Office system and personal computers	Yes	Showstopper
8	Dependency on supplier to provide detailed data	Yes	Showstopper
9	Strategy towards the supplier changes on a yearly basis	Yes	Showstopper

Figure 15: Validated root causes

All the selected potential root causes were validated with data. Three most important root causes (as in prioritization matrix) are directly affecting the primary metric; others are so called showstoppers (process enablers). For the Improve phase, the showstoppers have to be addressed first and then those that affects the y-metric. In many cases there will be more than few root causes, therefore it is important to assess its impact and using the Pareto 80/20 rule to select the ones to be addressed in the I-phase. Pareto charts rank root causes to drill down into a problem to discern the "Vital few" from the "Trivial many". This was used to assess the impact of three root causes and as a result, it can be clearly seen from Figure 16 that the impact of first two (combining demand and making the technology fit for business needs) is much greater than the third (wrong customer data in the system). Therefore, logical thing to do in the Improve phase is to focus on showstoppers and two root causes directly affecting y-metric.

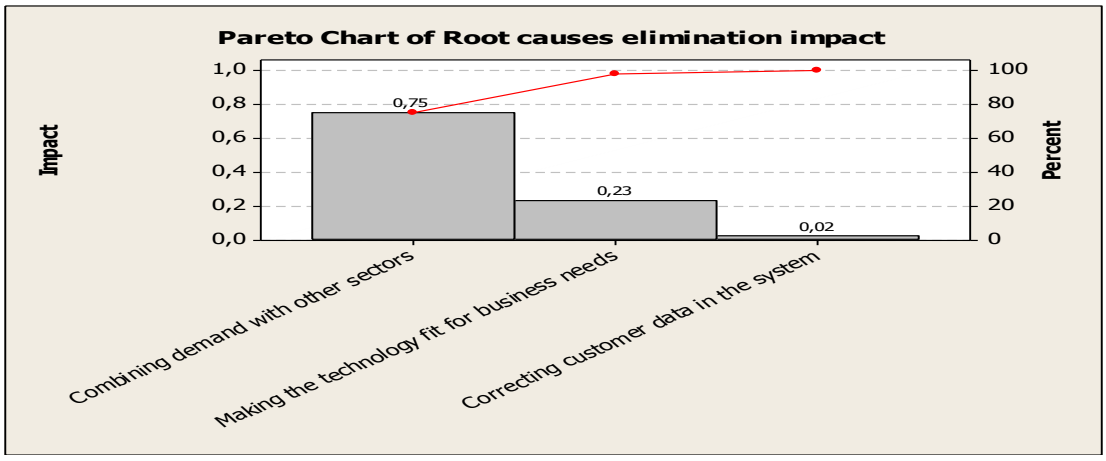

Figure 16: Applying Pareto 80/20 rule

Figure 17 below presents lessons learned about implementing Lean Six Sigma for contract management in IT Operations in the Analyze phase.

Depth of the analysis – exploit thinking in terms of X's affecting the Y's in a process which is equivalent to what are the processes and inputs that affect the output; when analyzing the root causes, use the team to come up with potential root causes, and ask them 5 times why (Lean tool) to get to very specific and addressable causes of the problem.

Root causes vs. solutions – be careful not to confuse root cause analysis with developing a solution. The purpose of the A-phase is to understand what is causing the bad performance, not what can be done. Such a behavior may limit creativity in the Improve phase, especially with regards to technological constraints.

Efficient use of resources – with the IT departments shrinking, less human resources are available, and use of their time has to be efficient. Once the potential root causes are brainstormed using the Cause and Effect Diagram, Cause and Effect Matrix should be used to focus the analyst efforts on potential root causes that may have the highest impact on y-metric, the highest severity or feasibility to address. Those activities have to be performed together with the team as they may have an expertise in the topic, e.g. invoice management, required to make subjective prioritization. An effective way to decide which root causes to address first in the Improve phase is to create Pareto chart with root causes that directly impact the y-metric on the horizontal axis and its impact on the vertical one.

Statistics – use statistical analysis whenever possible as the perceived root cause may not be a real one. Use of data creates confidence in the analysis results. Follow the rule: "In God we trust, all other bring data".

