HOW LEAN SIX SIGMA AND AGILE PRINCIPLES OPTIMIZE ITIL-BASED PROCESSES.

A design research in Philips IT I&O

Master's Thesis
In IMMIT

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It is more than writing a master thesis, I said to myself. With the increasing time I devoted into it, I see a clearer and clearer shadow of myself casted on this thesis. Not only a scientific research I've been working on to successfully achieve the end of the IMMIT program, but also a self-reflection I've been writing and thinking about: who I were and what I ponder over when I was 24.

This thesis is dedicated to my parents who respected and supported my choice of the IMMIT master program. I have been always gratitude for their love, time, energy and money they have lavished on me. They are and will always be my deepest source of strength, from where I grow, to where I go.

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Last but not least, I feel lucky and happy to meet all the friends I've been acquainted with during the two years of study. Time we spent, laughs we share, and pains we carry are all becoming my memory that will be cherished for the rest of my life.

Bingcheng
May 21, 2013
HTC, Eindhoven

"We have artists with no scientific knowledge and scientists with no artistic knowledge and both with no spiritual sense of gravity at all, and the result is not just bad, it is ghastly."

"You want to know how to paint a perfect painting? It's easy. Make yourself perfect and then just paint naturally."

- Robert M. Pirsig, 2009
Zen and the Art of Motorcycle Maintenance: An Inquiry Into Values

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LIST OF ABBREVIATIONS

CI&OP	Common Infrastructure and Operating Platform
CSI	Continual Service Improvement
DMAIC	Define- Measure- Analyse- Improve- Control
ITIL	Information Technology Infrastructure Library
LSS	Lean Six Sigma
ITSM	IT service management
TIMWOODS	Waste of transportation, Inventory, Motion, Waiting, Over production, Over processing, Defects, Skills.
OTL	Operational Team Lead
(S)IOMs	(Sector) Infrastructure and Operations Managers
SLA	Service Level Agreement
TCO	Total Cost of Ownership
BIA	Business Impact Analysis
MDT	Multi-Disciplinary Team
PIA	Privacy Impact Assessment
RAMPS	Reliability, Availability, Maintainability, Performance, Scalability
SLA	Service Level Agreement
ITBPs	IT Business Partners
AOP	Aspect Oriented Programming

1 INTRODUCTION

1.1 Research motivation

Traditionally, the metaphor of Information Technology System Management (ITSM) is building bridge between IT and business.(Peppard, 2007) This views business as a mainland and IT as an island separated by huge gap of oceans in between. IT people and Business people are speaking different languages, acting in different behaviors, and believing in different Bibles. ITSM derives from traditional management theories, managing behaviors, goals, and performances. The goal of ITSM is to optimize IT services in order to satisfy business requirements.(Galup, Dattero, Quan, & Conger, 2009) However, these management theories facing some culture shocks when meeting young and dynamic software architects and engineers. These technical people believe in freedom and liberty, focusing on what is enabled by technology and solving problems with rhythm of coding.

On the other hand, business and IT are never separated like before. Decades ago, IT may act like automation tools that help business achieve efficiency and effectiveness. While today, IT acts as nerve systems in the body; they play an essential role in business function, delivering messages from eyes to hands. An outage in IT means completely disable of the business. Business and IT can't make decisions exclusive of each other. In the future, IT should not be treated as a separate department. Instead, IT should be embedded into business operations. In *The Phoenix Project* (Kim, Behr, & Spafford, 2013) it is even predicted, "in ten years, every COO will come from IT. Any COO who doesn't intimately understand the IT systems that actually run the business is just an empty suit, relying on someone else to do their job".

Figure 1 Business-IT from bridge to neuron

In this background, we need to review the relationship of business and IT. We need to re-imagine them as neuron cells in brains. (See Figure 1) Each and every element in business and IT are closely linked with each other, so that messages can be transferred in light speed between business and IT. By then, change can be adapted fast enough. What exchanged fast among elements should not be only messages, but also academic theories and frameworks. Knowledge in management and IT are also inter-penetrated with each other: if management theory is used in IT, why not adopting software-programming paradigms into business management?

The author is excited by this crazy idea: managing/optimizing process and its performance are not one way and one channel from business to IT. They are both interconnected and multi-connected like neurons. Different frameworks in business and IT are never separated. They are supposed to be together. Technology and Liberal arts are long missing each other's' support. With these ideas in mind, the author conducts this design research that build and evaluates an artifact: Bing Box[1] model. In the Bing Box, elements from business and IT are linked together on different layers like neurons. Theories from both business management and IT will be adopted to analyze these connections. The Bing Box will provide a holistic view to the process optimization, plus a future oriented optimization method for system structure. The evaluation of this model is done in real-life IT department in Philips to determine how well the artifact performs.

1.2 Organization background

Stepping into the second decades of 21st century, the way companies doing business is changing greatly thanks to the exponential development of technology. The entire IT industry is changing from traditional time-based sourcing to cloud-based and output-based sourcing. Great companies like Philips are facing difficulties in keeping up with the change. In order words, even though they have great assets, people, and potentials, they are not achieving their plans. In all the sectors that Philips doing business in, namely healthcare, consumer lifestyle, and lighting, market shares are dropping continuously because of the slow execution in business and IT processes.[2]

To reverse the trend, Philips initiates Accelerate! Program to achieve better performance and become a great company for customers, employees, shareholders and society. The Accelerate! Program seeks to address business challenges through five major initiatives (Philips IT transformation White paper, 2013):

1. Customer Centricity – Strengthening Customer Centricity and entrepreneurship in markets to drive local relevance and gain market share.
2. Operating Model – Enabling our businesses and markets to flourish within a lean and simplified operating model leveraging strong-shared capability, assets and positions.
3. End2End – Innovating and executing with higher speed and excellence to outpace competition through lean and effective End2End customer value chains.

[1] Bing Box is named after the author.

[2] Source: Philips internal video, Our Accelerate! Transformation roadmap.

4. Resource to win – Creating granular strategies, which are resourced to Win, and agreed between businesses and markets.

5. Culture – Building a growth and performance culture where people are eager to win, take ownership, and team up to excel.

Philips Infrastructure and Operations department (Short for Philips I&O) is the key player to ensure the transformation journey of the Accelerate! Initiatives by empowering the digital revolution and removing unrewarded complexity in the IT landscape, which is short for Philips Integrated Landscape (PIL). The mission of Philips I&O is to make Philips systems run every day and the vision is to provide utility, value and choice for business. To succeed in that, I&O is currently carrying out a series of programs to change the Demand to Delivery process from Design-Build-Operate to Specify-Acquire-Performance through decommissioning legacy systems and implementing Common Infrastructure and Operating Platform (CI&OP).

In the end, Philips will be able to maintain a common platform, deliver common services and focus on one way of doing things. To make sure shared vision is fully discussed, agreed and realized, Philips I&O Futures team was set up to lead and coordinate the change by directing different stakeholders ranging from sector infrastructure and operations managers (SIOMs), Finance, Procurement, etc., with designed strategic objectives. These strategic objectives are designed based on Philips Company’s vision and mission.

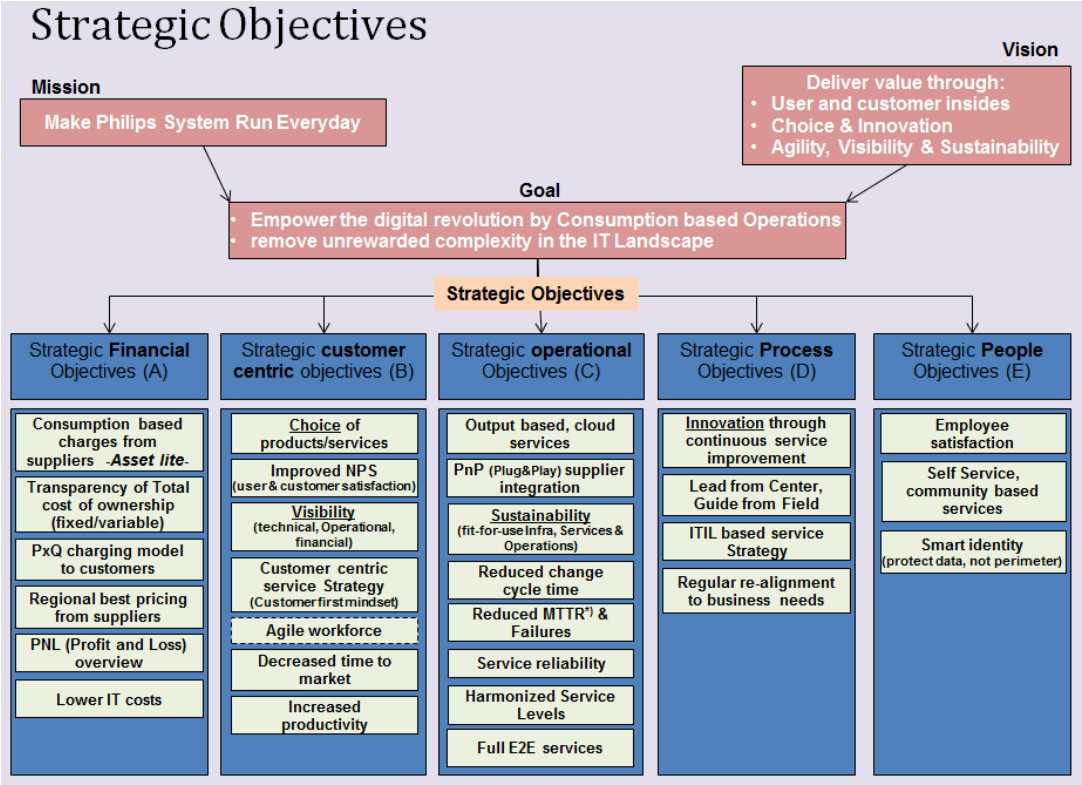

Figure 2 Strategic objectives[3]

In order to better achieve these objectives, the Lean Six Sigma principles are introduced into Philips I&O. The goal is to optimize the to-be IT services Demand to Delivery process and ensure the process providing defects-free services that meet customers' requirements. Being part of the Lean Six Sigma project, the author designed and conducted implementation plans according to Design- Measure- Analyse- Improve- Control (DMAIC) with respect to the Information Technology Infrastructure Library (ITIL), during which the author designed a new model. A model that combines Lean Six Sigma methodologies, agile principles even part of programming paradigm with the currently ITIL structured process.

1.3 Research model

As described above, to help the business succeed in the market, we need a closely linked business and IT organisations. Traditional IT management views that impact of IT theories firstly lands on IT organizations, then spread to business process, part of which will finally effect performance of business. While the author believes that business and IT are closely linked with each other on different levels that changes in IT or-

[3] Source: Philips I&O Futures' Mission and Vision document

ganisation will have directly impact on business process and affect business performance. A fusion of business and IT in academic frameworks to combine knowledge from both sides is a unique of this thesis.

The research questions are:

(Q1) How Lean Six Sigma and agile principles optimize ITIL-based processes?

- *(Q1a) How to combine business and IT academically and practically in a fusion model?*
- *(Q1b) How this combined model applies into IT organizations?*
- *(Q1c) What impact, improvement and benefits would the implementation of the model have on business/IT processes and its performances?*

The research work can be divided into two main phases: The first part includes the constructing of the Bing Box model, which will cover Q1a and Q1b. This Bing Box model will explain how an IT organization can maximize their benefits from all these frameworks. How can principles of eliminating waste (Lean), self-organizing team (Agile) and best practices in IT management (ITIL) work smoothly together. Then an implementation approach of this Bing Box theory is presented with methods from Aspect-Oriented Programming (AOP) and Six Sigma (6 σ).

The second phase was devoted to assess and evaluate the Bing Box model, which will cover Q1c. The implementation of Bing Box model in Philips IT will illustrate how this designed artefacts will optimize and benefit IT processes thus improve the business performance. The Figure 3 shows the research design.

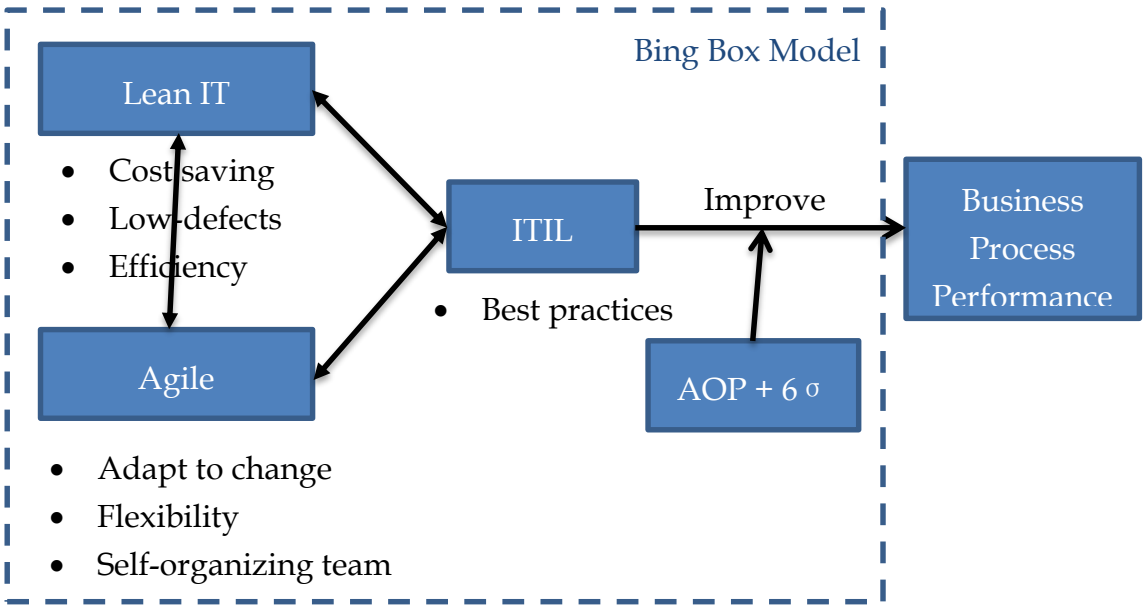

Figure 3 Research Model

1.4 Research structures

The research follows a design research guideline that seeks to extend the boundaries of human and organizational capabilities by creating new and innovative artifacts.(Alan, March, Park, & Ram, 2004) The Chapter 2 firstly reviews the current research on AOP, Lean Six Sigma, Agile and ITIL, aiming at identifying the broad conceptual bases for this study. In Chapter 3, we include the process of constructing the Bing Box model. The Chapter 4 describes the introduction of Bing Box model, two-implementation case of the model with tools from DMAIC/DFSS through observations and interviews. And the validation of the model is conducted with stakeholders. Chapter 5 contains the concluding remarks, the limitation of this research work and the future research areas. Chapter 6 provides the references used in this thesis. Appendix A is an ITIL big picture. Appendix B is the list of conducted interviews. Appendix C is the interview questions. Appendix D is the stakeholder positions in Bing Box model.

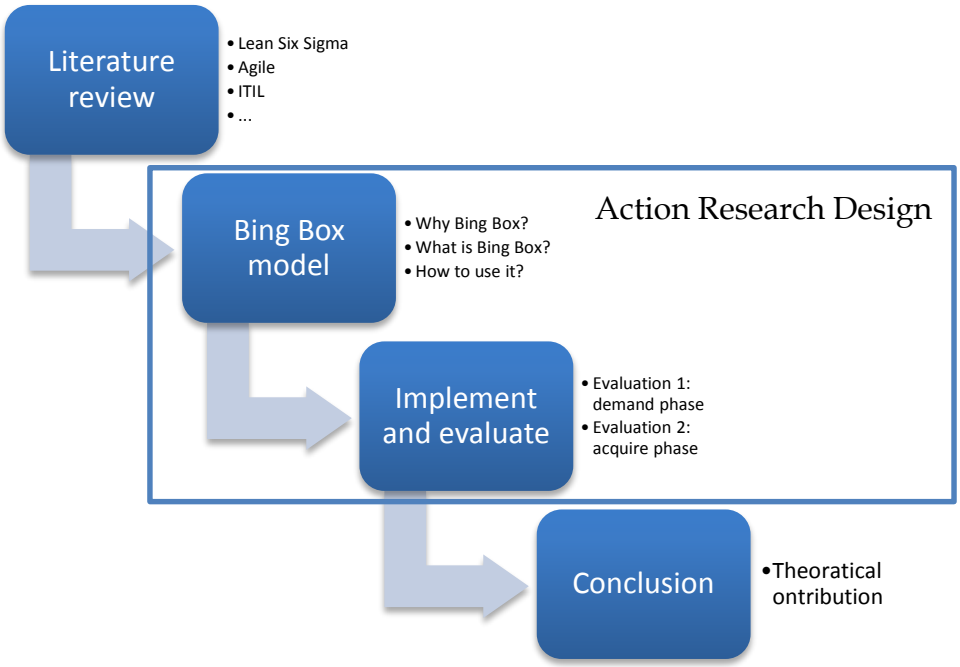

Figure 4 Research structures

1.5 Contribution to theory and practitioners

The first contribution of this thesis is the Bing Box model. It is a 3-dimension box combining Demand-to-Delivery process (X dimension), strategic level (Y dimension), and service flow (Z dimension). This model will provide a coherent link between business and IT. The second contribution is the implementation method of Bing Box, which combined with Six Sigma, ITIL continual service improvement and Aspect-Oriented

Programming paradigm. This approach will greatly increase the efficiency of optimization cycles by providing modularized optimizing components (aspects). The third contribution is the evaluation method that treat designed improvements as changes to the organisation and categorize the to-be-implemented KPIs into dynamic quality (indefinable), static quality (definable), indirect related to business and directly related to business. This will link back to the Bing Box model, plan corresponding actions and bring behaviour change in different level.

2 LITERATURE REVIEW

2.1 Lean Six Sigma

2.1.1 Six Sigma concept

Six Sigma is a set of techniques and tools for process improvement. Motorola developed it in 1986, coinciding with the Japanese asset price bubble, which is reflected in its terminology. Six Sigma became famous when Jack Welch made it central to his successful business strategy at General Electric in 1995. Today, it is used in many industrial sectors.(Schroeder, Linderman, Liedtke, & Choo, 2008)

Six Sigma seeks to improve the quality of process outputs by identifying and removing the causes of defects (errors) and minimizing variability in manufacturing and business processes. It uses a set of quality management methods, including statistical methods, and creates a special infrastructure of people within the organization ("Champions", "Black Belts", "Green Belts", "Yellow Belts", etc.) who are experts in the methods. Each Six Sigma project carried out within an organization follows a defined sequence of steps and has quantified value targets. DMAIC is one of those steps (will be explained later), similar in function as its predecessors in manufacturing problem solving, such as Plan-Do-Check-Act and the Seven Step method of Juran and Gryna (Balakrishnan, Kalakota, Ow, & Whinston, 1995). These methods are also included in ITIL, which is further compared in this chapter.

Six Sigma and its DMAIC/DFSS method emerged and developed in practice. It built on insights from the quality engineering field, incorporating ideas from statistical quality control, total quality management and Taguchi's off-line quality control. Their wide adoption in practice warrants a critical scientific analysis. One aspect of a scientific evaluation of Six Sigma is to critically compare its principles with insights from established scientific theories.(de Mast & Lokkerbol, 2012)

The relationship of Six Sigma and Performance Management is examined by Garvin (1988) with a quality performance model on internal process quality and product quality performance and their effects on operational performance and business performance. It was argued that the method of Six Sigma is itself a quality practice while sharing some characteristics with a core method. The theoretical structure of Lean Six Sigma in Quality Performance Model is shown in the Figure 6.(Brady & Allen, 2006)

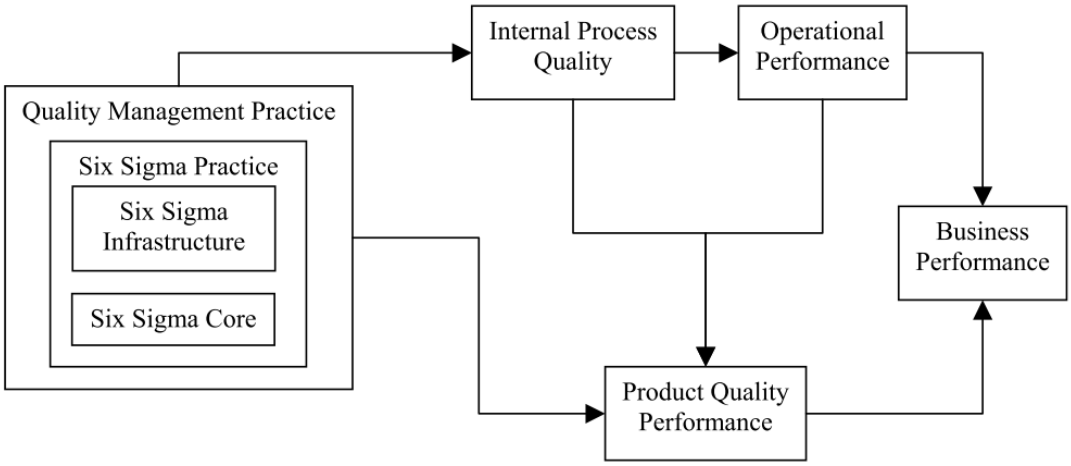

Figure 5 Lean Six Sigma in Quality Performance Model(Brady & Allen, 2006)

2.1.2 Six Sigma processes

DAMIC process is commonly known for optimizing existing process. It is a systematic way of problem solving. (de Mast & Lokkerbol, 2012)

Define Practitioners begin by defining the process. They ask who the customers are and what their problems are. They identify the key characteristics important to the customer along with the processes that support those key characteristics. They then identify existing output conditions along with the process elements.

Measure The focus is on measuring the process. Key characteristics are categorized, measurement systems are verified and data are collected.

Analyse Once data are collected, it is analysed. The intent is to convert the raw data into information that provides insights into the process. These insights include identifying the fundamental and most important causes of the defects or problems.

Improve The fourth step is to improve the process. Solutions to the problem are developed, and changes are made to the process. Results of process changes are seen in the measurements. In this step, the company can judge whether the changes are beneficial, or if another set of changes is necessary.

Control If the process is performing at a desired and predictable level, it is put under control. This last step is the sustaining portion of the Six Sigma methodology. The process is monitored to assure no unexpected changes occur.

Another practice of Six Sigma is Design for Six Sigma (DFSS). Antony, (2002) refers to DFSS as a powerful approach to design products and processes in a cost effective and simple manner. In the DFSS methodology, the inputs can be customer needs and wants, business needs, raw materials, and so on. The outputs are quality products, processes or services. The steps are:

Identify This stage essentially ensures that the organisation understands the criteria for success. It achieves this by: identification of customers and their requirements; clear definition of the design requirements for the product; identification of customer critical-to- quality characteristics (CTQs) using quality function deployment (QFD); planning of functional and engineering requirements; determination of the relationship between customer requirements and technical requirements; and determination of the target for each CTQ.

Design Once the organisation understands the parameters of design, these must be translated into the actual, effective design. This stage involves: analysis of the design requirements and key design parameters and their relationship with CTQs; identification of design alternatives; utilisation of concurrent engineering practice; study of the relation of design parameters to CTQs at sub-levels in complex processes or systems; and identification of the risks involved and typical failures, using, for example, design failure mode and effect analysis (DFMEA).