Graphical representation – a picture is worth a thousand words and graphs can greatly simplify an issue, especially when your team members have little or no knowledge about statistics.

Figure 17: Learnings (A-phase)

Improve phase: Designing solutions and implementing them

The objective of the Improve phase is to improve the process and implement the best solution/solutions. The focus of the Improve phase is to pilot potential (and promising) solutions and investigate their true impact on the y-metric, so they are proven. Statistics like Hypothesis testing can be used to ensure the impact is both practically important as well as significant (proven with statistics).

Solutions generated are currently being implemented in the organization, improvement actions have been initiated by the Green Belt/researcher; however their full implementation and visible results will be seen only in several weeks. Below selected solutions are presented, with relation to the root causes they are solving.

1. Correct the data in the accounting system

- update the data in the system together with involved contract manager, service owner and accounting officer,
- set up a procedure for monitoring invoice approvals / flow.

This action will ensure the proper invoice flow and will contribute to easier access to documentation, as access through the Accounting Office is highly problematic (showstoppers). No investments required.

2. Define the ownership on a high level and on operational level

- during a short kaizen event (kaizen event is an improvement initiative lasting from one hour to a few weeks; it is an intensive workshop with the team accelerating improvement actions), gather all the involved actors and develop a solution to the problem – no identified ownership (prerequisite for the next two solutions),
- secure the overall contract ownership for IT Operations contracts,
- use contract management disciplines covered in Chapter 2.2.3 and Figure 4 to draw a RACI matrix (responsible, accountable, checked with, informed) for the contract specific ownership, to be approved and deployed by the overall contract owner (presented in Appendix E).

Those actions will solve the problem with regards to diluted ownership, high rotation of people, access to documentation, and changing strategy towards the supplier (showstoppers); with no investments.

3. Replace old solution with a new one within the existing architecture

- boost the change currently running on the business side to change the communication medium with customers (as contract is about output management solutions). Decide to mark current solution as outdated and not preferred in communication with customers, do not allow new customers to choose this old medium,

- rollout the pilot solution being implemented on one of the business sites to all the sites covered in the contract (EMEA).

Those actions will solve the problem of using old technology that is not fit to the current business and market needs. It will also help to present Philips as an innovative company, with no significant investments required.

This solution will drive the y-metric down by 25% - the share of the service that can be eliminated from the contract by applying this solution. Applying this solution will also eliminate the problem of outdated customer information in the system, as this information will no longer be necessary. Change on the business side has been already initiated and no more investments are required.

4. Set up a new cross-sector contract

- initiate a project which will combine solutions for the same service in one contract with one supplier, involve Sector Operations Managers in discussion, set up a procedure to ensure such actions are performed whenever contract reaches its expiration date,

- develop a joint technological solution for all the sectors; as this is will be in line with the target architecture (Philips Integrated Landscape), an investment of 0.5 million will be justified,

- while combining demand, use this opportunity to renegotiate the pricing model and the tariffs,

- new contract needs to ensure the appropriate level of reporting, which will allow track the use of services to the business units and will allow contract manager with collaboration with respective IT Business Partner to challenge the demand.

This actions will solve the problem with lack of discussion across sectors and old technology in use (project will include software and hardware major upgrades).

This solution will further drive the y-metric metric to zero (as all the items will be removed from the old legacy contract).

Figure 18 below presents lessons learned about implementing Lean Six Sigma for contract management in IT Operations in the Improve phase.

Change management – make sure you allocate enough time and resources for implementation phase, assure all the stakeholders understand the purpose of changes and their impact before you start implementation – carefully prepare communication plan and track realization of the solutions.

Measuring effects – make sure your team and stakeholders understand the long term nature of the improvements being made. On one side, implementation may take lot of time and effort, on the second side – benefits (also financial) might be visible after a couple of months. Assure that your champion and manager both understand that many of the improvements in the contract management process will have indirect impact on the process performance and they should be called enablers – a must-do to have processes running but not directly affecting the y-metric.