Optimise The third stage involves the further consideration of design to ensure effective ''makeability'' – so that the organisation is confident that the product can be manufactured within the identified design parameters, and within the agreed budget. This stage involves: identification of sources of variability (manufacturing, environmental, etc.); minimizing product performance sensitivity to all sources of variation using robust design; application of tolerance design for critical design parameters obtained from robust design; optimising the design for manufacturability; optimising the design for product reliability; and determination of design capability and comparison with design specifications.

Validate The final stage checks that the process is complete, valid and will meet requirements in practice! It involves: verification of the design to ensure that it meets the set requirements; assessment of performance, reliability, capability, etc.; development of process control plan for the mean and variance of CTQs in production; and development of a DFSS scoring card.

2.1.3 LEAN concept

LEAN is another methodology that always combines with Six Sigma. Lean thinking is sometimes called lean manufacturing, the Toyota production system or other names. Lean focuses on the removal of waste, which is defined as anything not necessary to produce the product or service.

8 type of waste in Lean (short for "TIMWOODS")

T – Transport – Moving people, products & information

I – Inventory – Storing parts, pieces, documentation ahead of requirements

M – Motion – Bending, turning, reaching, lifting.

W – Waiting – For parts, information, instructions, equipment

O – Over production – Making more than is IMMEDIATELY required

O – Over processing – Tighter tolerances or higher grade materials than are necessary

D – Defects – Rework, scrap, incorrect documentation

S – Skills – Underutilizing capabilities, delegating tasks with inadequate training.

One common measure is time—the amount of time that the product is actually being worked on by the worker. Frequently, lean's focus is manifested in an emphasis on flow. Lean IT is adopting lean concept into managing IT. Table Waterhouse (2008) identified eight wastes in Lean IT.

ELEMENTS OF WASTE	EXAMPLES	BUSINESS OUTCOME
DEFECTS	• Unauthorized system and application changes. • Sub-standard project execution.	Poor customer service, increased costs.
OVERPRODUCTION (OVER-PROVISIONING)	• Server sprawl, under-utilized hardware. • Unnecessary delivery of low-value applications and services.	Increased costs and overheads: energy, data center space, maintenance; misalignment.
WAITING	• Slow application response times • Manual service escalation procedures • Slow employee on-boarding.	Lost revenue, poor customer service, lower productivity.
NON-VALUE ADDED PROCESSING	• Reporting technology metrics to business managers.	Miscommunication
TRANSPORTATION	• On-site visits to resolve hardware and software issues. • Physical software, security and compliance audits.	Higher capital and operational expenses.
INVENTORY (EXCESS)	• Unused software licenses and hardware. • Multiple repositories to handle risks and control. • Benched application development teams.	Increased capital expense, lost productivity.
MOTION (EXCESS)	• Fire-fighting repeat problems within the IT infrastructure.	Lost productivity.
EMPLOYEE KNOWLEDGE (UNUSED)	• Failing to capture ideas • Knowledge and experience retention issues. • Inappropriate use of talent on repetitive or mundane tasks.	Talent leakage, low job satisfaction, increased support and maintenance costs.

Table 1 Eight waste in Lean IT (Waterhouse, 2008)

2.2 Information Technology Infrastructure Library (ITIL)

2.2.1 ITIL structure

There are several well-established good practice frameworks to create effective IT service management systems such as ITIL. Nowadays, ITIL is a widely accepted guidance for IT service management, providing "a detailed description of a number of important IT practices, with comprehensive checklists, tasks, procedures and responsibilities which can be tailored to any IT organization"(Ogc, 2007). ITIL is not a standard that has to be followed; it is guidance that should be read and understood, and used to create value for the service provider and its customers. Organizations are encouraged to adopt ITIL best practices and to adapt them to work in their specific environments in ways that meet their needs.(Britain, Lloyd, Wheeldon, Lacy, & Hanna, 2011)

ITIL is the most widely recognized framework for IT service management (ITSM) in the world. In the 20 years since it was created, ITIL has evolved and changed its breadth and depth as technologies and business practices have developed. The newest version of ITIL (2011) framework is based on the five stages of the service lifecycle as shown in Figure 6, with a core publication providing best-practice guidance for each stage.

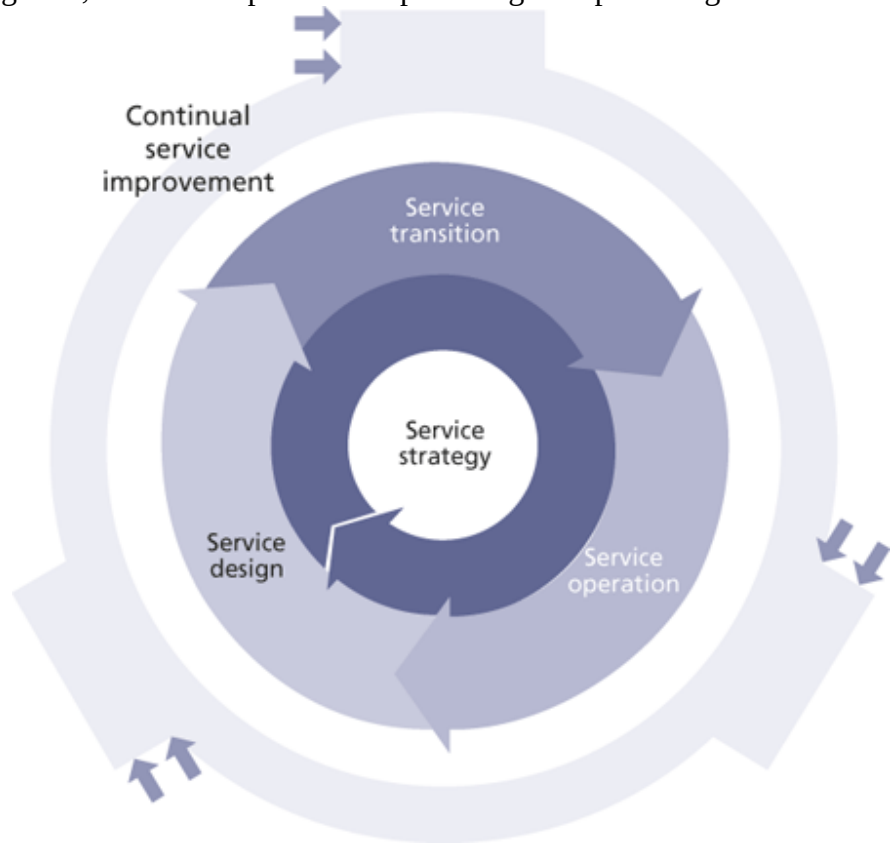

Figure 6 The ITIL service lifecycle

These five stages include key principles, required processes and activities, organization and roles, technology, associated challenges, critical success factors and risks. Continual service improvement (CSI) surrounds and supports all stages of the service lifecycle. Each stage of the lifecycle exerts influence on the others and relies on them for inputs and feedback. In this way, a constant set of checks and balances throughout the service lifecycle ensures that as business demand changes with business need, the services can adapt and respond effectively.

2.2.2 ITIL Continual Service Improvement (CSI)

According to the ITIL framework, the purpose of the CSI stage of the lifecycle is to align IT services with changing business needs by identifying and implementing improvements to IT services that support business processes. These improvement activities on IT process and services support the lifecycle approach through service strategy, service design, service transition and service operation. CSI is always seeking ways to improve service effectiveness, process effectiveness and cost effectiveness.

If services and processes are not implemented, managed and supported using clearly defined goals, objectives and relevant measurements that lead to actionable improvements, the business will suffer. Depending upon the criticality of a specific IT service to the business, the organization could lose productive hours, experience higher costs, suffer loss of reputation or, perhaps, even risk business failure. Ultimately it could also lead to loss of customer business. That is why it is critically important to understand what to measure, why it is being measured and what the successful outcome should be.(Britain et al., 2011) The objectives of CSI indicated by Britain et al. (2011) are to:

- Review, analyses, prioritize and make recommendations on improvement opportunities in each lifecycle stage: service strategy, service design, service transition, service operation and CSI itself
- Review and analyses service level achievement
- Identify and implement specific activities to improve IT service quality and improve the efficiency and effectiveness of the enabling processes
- Improve cost effectiveness of delivering IT services without sacrificing customer satisfaction
- Ensure applicable quality management methods are used to support continual improvement activities
- Ensure that processes have clearly defined objectives and measurements that lead to actionable improvements
- Understand what to measure, why it is being measured and what the successful outcome should be.

2.2.3 The seven-step improvement process

Fundamental to CSI is the concept of measurement. CSI uses the seven-step improvement process shown in Figure 7.

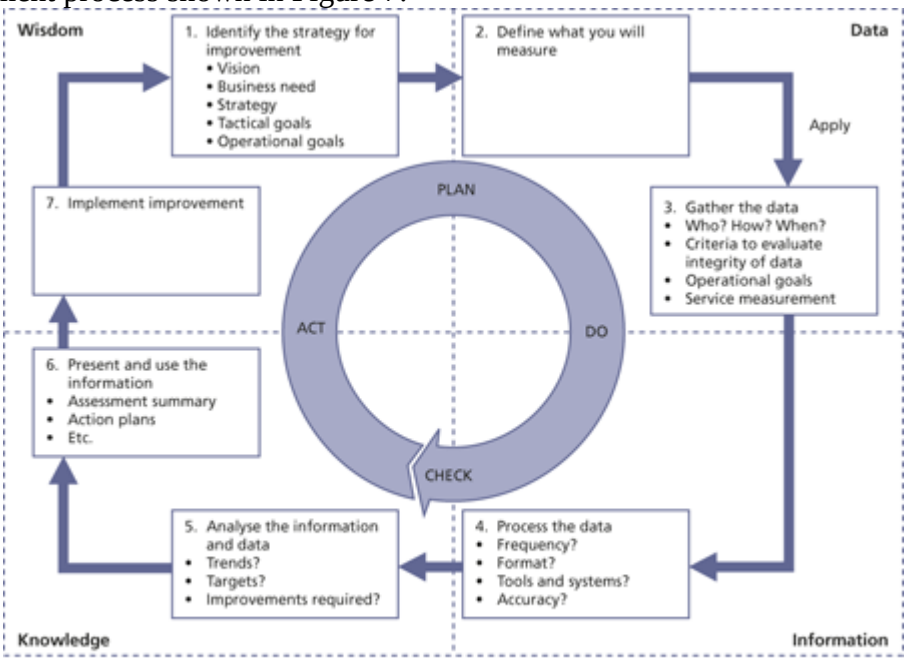

Figure 7 the seven-step improvement process (Britain et al., 2011)

It is obvious that all the activities of the improvement process assist CSI in some way. It is relatively simple to identify what takes place but more difficult to understand exactly how this will happen. The improvement process spans not only the management organization but also the entire service lifecycle. This is a cornerstone of CSI, the main steps of which are as follows(Long, 2008):

1. **Identify the strategy for improvement**

Identify the overall vision, business need, the strategy and the tactical and operational goals.

2. **Define what you will measure**

Service strategy and service design should have identified this information early in the lifecycle. CSI can then start its cycle all over again at ‘Where are we now?’ and ‘Where do we want to be?’ This identifies the ideal situation for both the business and IT. CSI can conduct a gap analysis to identify the opportunities for improvement as well as answering the question ‘How do we get there?’

3. **Gather the data**

In order to properly answer the question ‘Did we get there?’ data must first be gathered (usually through service operations). Data can be gathered from many different sources based on goals and objectives identified. At this point the data is raw and no conclusions are drawn.

4. **Process the data**

Here the data is processed in alignment with the critical success factors (CSFs) and KPIs specified. This means that timeframes are coordinated, unaligned data is rationalized and made consistent, and gaps in the data are identified. The simple goal of this step is to process data from multiple disparate sources to give it context that can be compared. Once we have rationalized the data we can begin analysis.

5. **Analyse the information and data**

As we bring the data more and more into context, it evolves from raw data into information with which we can start to answer questions about who, what, when, where and how as well as trends and the impact on the business. It is the analysing step that is most often overlooked or forgotten in the rush to present data to management.

6. **Present and use the information**

Here the answer to 'Did we get there?' is formatted and communicated in whatever way necessary to present to the various stakeholders an accurate picture of the results of the improvement efforts. Knowledge is presented to the business in a form and manner that reflects their needs and assists them in determining the next steps.

7. **Implement improvement**

The knowledge gained is used to optimize, improve and correct services and processes. Issues have been identified and now solutions are implemented – wisdom is applied to the knowledge. The improvements that need to be taken to improve the service or process are communicated and explained to the organization. Following this step the organization establishes a new baseline and the cycle begins anew.

DMAIC and 7 steps of ITIL continual service improvement are mapped in the Table by Kastelic & Peer (2012).

Seven step improvement process (ITIL v3)	**DMAIC model (Six Sigma)**
step 1 – Define what you should measure?	**Define:** Identify the problem. Define measurable goals and end results.
step 2 – Define what you can measure?	
step 3 – Gather the data. Who? How? When? Integrity of data?	**Measure**: Benchmark current performance. Collect data.
step 4 – Process the data. Frequency? Format? System? Accuracy?	**Analyze:** Identify root cause of problem. Analyze the data and identify improvement opportunities.
step 5 – Analyze the data that IT can make decisions during the next steps.	
step 6 – Present/assess the data analyzed, draw recommendations for improvement and take corrective actions.	**Improve:** Recommend and implement solutions. Produce action plan.
step 7 – Implement corrective actions.	
///	**Control:** Sustain improvement. Predict process behavior.

Table 2 ITIL and Six Sigma (Kastelic & Peer, 2012)

2.3 Agile

As stated in the introduction, Philips is trying to achieve agile to adapt to the fast changing environment. Plus, the strategic objectives are also well designed to become agile. As a result, the author will execute the analysing process with a benchmarking to agile manifesto. In the meanwhile, the author's working approach was also agile.

Agile characteristics:

- Value driven- everything we do is to create maximum value
- Feedback driven- we adapt based on customer feedback
- Lean – we eliminate waste and continuously improve
- Empirical – our product evolves to create maximum value for our customer in the shortest lead-time.

The Agile Manifesto: Purpose "We are uncovering better ways of developing software by doing it and helping others do it.

- Individuals and interactions over processes and tools.
- Working software over comprehensive documentation.
- Customer collaboration over contract negotiation.
- Responding to change over following a plan.

(Fowler & Highsmith, 2001)

In an Agile organization the agile manifesto is leading in everything. Regarding the agile manifesto, Philips' ambition in achieving agility is translated into a list in the following principles (Philips IT I&O mission and vision, 2013):

- Our highest priority is to satisfy the customer through early and continuous delivery of valuable outcomes.
- Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage. By confirming with higher managers, the team will constantly adjust their way.
- Business people and developers work together daily throughout the project. The project involves a lot of different parties in. A stand up meeting is held three times a week to check the updates and get help from others.
- Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
- The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
- Agile processes promote sustainable development. The sponsors, developers and users should be able to maintain a constant pace indefinitely.
- Continuous attention to technical excellence and good design enhances agility. Simplicity—the art of maximizing the amount of work not done—is essential.

The best architectures, requirements and designs emerge from self-organizing teams.

- At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behaviour.

In the professional literature, practices and perspectives in agile development have the aim of increasing the performance of the team, often by enabling empowerment of the individual developer within the team. (Tessem, 2014) A brief explanation of the benefits of other agile practices in the context of shared mental models is provided in Table 3. For each agile practice, a description of the agile practice is identified along with any respective shared mental model practices, as well as how shared mental would be developed in the team when the agile practice is leveraged.(Yu & Petter, 2014)

Agile practice (agile method)	Description	Shared mental models practice	Four Stages to building shared mental models	Specific type of shared mental models
Product backlog (Scrum)	List of prioritized requirement items provided by the product owner[82]. As new requirements are identified by the product owner, these are added to the product backlog	Planning, leader briefing	Enhances the knowing stage by clearly presenting all requirements to the team. Facilitates the information sharing process among the team	Establishes shared accurate taskwork mental models about the task requirements
Effort estimation (Scrum)	Estimate the most likely effort to take for the product [83].	Self-correction	Occurs in the understanding stage when teams integrate knowledge from customers and developers to make estimations on the effort required for the tasks in the product backlog	Accurate effort estimation leads to accurate shared taskwork mental model on how much amount of time and effort the project will take
Sprints (Scrum)	Rapid series of iterations that deliver a working product at its conclusion; each sprint lasts only 3–5 weeks [82].	Team-interaction training	Influences all four stages of building shared mental models by iteratively asking team members to know, learn, understand, and execute on the project	Enhances the similarity and accuracy of the taskwork mental models on the task requirements
				Improves the teamwork mental models because teams are able to learn how to work through successes and failures quickly through a series of rapid development cycles
Sprint planning meeting (Scrum)	Meeting that plans only for the next sprint (3–5 weeks of work) based on the requirements in the product backlog[82]	Planning	Enhances the development of learning and understanding stages by facilitating information sharing and integration	Improves the teamwork mental models through structure and forced communication
Sprint retrospectives (Scrum)	At the conclusion of each sprint, the team identifies and discusses challenges and opportunities within last sprint[84]	Self-correction training, reflexivity	Enhances the development of learning and understanding stages by facilitating the information sharing and integration. This practice also improves the teams' executing capability in the next sprint	Improves both the taskwork mental models and teamwork mental model accuracy

Table 3 Agile practices brief description (Yu & Petter, 2014)

2.4 Aspect-oriented programing (AOP)

AOP provides an important philosophy in the designed model “Bing Box” in the later part of the thesis. The term “Concerns” used in AOP very similar to the “objectives” in

business processes. Both of concerns and objectives need to be considered while designing the whole system.

Aspect-oriented programing (AOP) (Kiczales et al., 1997) is a programing paradigm that allows the encapsulation of concerns that orthogonally crosscut the components of a system, called the crosscutting concerns (CCCs), into a new component called an aspect. In this way, AOP increases software modularity and reduces the impact of change propagations when the systems are modified. According to Laddad (2003) a concern is a particular goal, concept, or area of interest. In technology terms, a typical software system comprises several core and system-level concerns. An aspect of a program is a feature linked to many other parts of the program, but which is not related to the program's primary function. An aspect crosscuts the program's core concerns, therefore violating its separation of concerns that tries to encapsulate unrelated functions. Many such concerns tend to affect multiple implementation modules, thus known as crosscutting concerns. Using current programming methodologies, crosscutting concerns span over multiple modules, resulting in systems that are harder to design, understand, implement, and evolve. AOP better separates concerns than previous methodologies, thereby providing modularization of crosscutting concerns.

We can view a complex software system as a combined implementation of multiple concerns. A typical system may consist of several kinds of concerns, including business logic, performance, data persistence, logging and debugging, authentication, security, multithread safety, error checking, and so on. You'll also encounter development-process concerns, such as comprehensibility, maintainability, traceability, and evolution ease. Figure 8 illustrates a system as a set of concerns implemented by various modules.

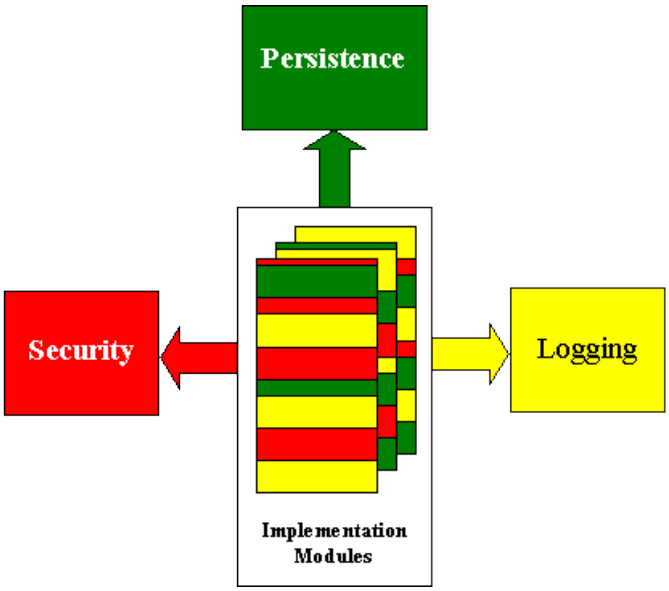

Figure 8 Implementation modules as a set of concerns[4]

Figure 9 presents a set of requirements as a light beam passing through a prism. We pass a requirements light beam through a concern-identifier prism, which separates each concern. The same view also extends towards development-process concerns.

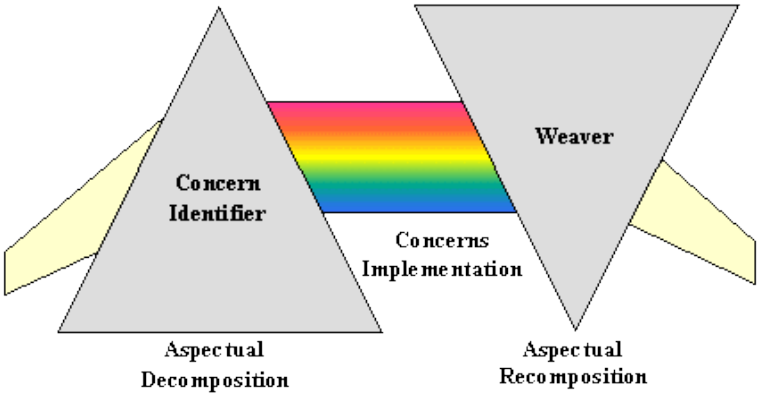

Figure 9 AOP development stages [5]

AOP involves three distinct development steps(Laddad, 2003):

Aspectual decomposition: Decompose the requirements to identify crosscutting and common concerns. We separate module-level concerns from crosscutting system-level concerns. For example, in the aforementioned credit card module example, we would identify three concerns: core credit card processing, logging, and authentication.

Concern implementation: Implement each concern *separately*. For the credit card processing example, we'd implement the core credit card processing unit, logging unit, and authentication unit.

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[4] Source: website"I want my AOP!, Part 1 | JavaWorld," n.d.

[5] Source: website "I want my AOP!, Part 1 | JavaWorld," n.d.

Aspectual re-composition: In this step, an aspect integrator specifies re-composition rules by creating modularization units, also known as aspects. The re-composition process, also known as *weaving* or *integrating*, uses this information to compose the final system. The weaver, in other words, interlaces different execution-logic fragments according to some criteria supplied to it. You would also specify that each operation must clear authentication before it proceeds with the business logic.

Following are the AOP benefits and how they contribute the business processes.

Modularized implementation of crosscutting concerns: AOP addresses each concern separately with minimal coupling, resulting in modularized implementations even in the presence of crosscutting concerns. The objectives (KPIs around it) will be separated into different catalogues. Such an implementation produces a system with less duplicated code (less KPI redesigns). Since each concern's implementation is separate, it also helps reduce code clutter. (KPIs design are separated from process design, which will increase clarity of process as well as optimize according to KPIs) Further, modularized implementation also results in a system that is easier to understand and maintain.

Easier-to-evolve systems: Since the aspected modules can be unaware of crosscutting concerns, it's easy to add newer functionality by creating new aspects. Further, when you add new modules to a system, the existing aspects crosscut them, helping create a coherent evolution. In business process, the objectives are consistent across different activities even guide the creating of new creativities.

Late binding of design decisions: Recall the architect's under/overdesign dilemma. With AOP, an architect can delay making design decisions for future requirements, since she can implement those as separate aspects. How much is too much also applicable in KPI design.