Figure 18: Learnings (I-phase)

4.3 Lean Six Sigma impact on Contract Management process

During the whole case study project duration, impact of Lean Six Sigma on main components of effective contract management has been assessed. It was done by using the evaluation framework developed during the exploratory research (literature and good practices) review on Excellence in contract management (Chapter 2.2.3). The template of the evaluation tool can be found in the Appendix A. The tool is used to show which areas, and at what stages, were influenced by running the Lean Six Sigma project. The evaluation was executed at the beginning of each of the phases and is presented in this chapter as Figure 19; the major changes will be explained below for learning purposes.

- The Lean Six Sigma project did not harm the existing contract management process. It proved to be beneficial in all the aspects requiring improvements.
- Huge improvement is being made on the Relationship Governance level, from the scratch level to excellent. For the purpose of stakeholder mapping, Executive Sponsor was appointed for contracts with Supplier A during the Define phase. Further, implementing the solution regarding defining ownership and responsibilities of each of the stakeholders will bring the relationship governance to the highest level. Huge improvement thank to the Lean Six Sigma deep dive into root causes of contract mismanagement.
- Commercial Management is being gradually improved during the project. Factors contributing to that are Lean Six Sigma requirement with regards to data collection and to process mapping – detailed data was obtained what helped to understand the commercial purpose and connect to business.
- With regards to Service Definition, the main improvement comes from bridging IT and Business together in order to define performance requirements and future demand development. This is a result of the Measure and Analyze phases which gave the contract manager the knowledge about usage of the services (outcome of gathering the data and validating root causes).
- Performance Management will be further improved once the roles are clarified and documentation availability will increase after the Improve-phase.
- Demand management and especially spend visibility, not existing in practice for this contract before the project started, improve drastically thanks to better alignment between IT and business, as well as involving supplier in reviews.
- Management Information and Control & Compliance require Philips Enterprise Information Management department to be more developed to provide real time 360° data access. This would create a great environment for next Lean Six Sigma actions.

Area	Component	Questions	Where is your organization?						
Relationship governance	**Sponsorship**	What level of sponsorship exists for the relationship?	No executive sponsorship	D		MAI		C	Full engagement and support
	Review	How often do the reviews take place and do they involve supplier?	Informal reviews, lack of stakeholder improvement	DMAI				C	Formal, structured reviews that canvas opinion from all functional stakeholders
Commercial management	**Cost transparency**	Are costs transparent enough to ensure that overcharging does not occure?	Little understanding of input costs		D	MAI		C	Appropriate transparency with right of audit exercised periodically
	Benefits management	Are the benefits promised by contract fully realized?	No known commercial baseline	D	M	A	I	C	Regular tracking of benefit delivery linked to functional budgets
Service definition	**Access**	Can the business access the supplier and the provided services?	Limited access via Procurement	DM		AI		C	Easy supplier and service access
	Definition	Is the purpose and scope of the contract defined and commmunicated?	Poorly defined or understood scope of services			DMA		IC	Services in scope are well defined and understood and clearly communicated
Performance management	**Measurement**	Are there KPIs in place which can monitor performance?	Poorly defined performance requirements					DMAIC	Defined set of KPIs in place and routinely measured
	Management information	Is there an Information Management system that can support contract manager?	Limited detail availability, held in silos	D	MAI		C		Detailed, real-time data available across organisation
Demand management	**Control and compliance**	Are there permanent control methods to ensure compliance with the contract?	Little or no control of contract		DMA	I	C		Robust, proactive monitoring of contract by relevant functions
	Spend visibility	Is the total spend in the contract well understood?	No understnading of contractual spend	DM		A	I	C	Periodic analysis of spend with supplier

Figure 19: Lean Six Sigma impact on Contract Management process

In Figure 19, ‘D’, ‘M’, ‘A’ and ‘I’ letters show where the organization was at the beginning of each phase. The letter ‘C’ shows were the organization is expected to be at the beginning of the Control phase, so after the solutions of the Improve phase are fully implemented.