More code reuse: Because AOP implements each aspect as a separate module; each individual module is more loosely coupled. For example, you can use a module interacting with a database in a separate logger aspect with a different logging requirement.

2.5 Philips IT I&O

IT I&O is the engine that runs our IT Business Applications and productivity tools which every one of Philips +100K users and 592 business sites use every day. The mission of I&O is to make “Philips Systems Run”. By selecting, implementing and operating IT solutions for phones, tablets, PC’s and other personal use devices, networks, computing servers and facilities, collaboration tools (including video conferencing and email), Philips IT I&O helps to connect Philips’ customers, products, employees and suppliers.

The IT Infrastructure and Operations Vision is to deliver *Utility* and *Value* to Philips. Over the last decade the focus for Infrastructure and Operations, regardless of how it was organized and delivered as part of Philips IT, has been to deliver lowest cost combined with reliability. Over the years, the distribution, complexity and age of Philips IT Landscape and its Infrastructure has driven reliability out of Operations. Delivering Utility and Value will require IT Infrastructure and Operations to take a leading role in bringing Simplification to our IT Infrastructure Landscape to get the right balance between utility and value. Simplifying IT Infrastructure and Operations Landscape requires will help Philips to achieve:

- **Choice** in the products and services for Philips Business Clients select and use. One size no longer fits across all of Philips.
- **Innovation** in the application of IT Operating Models, supplier / resourcing models, and locations / hubs for service talent and economies of scale.
- **Agility** in the design of Infrastructures and IT Services which can adapt and grow and flow and contract, whenever and wherever necessary.
- **Visibility** delivering transparency in technical, operational and financial performance allowing informed decision at all levels of Philips Leadership and Management.
- **Sustainability** in the form of fit for use Infrastructures, Services and Operations delivering predictable and reliable performance and cost value.

The Figure 10 shows the I&O vision.

Figure 10 I&O Vision

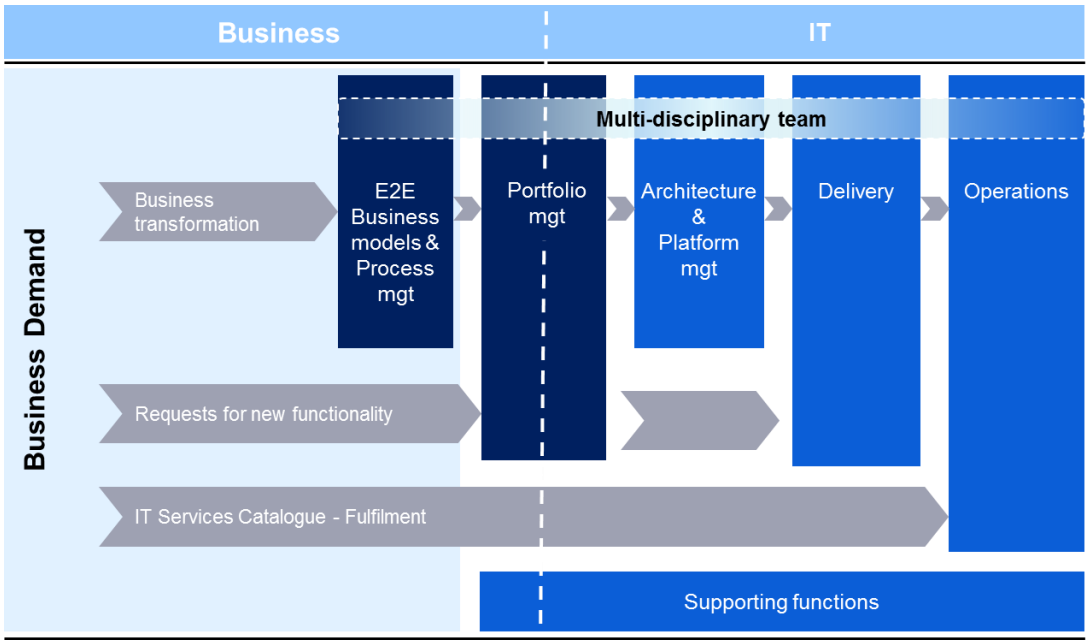

Figure 11 Philips new IT operating model[6]

The Philips IT Operating Model is ITIL-based, and provides the context for the Infrastructure and Operations Operating Model, aligning our Infrastructure Platforms Delivery and our IT Operations (See Figure 11) with the Philips Accelerate! Business / Market Combinations (BMCs) structure following a principle of "Lead & Guide from the Centre – Execute in the Field. To achieve agile, Philips has taken several actions. End of 2011 the Agile Workgroup was built from a group of Agile evangelists from within Philips. To this date, the Agile Workgroup has been working with stakeholders from inside and outside IT. The first campaign has been detailed out for quite a bit already and high-level actions have been set for the upcoming campaigns.

Philips I&O has begun the multi-year effort that will result in Global Outsourcing Contracts (centrally contracted and implemented) running their course with natural terminations over the next eighteen (18) to twenty-four (24) months (HP, Microsoft, BT, TSI, Xerox). This will allowing I&O ample time to re-compete all major sourcing activities in accordance with our strategy to achieve Output Based, Cloud and regionally priced and executed sourcing contracts. This will significantly reduce one of the key drawbacks in Global Pricing Schedules with IT suppliers - the impact of "some win, some lose" in foreign exchange fluctuations. With regional contracting for outsourced services, guided by ITIL based service design and information flow, with Enterprise Platforms technical standards, commonality of our services will be retained with regional best pricing and a minimizing of foreign exchange impacts.

[6] Source: Philips IT webcast Operating Model, September 2013.

3 RESEARCH FRAMEWORK

3.1 Design Science

Design research seeks to create innovations that define the ideas, practices, technical capabilities, and products through which the analysis, design, implementation, management, and use of information systems can be effectively and efficiently accomplished.(Vaishnavi & Jr., 2007) Such artefacts are not exempt from natural laws or behavioural theories. To the contrary, their creation relies on existing kernel theories that are applied, tested, modified, and extended through the experience, creativity, intuition, and problem solving capabilities of the researcher.

March and Smith (1995) identify two design processes and four design artefacts produced by design-science research in IS. The two processes are “build” and “evaluate”. The artefacts are constructs, models, methods, and instantiations. They are evaluated with respect to the utility provided in solving those problems. Constructs provide the language in which problems and solutions are defined and communicated(Schön, 1983). Models use constructs to represent a real world situation- the design problem and its solution space(Simon, 1969). Models aid problem and solution understanding and frequently represent the connection between problem and solution components enabling exploration of the effects of design decisions and changes the real world. Methods define processes. They provide guidance on how to solve problems, that is, how to search the solution space.

Figure 12 presents a conceptual framework for understanding, executing, and evaluating IS research combining behavioural-science and design-science paradigms by Hevner, March, Park, & Ram (2004). They use this framework to position and compare these paradigms. IS research is conducted in two complementary phases. Behavioural science addresses research through the development and justification of theories that explain or predict phenomena related to the identified business need. Design science addresses research through the building and evaluation of artefacts designed to meet the identified business need. The goal of behavioural-science research is truth. The goal of design-science research is utility. These two research frameworks are inseparable. Truth informs design and utility informs theory. An artefact may have utility because of some yet undiscovered truth. A theory may yet to be developed to the point where its truth can be incorporated into design. In both cases, research assessment via the justify/ evaluate activities can result in the identification of weaknesses in the theory or artefact and the need to refine and reassess. The knowledge base provides the raw materials from and through which IS research is accomplished. The knowledge base is composed of Foundations and Methodologies. Prior IS research and results from reference disciplines

provide foundational theories, frameworks, instruments, constructs, models, methods, and instantiations used in the develop/build phase of a research study. Methodologies provide guidelines used in the justify/evaluate phase. Rigor is achieved by appropriately applying existing foundations and methodologies. In behavioural-science, methodologies are typically rooted in data collection and empirical analysis techniques. In design science, computational and mathematical methods are primarily used to evaluate the quality and effectiveness of artefacts; however, empirical techniques may also be employed.

The contributions of behavioural-science and design-science in IS research are assessed as they are applied to the business need in an appropriate environment and as they add to the content of the knowledge base for further research and practice. A justified theory that is not useful for the environment contributes as little to the IS literature as an artefact that solves a non-existent problem.

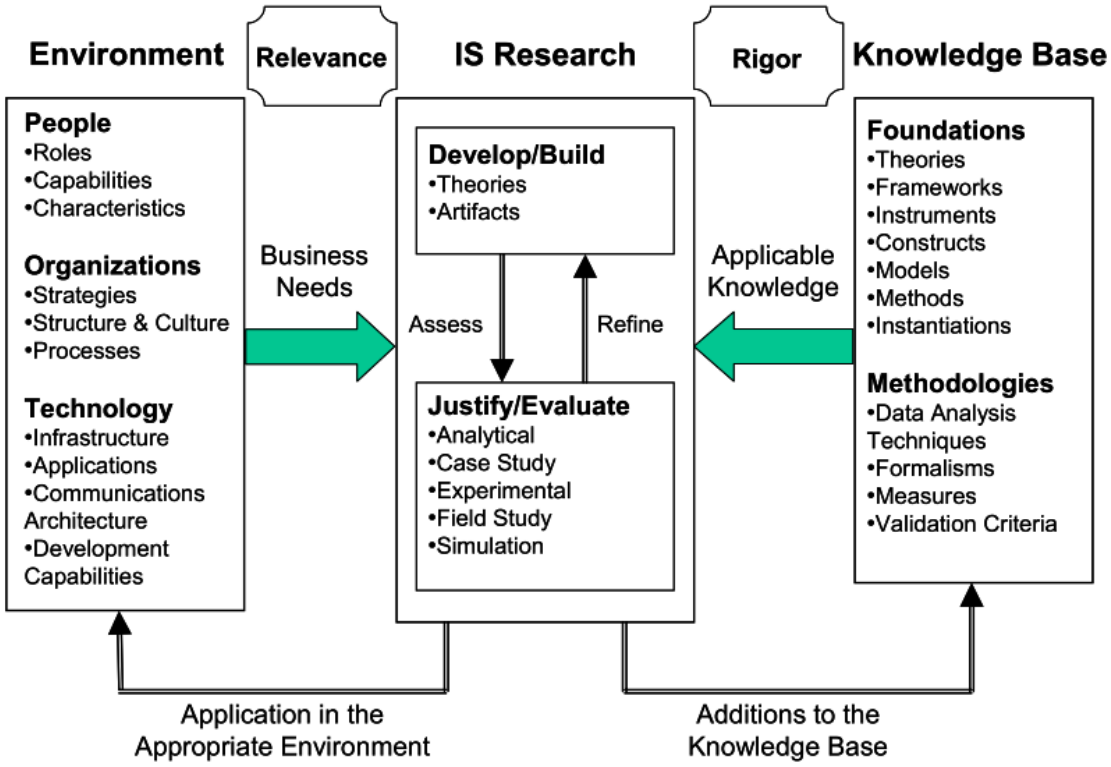

Figure 12 Information system research framework(Hevner et al., 2004)

The evaluation of designed artefacts typically uses methodologies available in the knowledge base. These are summarised by Hevner in the Table 4. The evaluation of style lies in the realm of human perception and taste. In other words, we know good style when we see it. While difficult to define, style in IS design is widely recognized and appreciated.(Kernighan & Plauger, 1978; Pirsig, 2009; Winograd, 1996) Gelernter, 1998 terms the essence of style in IS design "machine beauty". He describes it as a marriage between simplicity and power that drives innovation in science and technology.

1. Observational	Case Study: Study artifact in depth in business environment
	Field Study: Monitor use of artifact in multiple projects
2. Analytical	Static Analysis: Examine structure of artifact for static qualities (e.g., complexity)
	Architecture Analysis: Study fit of artifact into technical IS architecture
	Optimization: Demonstrate inherent optimal properties of artifact or provide optimality bounds on artifact behavior
	Dynamic Analysis: Study artifact in use for dynamic qualities (e.g., performance)
3. Experimental	Controlled Experiment: Study artifact in controlled environment for qualities (e.g., usability)
	Simulation – Execute artifact with artificial data
4. Testing	Functional (Black Box) Testing: Execute artifact interfaces to discover failures and identify defects
	Structural (White Box) Testing: Perform coverage testing of some metric (e.g., execution paths) in the artifact implementation
5. Descriptive	Informed Argument: Use information from the knowledge base (e.g., relevant research) to build a convincing argument for the artifact's utility
	Scenarios: Construct detailed scenarios around the artifact to demonstrate its utility

Table 4 Design Evaluation methods(Hevner et al., 2004)

The author designed constructs and models that will potentially help improve the process. The implementation of this model will be evaluated by observational method: field study in the actual use of process. Interviews with responsible people will be done to collect field information to support the effectiveness and efficient of designed model.

3.2 Justification for choosing the research approach

Methodology, i.e. research design, can be defined as general discussion on assumptions supporting different methods and implications as well as on challenges and restrictions of choices for the process of conducting research. A distinction is also made between 'methodologies' and 'methods' since methods are the particular practical means and instruments, which are utilized to access or create data by practicing different forms of interaction with those being studied.(Barbour, 2007) In this research, we are going to use qualitative methods. Data collecting methods are observation and interview.

The ensemble of methodological decisions of a study depends on the chosen research mission or research problem.(Eriksson & Kovalainen, 2008) When we are thinking about what is the future operation processes look like; what quality level should they meet and how it will help achieve customers and business objectives. We understand that it is better to use qualitative research method to get deep and sophisticated information from different aspects of perception. In this thesis, the author will use qualitative research method for the research question. In the end, a series of improvement will be

proposed for further discussion. In addition, the other reasons for selecting the research approach in this research were also due to several considerations introduced by Malhotra and Birks (2007) amongst which are the personal preferences and experiences of the researcher, the ability to pose sensitive questions and to unveil subconscious feelings, ability to deal with complex phenomena and to obtain a holistic view over the phenomenon of interest. Qualitative research can be described as an unstructured, mainly exploratory design based on small samples, intended to give insight and understanding, whereas quantitative research techniques aspire to quantify data and often apply some form of statistical analysis.(Eriksson & Kovalainen, 2008) In more definite terms, Creswell (2009) defines qualitative research as:

"A means for exploring and understanding the meaning individuals or groups ascribe to a social or human problem. The process of research involves emerging questions and procedures; collecting data in the participants' setting; analysing the data inductively, building from particulars to general themes; and making interpretations of the meaning of the data. The final written report has a flexible writing structure."

The reason for choosing action research is because that Philips Company brings the research question and the author of this thesis is also one of the project members, who are supposed to work out a solution and improvement plan for the Philips. As is defined by Eriksson & Kovalainen (2008) the research, where close collaboration with the research object and its practical problem solving is part of the research process, is often termed action research. Thus it is suitable for us to use action research in this case. In action research, researchers are often seen as facilitators who bring in change to an organization, and who also promote reflection over the change, and finally do research on this specific case, i.e. the researcher is supposed to be involved in the activities they are doing research on. This involvement helps the colleagues in the project gain further understanding, reflect on, change and improve their own work situation. When they are increasingly participating in the data collection, power sharing and learning processes in research, they will gain empowerment in return.(Kemmis & McTaggart, 1988) Researcher and researching subject's learning together, this aspect of action research thus relates it to critical theory.(Reason，Peter & Bradbury, 2006) As a result the philosophy stance of this article is critical.

3.3 Data collection and analysis

Different data collection and reporting instruments are used for each of the research phases. The list can be found in Table 5.

Phase	Data collection	Data reporting	Participants	Time
Model design	-Literature and documents -Company meetings	-Categorized list of constructs and propositions	-The author joined Philips IT I&O -Supporting profes-	January-April

	and documents	-Meeting minutes and recordings -Emails	sor: Piet Ribbers	
Model implementing	-Observation -Semi-structured interviews for related people -Workshops -Action taking and evaluation -Meeting minutes -Progress reports -Strategic planning reports	-Research log -Interview and workshop recordings -Interview reports -KPI list	-Philips IT I&O departments -I&O Management Team -Supporting professor: Piet Ribbers	April-May
Model evaluating	-Analyse data from phase 2 -Observation	-KPI list with comments -Interview reports	-Improving -Supporting professor: Piet Ribbers	May

Table 5 Data collection and analysis plan

During the first phase, a broad set of data sources was used to gather insights regarding the relative frameworks. An articles database was created with categories such as Lean Six Sigma, ITIL, Agile, and business transformation. In addition, meeting notes were taken during the introduction meetings held with managers. In this phase, the Bing Box model was firstly drafted.

For the second research phase, Bing Box is implemented as well as evolved in Philips IT. During the action research iterations, empirical data are collected mainly by observations, interviews and workshops. We are actively involved in the project and conduct observations and interviews within the Philips Lean Six Sigma project team as well as in related departments. These departments include SIOMs, IOM, CI&OP, O.C.C., OPMS and other dependencies departments. By contacting the related parties, the author has access to meeting observations, several interviews, and the workshops. Observations are natural data and interviews are the most typical form of data collection in action research. The author conducted the interviews in an open-ended nature, which implied that the respondents provided objective opinions of the events as well as insights into certain occurrences. (Fontana & Frey, 2000). The interview of business and customers may allow the researcher to build up a deeper mutual understanding and relationship with the informant, which in turn can facilitate co-operation with other managers, who may contribute to the study.(Daniels & Cannice, 2004) Interviews with practi-

tioners also have the ability to offer valuable insight into practical issues.(Hackley, 2003)

Finally, for the third research phase, the Bing Box model is evaluated observation and interviews. These interviews were documented in written interview summaries that were validated with the interviewee by emails. Analysis of the data is conducted by part of the grounded theory method, i.e. data analysis proceeds from open coding (identifying categories, properties and dimensions) through selective coding (clustering around categories) to theoretical coding. As soon as we got the first empirical data, data analysis begins through identifying categories and connecting them. With the proceeding of more and more interviews, the data may come into existing categories or creating a new category. Categories may finally become concepts.

3.4 Evaluation criteria

Evaluation criteria of action research should be defined before performing the research in order to later judge its outcome, as well as ways of managing alterations in these criteria in process of problem diagnosis, action intervention, and reflective learning. Otherwise, what is being described might be action (but not research) or research (but not action research).

The biggest difference of action research and other research methods is that action research is not an "independent research": Since the author is participating the project, it should include the participants of the field study and all stakeholders identified, i.e. the sharing of results with stakeholders is an integral part of the writing process. Moreover, in action research, practical problem solving goes hand in hand with research. Researchers and practitioners work together and share a mutually acceptable ethical framework. Successful action research is unlikely where there is conflict between researchers and practitioners or among practitioners themselves. For example, problems may well arise if the research could lead to people being fired. This result can conflict with the researchers' principles but be acceptable to practitioners (or vice versa).

4 CONTENT

4.1 ITIL-based process

In this session, an introduction of current process in which Bing Box model will be used is presented. I&O Futures evokes a shift from “Demand-Design-Build-Run” towards “Demand-Specify-Acquire-Performance Manage” thinking, acting and management based on ITIL 2011 v3 principles. This “Demand-Specify-Acquire-Performance Management” process is developed and introduced by Common Infrastructure & Operational Platform program, thus the process is also called by CI&OP process. (See Figure 13) In this new context, I&O will run in three departments Personal IT (individual employee facing IT: desktop, mobile, etc.), Enterprise IT (company structure facing IT: server, license, applications, etc.), and Commercial IT (Philips’ customer facing: IT services sells along with products to customers). Besides the typical ITIL “Service Operations” processes, Commercial IT/Enterprise IT/Personal IT does have ownership of some processes in the ITIL “Service Design” and “Service Transition Life Cycle” Stage. “Demand-Specify-Acquire-Performance Manage” is designed to align with the ITIL “service strategy-design-transition-operations”. I&O is accountable for IT towards the Philips and its customers, while suppliers are responsible for creating, deploying and operating the IT services on behalf of I&O rather than I&O executing these as in-house activities.

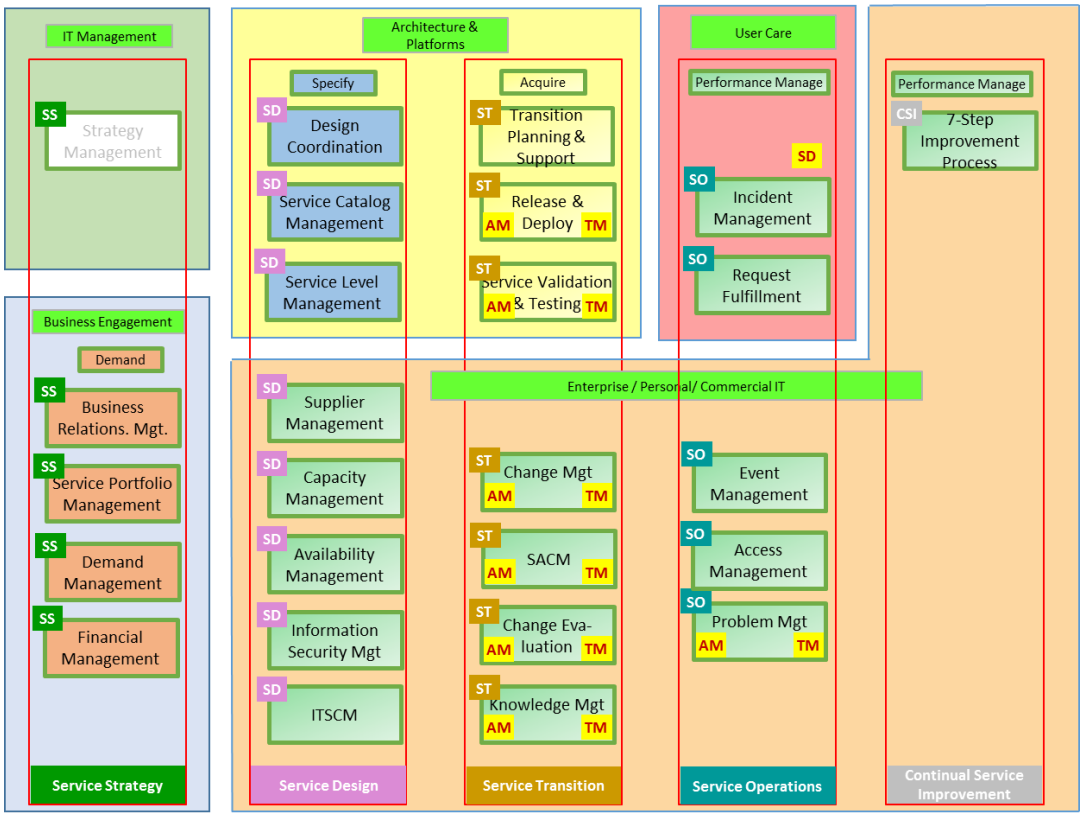

Figure 13 ITIL-based Processes

In this ITIL-based to-be process, I&O aims for a “One Stop Shopping” approach for a service which means a supplier is expected to deliver “full stack” like applicable for SaaS solutions, reducing complexity due to Philips regulated sub-contracting. In order to reduce complexity, have clear accountabilities, as well as improve speed of action, I&O desires to reduce its number of suppliers as well as the number of touch points with suppliers by just managing them. (Philips mission and Vision document, 2013)

Figure 14 shows a detailed level of “demand-specify-acquire-performance management” CI&OP process. Demand phase deals with demand intake, where all customer needs flow in. Specify phase interprets customer requirements into technical blueprints. It only happens when the demand is not included in the service catalogue of CI&OP and customers require a new design of service. If demand requests exist in service catalogue, then the demand will flow into “fast track” which will end up directly in Acquire or Performance Management phase. Performance management will handle the user care and the running of a service.