Contract management evaluation framework, used originally for the purposes of the thesis, proved to be a very valuable tool and will be deployed in Philips IT as part of the Control phase. All the contracts will be assessed using this tool, which will serve as an enabler for further project initiatives. It will monitor performance of all the contracts and spot which contracts can be used as examples and on which Operational Excellence team should have a look at. The tool will be used in a way that it will set up strict requirements to achieve each of the levels of excellence per component, and define scoring per each of the indexes (areas); finally defined metric will be used for Lean Six Sigma project selection and achieving operational excellence in IT contract management. The metric will be built in a way presented in Figure 20 below. Together with the primary metric of number of billable items, will provide next wave of projects with a powerful way to measure the performance and identify the outlying contracts.

$$\underline{\boldsymbol{Contract\ management\ performance} =}$$
$$= (20\% \times Relationship\ Governance\ Index)$$
$$+ (20\% \times Commercial\ Management\ Index)$$
$$+ (20\% \times Service\ Definition\ Index)$$
$$+ (20\% \times Performance\ Management\ Index)$$
$$+ (20\% \times Demand\ Management\ Index)$$

Figure 20: Contract management performance evaluation metric

5 DISCUSSION

This chapter starts with discussion about the case study findings, summarizes Lean Six Sigma implementation and its impact on contract management process, proving Lean Six Sigma to be effective methodology and set of tools for optimizing IT legacy management in order to achieve excellence in procurement in a global IT organization. Following the discussion on findings of the empirical research, limitations of the study are described: validity of results and generalizability. Last section of this chapter presents ideas for further research.

5.1 Case study findings

Case study objective was to show how and why Lean Six Sigma should be implemented in the IT organization to improve contract management process performance.

Empirical researched justified the use of Lean Six Sigma process improvement methodology to IT contract management. Its implementation was shown phase by phase, pointing the points where special attention was required from the practitioner in order to achieve best results. Those were highlighted in the boxes at the end of each phase as learnings. Those practical insights suggest looking carefully at:

- Definitions being in use in the organization,
- Resistance of employees and how to address it,
- Process mapping activities and data collection (availability),
- Depth of the analysis and efficient use of resources,
- Extensive use of statistics and graphical ways to present outcome to the audience,
- Change management in order to implement best solutions and wait for results.

Therefore, the ’how to implement Lean Six Sigma’ was explained.

The why to implement Lean Six Sigma’ was explained by the overall impact of Lean Six Sigma project on contract management process in Philips IT, which turned to be enormous. As the impact assessment tools showed, one of worst managed contracts in the history of Philips IT, will become, after improvements are fully implemented, an example of successful implementation of Lean Six Sigma in the organization, driving future improvements and spreading the Lean Six Sigma culture within the organization.

Case study results (of the M and A phases) showed that issues related to contract management discovered in the literature and best practices review exist also in Philips IT:

- Discussed in Chapter 2 wastes and sources of value leakages served as a basis for brainstorming, creating cause and effect diagram, and further investigations. As a result analysis phase went smoothly with all the selected potential root causes being validated,
- The IT-business misalignment is clear in this case study, no communication channels between parties resulted in losing the understanding of the commercial purpose of the service being provided to the business by IT department/supplier,
- The IT departments internal complexity – also turned out to be true in the case study as Philips Purchasing was not able to drive changes alone and there was no decisive counterpart on the IT side, caused by diluted ownership of the contract, caused by recent reorganization of the IT structures. Not empowered procurement professional cannot operate effectively without strong support of the IT organization.

In addition some additional remarks can be made regarding Lean Six Sigma implementation:

- The environment is not supportive and data is not readily available, much effort was needed to collect it, but that also proved how badly managed the contract used to be,
- Not all Lean and Six Sigma tools and techniques can be readily applied to the IT/service environment - those methodologies were originally developed in factories; it is also influenced by the long term nature of contracts and process performance reporting. Selection needs to be made to decide which tools are applicable and use of which will add value to the Lean Six Sigma project.

5.2 Limitations of the study

The exploratory research resulted in identified factors that contribute to achieving excellence in procurement. The theoretical frameworks proven in further research to be very useful, however its validity is questionable, due to application to only one case study, therefore not all parts of the theoretical models and frameworks were empirically tested, e.g. sourcing pillar of procurement has not been investigated in the case study at all, only the IT contract management part was confirmed empirically.