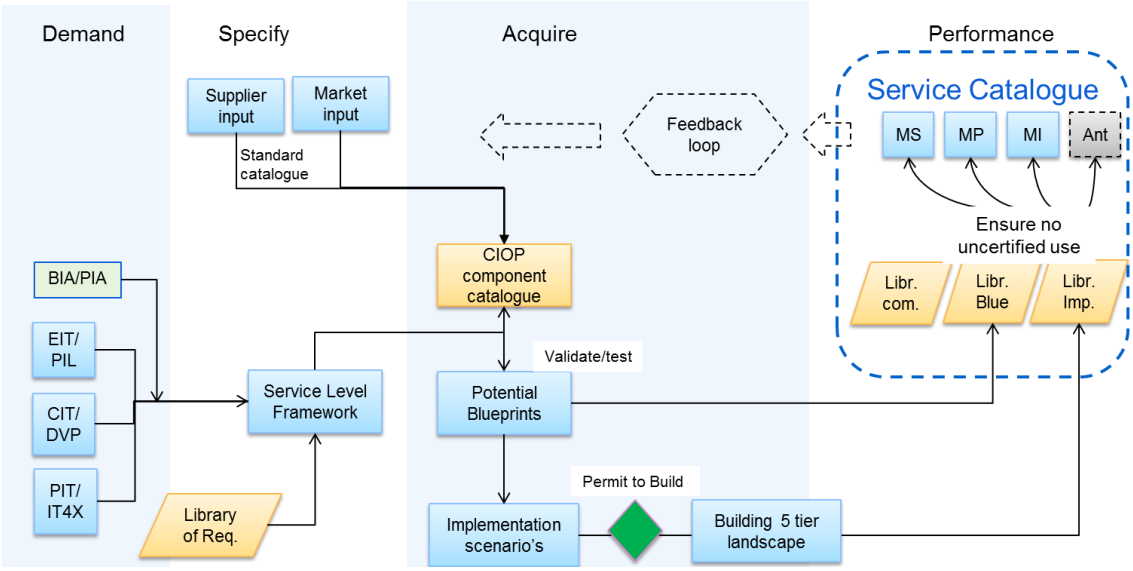

Figure 14 A detailed level of CI&OP process

Demand

The goal of demand phase is to gain insight on demand for existing, new or to be changed CIOP services by structural collecting the appropriate information that (can) influence existing and / or future demand. The demand process starts with pro-active (I&O pre-sales of existing CIOP services to business) and re-active (business approaching I&O) collecting demand.

Specify

A multi-disciplinary team (MDT) is setup to combine the business requirements and Business Impact Analysis (BIA) assessment results with Philips requirements / constraints to produce a Service Level Framework. The Service Level Framework contains all service specifications required for a successful end2end service including acceptance criteria.

The maturity level Philips want to achieve in this phase is: standardization / re-use of requirements to ease specification, speed, supplier selection and ensure appropriate requirements / constraints for Architecture, IT Service Continuity, Risk, Security, Compliance, Finance, IMS, Legal, Performance Manage as stored in the Library of Requirements are applied.

Acquire:

Creation of the blueprint(s) based on the Service Level Framework and using the CIOP Component Catalogue. After positive verification and selection of the blueprint, the pre-selected suppliers create implementation scenarios. Permit to Acquire is given after selection the preferred implementation scenario followed by full stack creation of the CIOP Service and handover into Performance Manage.

In this phase, the onboarding of new suppliers should follow required compliance, security and data privacy regimes, without committing any type of commitment in terms

of volume and duration. I&O makes use of pre-contracted suppliers to create IT blueprints / implementation scenarios.

Performance Manage:

Performance manage the CIOP Service which contains of activities like CIOP Service performance monitoring, reporting & analysis, actual usage, charging and service improvement via contracted Output Based Partners and Operating Partners. As multiple parties are dependent on each other within the Philips IT Ecosystem to deliver IT services, it is important that all parties have the information they need. Accountability for IT User Satisfaction lies with the User Care organization that, for this reason, owns the Incident Management / Request Fulfillment processes and the Service Management Tooling. User Care is also accountable for IT User Trainings and communication. Services can make use of other underlying services, which make them act in a demand – supply relationship.[7]

4.2 Bing box – the designed artifact

4.2.1 Why Bing Box?

The model of "Bing Box" will construct a holistic context with background information to set an analyzing foundation, from the organization perspective. This reflects the author's idea of neurons instead of bridge: The elements inside of Bing Box are a mix of IT and business. Each business objectives are closely linked with IT capabilities to enable them. And any IT activities in the box will have impacts linking back to business functions. The Bing Box can be as big as covering the entire Philips. However, due to the limitation of time and resources in hand, the author will only map out parts of the neuron connections in Bing Box and explain those parts in depth.

With aspect-oriented programming[8] (AOP), Bing Box is both contributing in present and providing advice repositories for the future. A modularized optimizing cycle is designed to implement into crosscutting concerns in Bing Box. These cycles follow the DMAIC/DFSS steps of Six Sigma. Instead of only repeating cycles, each cycle will also re-use the related aspects and components from former cycles. In this way, the optimization process will be simplified with less KPI reworks in different organizational silos.

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[7] Guiding Principles I&O Futures

[8] Programing paradigm see Chapter 2

Optimizing process is separated from process design, which will increase clarity of process.

4.2.2 What is Bing Box?

The Bing Box model consists of 3 parts:

- The Box concept (with 3 dimensions);
- The elements inside the box (with coordinates in Bing Box);
- The analyzing method of elements within the Box context.

In this session, the concepts of the Box and elements will be explained. In the next session, analyzing method will be explained first in the Box level, and then drilling down into element level.

The Box

The Bing Box concept is an imagined box with 3 dimensions as shown in Figure 15. Dimension X is process and supporting functions. If X=Demand, this means the element is about demand phase in CI&OP process (Demand-Specify-Acquire-Performance Management). The element can be a person, a series of activities or even related knowledge. Dimension Y is the height: strategic level, tactical level and operational level. In this case, I&O futures is in Strategic Level. CI&OP process contains activities in tactical level and operational level. Dimension Z is the service / information flow, which includes different parties in the process, namely Business, Portfolio Management, E2E Platform Management, Delivery, I&O and Vendors. We can assign almost anyone in the company by these three dimensions. The linkage of elements can be triggered by actions, reporting, or incidents events. Following paragraphs will describe the box from different facades.

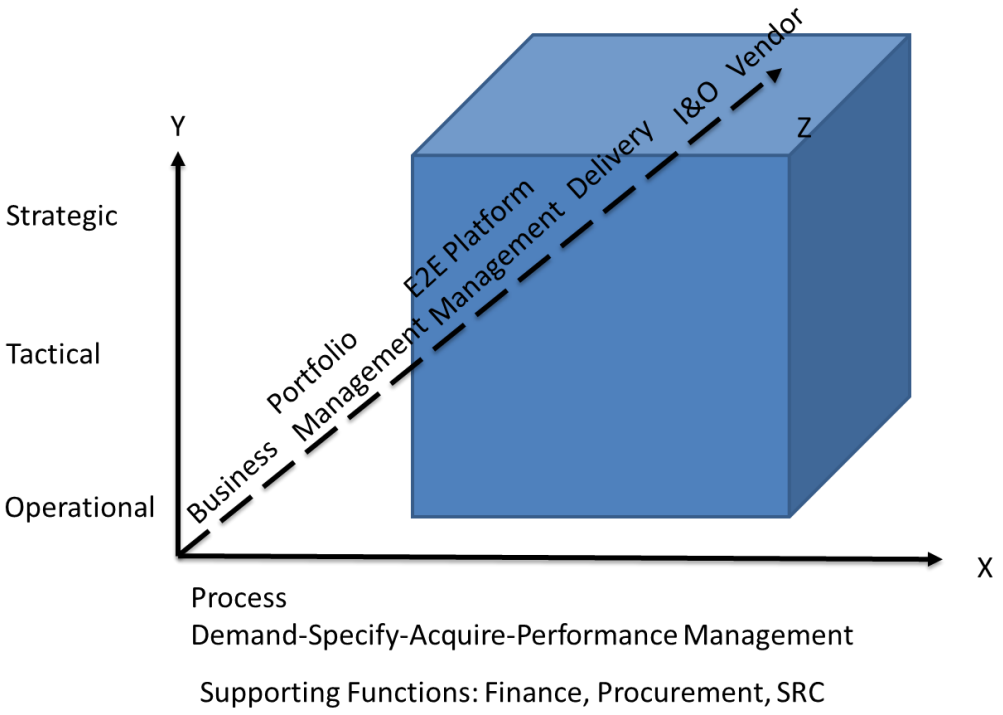

Figure 15 Bing Box

By combining X and Y, we'll have process and supporting functions combined with strategic level, tactical level and operational level. (See Figure 16) This will help us understand how strategies can be aligned from top to bottom in the organization. We'll see how CI&OP processes works in different level and how process and its supporting functions collaborate in different level. On this side of box, we call it strategy alignment. The objectives and measurements designed in the strategic level elements should be able to guiding down to tactical and operational level elements. While on the other hand, the elements in operational level should also be able to freely bring up recommendations and changes from the day-to-day operating experiences. And when tactical level elements make any changes, it should be always re-aligned with strategic level. By re-alignment, it doesn't necessarily mean reporting and getting approval from upper level. It emphasizes on the spontaneous acting organization culture that people bring companies' vision into everyday work. With this façade moving along in Z dimension from business to vendor, the related aligning activities are changing accordingly. This thesis is focusing on the strategy alignment in business and IT, which extended the unified strategic alignment model by Chevez (2010). The alignment example will be further illustrated in the following two evaluation cases.

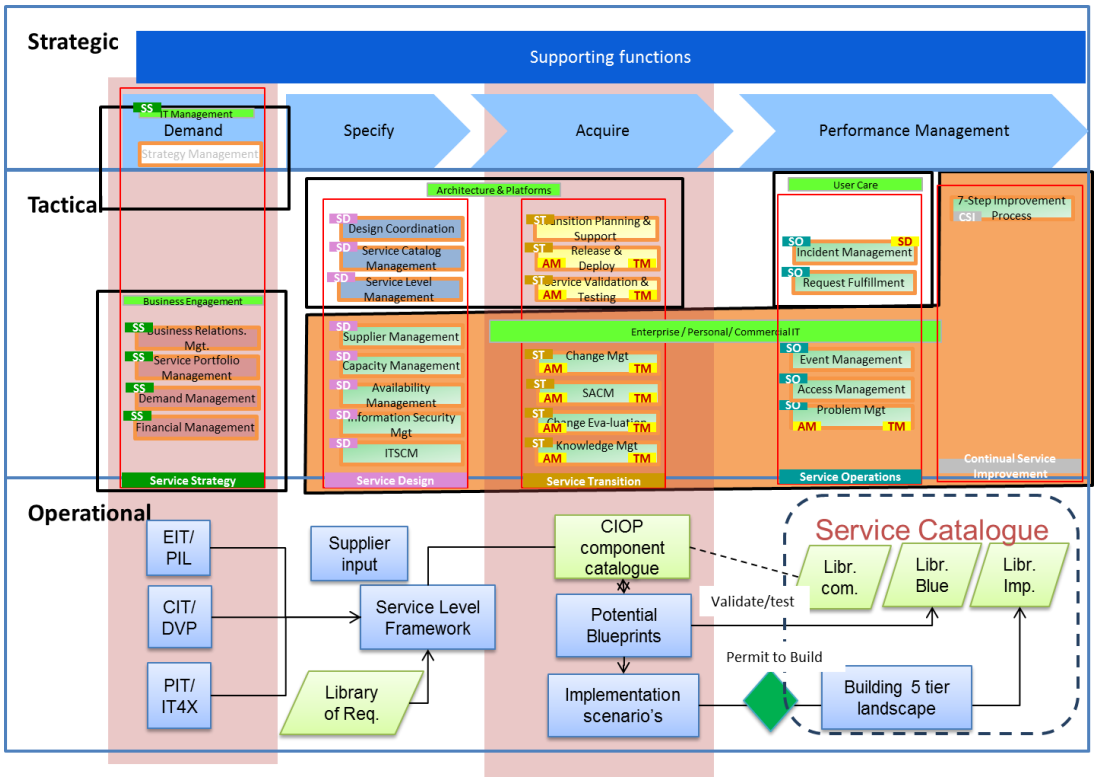

Figure 16 X/Y dimension - Strategy Alignment

In this dimension, ITIL continual service improvement tools such as process measurement can be adopted. (See Figure 17)