The IT contract management process improvements using Lean Six Sigma proved in a case study to be very beneficial for the organization in both short and long term, however the case study also has several limitations:

- Data collection method might have affected the quality of the data and therefore also conclusions made. In many cases the data was not available or samples were too small to perform statistical tests with accurate results and manual collection of data was not efficient and would require significant investments.
- Data analysis on the case study, especially the data gathered during the interviews, was subject for interpretation of the researcher's judgment, and, as a consequence, is subjective.
- Contract management process and Lean Six Sigma impact was assessed only from the Philips IT perspective, therefore no insights about how it impacted supplier or business customers are available.
- Results of the study lack of generalizability because only a single case study on single contract is involved. However, the objective of the study is not to prove a hypothesis but to give insights and familiarity with the subject area as a base for more rigorous investigations in the future. Hence, ideas for further research are presented in the next section.

5.3 Ideas for further research

The case study did not assess impact of past and current sourcing activities on current and future contract management process performance. Further research can be carried out to verify whether good sourcing processes have any correlation with better contract management from the starting point. In addition, as the case study focused on IT legacy contracts, a point for further investigation would be to check whether and, if, why non-legacy contracts are better managed.

Also a point of interest is to validate the Lean Six Sigma project impact on contract management process from the perspectives of supplier and business customer. In an environment where more and more services and processes are being outsourced to third parties, it would be beneficial to know how improvement initiatives can be carried out in close cooperation with external partners.

The case study has also validated the benefits of using Lean Six Sigma as an improvement methodology with regards to IT contract management process. Further research can be done to assess the impact of other improvement methodologies and compare results, to have the clarity which one is the most effective and efficient in given circumstances.

6 CONCLUSIONS

The first purpose of this research is to explain what Procurement Excellence is with relation to IT. This was done by extensive literature review and concluded with to areas of focus: sourcing and contract management activities. The latter one was further investigated more in-depth, both in the literature and best practices review – showing the most common sources of value leakages in IT contract management, with a special focus on legacy services, and providing researcher with a tool for evaluation of contract management in the case study.

The second purpose was to present process improvement methodologies used in IT. This was achieved by introducing several process improvement approaches, comparing them and focusing on Lean and Six Sigma as most appropriate for the purposes of the coming case study. Exploratory research in the literature provided researcher with typical wastes that can be observed with regards to IT and Procurement processes, this was used as an input in the implementation of Lean Six Sigma in a project at Philips IT.

The third purpose of the thesis was to answer the question on how and why to implement Lean Six Sigma in IT Contract Management. This was performed with the use of a designed case study, which showed through example of an actual project led by researcher how Lean Six Sigma should be implemented, step by step (phase by phase). Use of the impact assessment tool, developed during the first part of the research, helped to prove why Lean Six Sigma should be deployed to improve contract management process in IT. As project have not reached Control phase, no financial benefits can be claimed by the project, however, it is clear that full implementation of the solutions will bring significant hard cost savings, what could only strengthen the position of Lean Six Sigma as the right methodology to use in this case.

All three research questions have been answered throughout the thesis and all the objectives have been met, therefore research is concluded to be successful and fulfilling initial expectation.

6.1 Managerial implications

The findings of the thesis have several managerial implications; first it describe pillars needed for achieving excellence in IT Procurement, what can be used in their daily practice. Second, firms which consider making the improvement effort with regards to the contract management process in the IT environment should incorporate Lean Six Sigma as the most efficient way to improve performance of existing broken processes. Lean Six Sigma gives structure and tools required to manage the project. It also helps company to simplify its process and focus on value-adding activities.

Lean Six Sigma practitioners can learn from the best practice review done about IT contract management; practical insights from running an actual DMAIC project in this area should not be underestimated.

Case study showed that the biggest problem for deployment of Lean Six Sigma within IT organization is the resistance of its employees; therefore this issue will be carefully addressed by the project manager and IT Management Team. For the IT legacy contract management, a careful investigation of the existing definition of the term ‘legacy’ is required for the smooth management of improvement project.

For the IT contract management process two improvements require special attention and can be easily copied to any organization. First is the issue of diluted contract ownership that stops all the improvements as people do not know who is responsible for performing those actions. Therefore a RACI matrix should be introduced that will specify who (which function in the organization, as people change) is responsible, accountable, with whom the changes need to be checked and who should be informed about them. This will bring transparency in the governance of any contract. This would be much more difficult to realize and tome up with such a broad, generic, but at same time very effective solution.

Second, the contract management performance evaluation metric, adapted from KPMG’s tool for assessing contracts. It proved to be a good representation of what good contract management look like. The metric can be used to identify outliers and opportunities for improvements in the contract management process, not only for IT legacy. This metric will be deployed in Philips IT and once it proves to be useful source of information, might be rolled out to other departments.

However, worth noting is the fact that IT contract management process is very specific - it involves stakeholders from various departments and organizations. There is hardly any standardization of this process at Philips IT and learnings from this case study need to be carefully adapted on a case by case basis.

6.2 Concluding comments

"In God we trust, all others bring data!" (W.E. Deming)

The use of data-driven Lean Six Sigma methodology for improving the existing IT contract management processes is a significant addition to the existing best practices in contract management. The importance of contract management as a business process will continue to increase. Organizations are more and more dependent on external partners, in order to take advantage of their expertise to perform complex, specialized tasks that are outside of company's core competencies (Sherman 1987). This trend requires contract management process to be effective, capable and efficient. Altogether with increasing importance of contract management for the competitiveness of the organization, increases the need for monitoring and systematic assessment for continuous process improvements. Lean Six Sigma's main purpose is focus on customers, transparency and deployment of kaizen philosophy of continuous improvement among empowered employees - not sticking to strict rules and tools by a small number of enlightened managers. It is hoped that Lean Six Sigma will be deployed in other organizations as well, to improve IT contract management and other processes.

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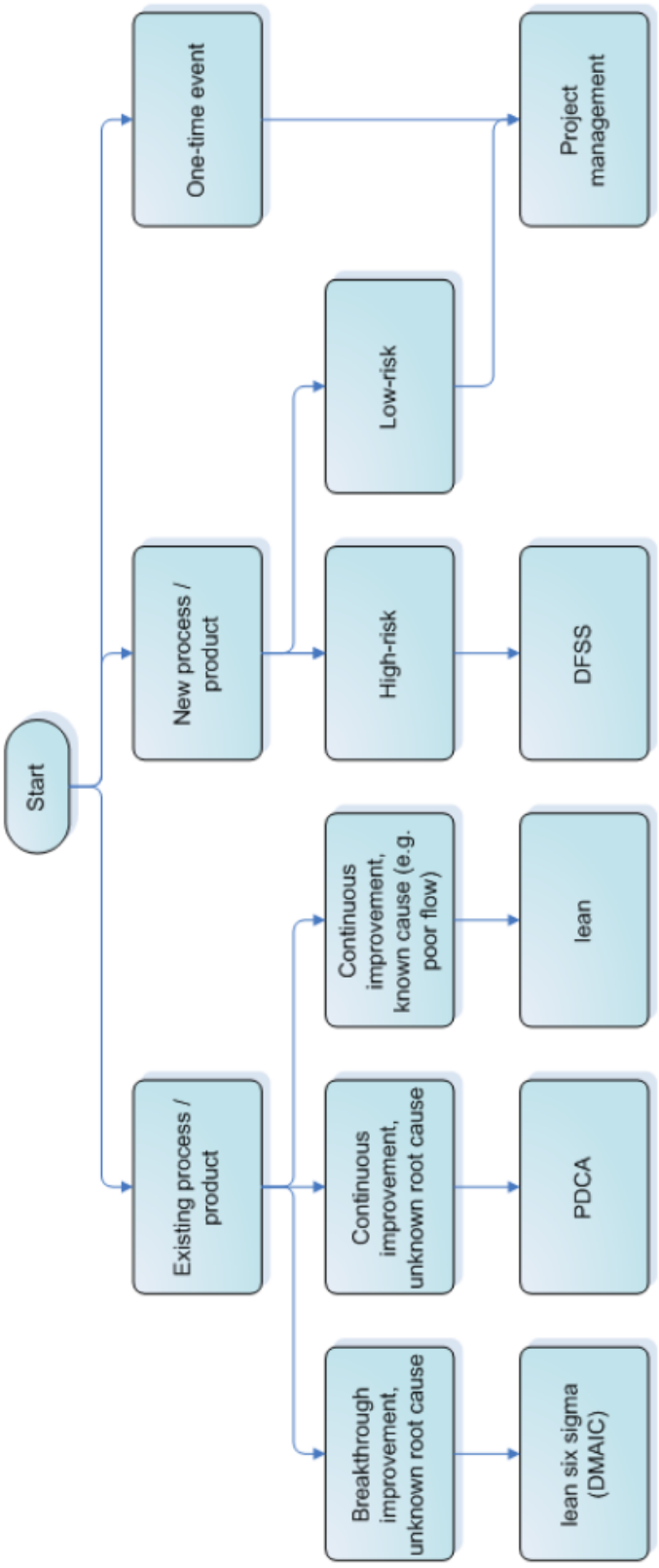
APPENDIX A: CONTRACT MANAGEMENT ASSESSMENT TOOL

Area	Component	Questions	Where is your organization?		
Relationship governance	**Sponsorship**	What level of sponsorship exists for the relationship?	No executive sponsorship	----------	Full engagement and support
	Review	How often do the reviews take place and do they involve supplier?	Informal reviews, lack of stakeholder improvement	----------	Formal, structured reviews that canvas opinion from all functional stakeholders
Commercial management	**Cost transparency**	Are costs transparent enough to ensure that overcharging does not occure?	Little understanding of input costs	----------	Appropriate transparency with right of audit exercised periodically
	Benefits management	Are the benefits promised by contract fully realized?	No known commercial baseline	----------	Regular tracking of benefit delivery linked to functional budgets
Service definition	**Access**	Can the business access the supplier and the provided services?	Limited access via Procurement	----------	Easy supplier and service access
	Definition	Is the purpose and scope of the contract defined and commmunicated?	Poorly defined or understood scope of services	----------	Services in scope are well defined and understood and clearly communicated
Performance management	**Measurement**	Are there KPIs in place which can monitor performance?	Poorly defined performance requirements	----------	Defined set of KPIs in place and routinely measured
	Management information	Is there an Information Management system that can support contract manager?	Limited detail availability, held in silos	----------	Detailed, real-time data available across organisation
Demand management	**Control and compliance**	Are there permanent control methods to ensure compliance with the contract?	Little or no control of contract	----------	Robust, proactive monitoring of contract by relevant functions
	Spend visibility	Is the total spend in the contract well understood?	No understnading of contractual spend	----------	Periodic analysis of spend with supplier

Source: KPMG: "Contract management – bridging the gap: What does good contract management look like?", 2011

APPENDIX B: METHODOLOGY ROADMAP



Source: Philips: "Green Belt student training materials", 2013

APPENDIX C: LIST OF CONDUCTED INTERVIEWS

Position	Date	Main topic	Outcome
Master Black Belt, Operational Excellence team within Philips IT Operations	02-07.2013, coaching on a weekly basis	Ongoing support with Lean Six Sigma implementation in service / IT environment	Guidance on methodology, tools and techniques deployment
External consultants, KPMG Shared Services and Outsourcing Advisory	02.2013	Potential savings opportunity scan	Understood what the broken process is and potential savings
Senior Sourcing Specialist/Supplier Relationship Manager, Philips Group Purchasing (IT) (PGP)	02.2013, afterwards: once per month	Brief introduction to contracts with Supplier A, initial analysis and future actions alignment, introduction to procurement processes	Defined legacy, Full support of PGP
15 Contract Managers, Philips IT Operations	02.2013	Current contract management practice (scope: Supplier A)	Legacy contracts discovery
Technical Operations Manager, Philips IT Operations	03.2013	Resistance of the organization for change	Full support with implementation (Champion position) and landscape understanding
Operational Team Lead/Service representative, Philips IT Operations	04.2013, afterwards: once per month	Contract management process walk (Gemba)	Discovered: technological issues, poor invoice management, diluted responsibilities, lack of governance
Supplier Performance Manager, Philips IT Operations	05.2013	Understanding of the newly created role	Defined temporary process owner
Infrastructure & Operations Manager, Philips IT Operations	05.2013	Commercial understanding of IT services	Discussion with business/challenging the demand
Green Belt, Philips IT Operations	05.2013	Organizational resistance and change management	Communication management plan
Green Belt, Philips IT Delivery	06.2013	Alignment of projects within the stream and leverage op-	Rollout plan development initiated

		portunities / sharing experiences	
Contract Manager, Supplier A	07.2013	Relationship governance	Supplier willingness to cooperate and to contribute to process improvements
Black Belt, Capgemini	07.2013	Lean Six Sigma process improvements in reality	Focus of the project should be on process improvements, not only on cost savings

*Only major interviews were listed. Most of the interviews had semi-structured form, with preliminary agenda, but not limiting interviewee creativity nor his/her initiative for sharing ideas/problems.

APPENDIX D: SEMI-STRUCTURED INTERVIEWS WITH PHILIPS CONTRACT MANAGERS

- What is the service provided by your contract? Short description. Who is the customer/benefiter of this service/contract?
- What is the length of the contract? When the current one did start and when does it ends?
- Who is the contract owner? Who signs the contract?
- Who checks the monthly invoices? Who approves them? Please send us/bring the latest invoice as an example to see how costs are presented (one line, broken to components, etc.)
- Who is responsible for putting in the purchase order (PO) for the contract? We would like to link the POs to the contracts and to know who can be responsible for updating this information at the end of the year.
- How would you evaluate collaboration from Supplier A side?
- Are you satisfied with a service provider?
- Do you understand the hardware that is behind your contract?
- Do you understand the software that is behind your contract?
- Are there any plans to replace some part of services? If so, what is the project plan/timing/project number? What will be the effect on the contract? Who is the initiator of such changes?
- What is the future of the contract? Is it going to be terminated/limited in quantity/moved to another vendor? Have alternatives been investigated already (solution, technology, vendor)? If so, what is the result of that? If not, why?
- Do you see areas for improvement? If so, where? Do you see areas for cost savings? If so, where? Can you give us any estimation in terms of Euros? If not, why? Have you thought about it? Price, quantity, quality.
- Comparing estimated spend of 2012 and actual spend in 2012, have you experienced overspend? What was the reason? If services or functionalities have been added to the contract during the year, who approved this? Which project was done on that? Is this a trend or a one-time situation?
- Comparing estimated spend of 2012 and estimated spend in 2013, where are those differences coming from? What is the reason? Was there e.g. a project on that, or is this because of lower usage expected in 2013? If services or functionalities have been added or removed from the contract, who approved this? Which project was/is being done on that? Is this a trend or a one-time situation?

APPENDIX E: KEY AREAS OF RESPONSIBILITIES FOR CONTRACT MANAGEMENT PROCESS

R to be responsible
A to be accountable
C to be checked with
I to be informed

		Roles									
#	Area	OTL/SDM	IOM	(A)OM	SPM	SRM/PGP	Supplier	Architecture&Platform rep	OPEX team	Head of IT Ops	ITBP
1	Overall contract ownership					C	I			RA	
2	Authoring and negotiation	I	I			RA		C			C
3	Baseline management	I	RA	C		I					C
4	Savings	RA	C	C		I	C	C	I		C
5	Document management	RA		C		I			I		
6	Technology strategy	I	I			I	C	RA			
7	SLA compliance	RA	I	C	C	I					C
8	Commitment management	C			I	RA	I				
9	Communication management	C			I	RA	I				
10	Contract visibility and awareness	C	I	RA		I					
11	Issue and change management	C	I		RA	I					
12	Transaction compliance	RA	C			I			I		

#	Area	Short description of the area
1	Overall contract ownership	Top decisive person, contacting supplier on highest level
2	Authoring and negotiation	Creating contract and negotiating terms with supplier
3	Baseline management	Managing the natural changes in the number of billable items and driving costs down by challenging the demand
4	Savings	Driving costs down by process optimization
5	Document management	Storing all contract documentation in a shared workspace
6	Technology strategy	Investigating alternatives technologies to upgrade or change current contract
7	SLA compliance	Checking if the service is delivered at the contracted level
8	Commitment management	Ensuring win-win situation: ensure supplier profitability and Philips quality service and cost efficiency
9	Communication management	Ensuring efficient communication channels with supplier
10	Contract visibility and awareness	Informing the organization of purpose and scope of contract
11	Issue and change management	Managing exceptions/escalations on a daily basis and managing change requests
12	Transaction compliance	Comparing the invoiced items with the real usage