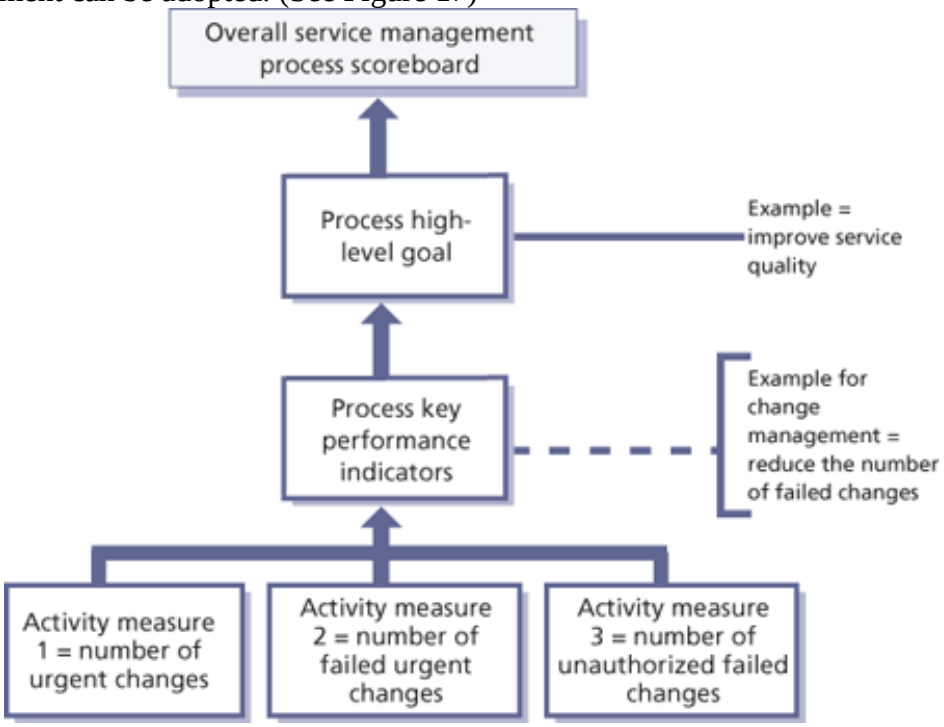

Figure 17 Process measurement tree (ITIL, 2011)

By combining X and Z, we can see that process and supporting functions are combined with business to vendors. Process mapping can be drawn in this façade including all the related parties and their supporting functions in all levels. Figure 18 shows con-

ceptual strategic level interactions among business, I&O and vendors in different steps. In the picture, process flows from left to right; information flows top to bottom; services flow bottom up. In operational level, we can draw swim lane process activities with inputs and outputs.

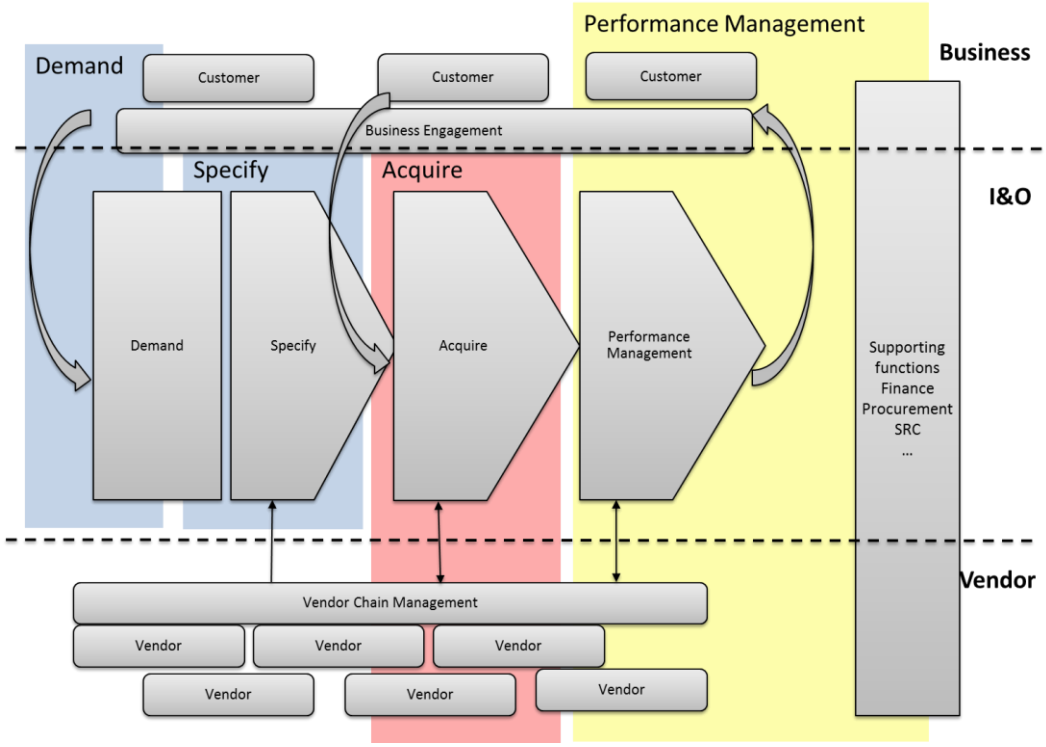

Figure 18 X/Z dimension - Silo breaking

By combining Y and Z, we'll see parties in different height: how customer, business engagement, IT and vendors interact in strategic level, tactical level and operational level. (See Figure 19) When this façade moving along process dimension, stakeholder's responsibility and involvement will change accordingly. Though we drew the stakeholders in a line sequence, it is not a strict flow line from one to another. Ideally all stakeholders would be appropriately involved with faster information and service exchanges in order to make sure quick respond to change in agile principles. According to Philips strategy, IT department will be integrated together, which will result in a simplified IT landscapes with easier information and service flow among all the stakeholders.

Above explanations is the brief view on the three facades of Bing Box. These three dimension help by providing coordinates that will link elements inside coherently and harmoniously. Following up is the definition of elements.

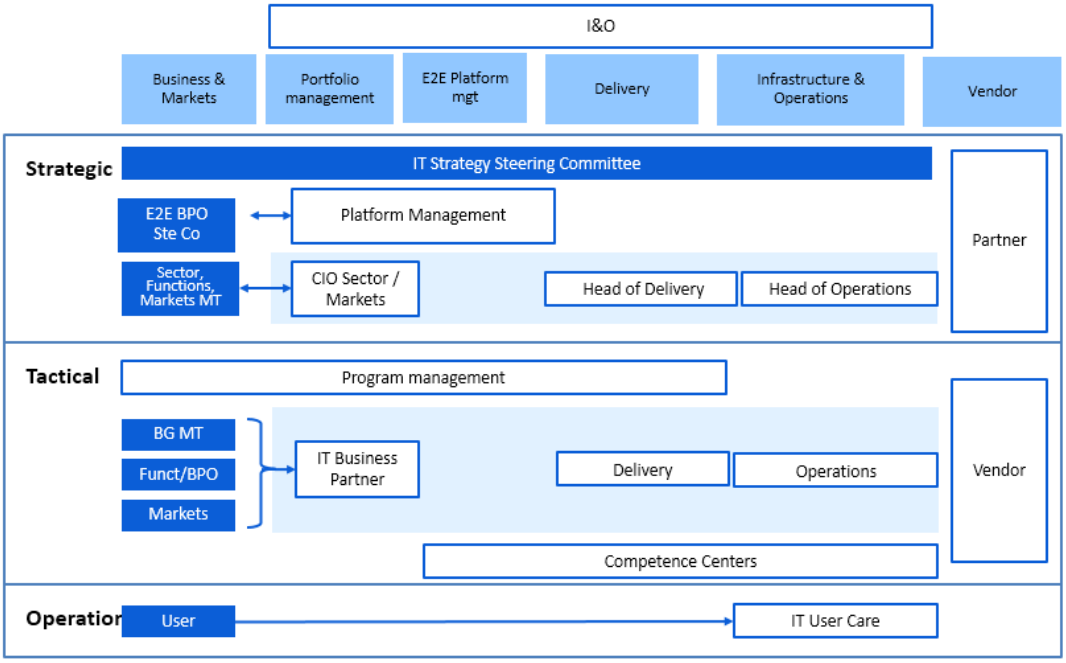

Figure 19 Y/Z dimension – Service/information flow

The Elements

An element in the Bing Box, can be a department, a position, a person, or even knowledge or frameworks. Elements with coordinates on X, Y and Z, can be understood better in a big picture. For example, the CI&OP program can be viewed as an element with coordinates X=Demand, Specify, Acquire, Y=Tactical and Operational, Z= all. Then we can understand that this program's role and its wide affected stakeholders in the whole company. We can also take out a person working under a certain position, SIOM's (Sector Infrastructure and operating manager) coordinates are X=all, Y=Strategy, Z=I&O; IOM's (Infrastructure and operating manager) coordinates are X=all, Y=Tactical, Z=I&O; IT business partners' are X=demand, acquire, performance management, Y=Tactical, Z=Business. This greatly clarifies the position relationship in the organisation: IT business partners works in business as a representative of IT, working with day-to-day business and IT issues. IOMs are managers of IT business partners in I&O who collect feedbacks and setting up tactical goals for IT. While, SIOMs are in strategy level, overviews the whole sector and provide cross sectors supporting and strategies designing. More examples are attached in Appendix D Positions in Bing Box. The elements can also be a mix of IT and business knowledge in different people. For example, SIOMs should be equipped with service strategy knowledge according to ITIL and business strategy knowledge to view I&O as businesses.

Concerns are the goal/ objectives/ values/ quality of an element. Elements and concerns are N: N relationships. The same concern that appears in different elements are called crosscutting concerns. Further than what is introduced in Chapter 2, the author will extend the concept of concerns with the metaphysics of quality. "Quality," or "value," as described by Pirsig (2009), cannot be defined because it empirically precedes

any intellectual construction of it, namely due to the fact that quality exists always as a perceptual experience before it is ever thought of descriptively or academically. Quality is the "knife-edge" of experience, found only in the present, known or at least potentially accessible to all of "us".(Plato, n.d.) Quality itself is indefinable, but to better understand it, Pirsig breaks Quality down into two forms: static quality patterns (patterned) and Dynamic Quality (un-patterned).

Static quality patterns. Pirsig defines static quality as everything, which can be defined. Everything found in a dictionary, for instance, is static quality. These static forms, if they have enough good or bad quality, are given names and are interchanged with other "people", building the base of knowledge for a culture. In the Bing Box, a static quality pattern can be “fast”. This concern is an always-existing measurement that IT will always seeking ways to decrease the time used from demand to deliver.

Dynamic Quality cannot be defined. It can only be understood intellectually through the use of analogy. It can be described as the force of change in the universe; when an aspect of Quality becomes habitual or customary, it becomes static. Pirsig calls Dynamic Quality "the pre-intellectual cutting edge of reality" because it can be recognized before it can be conceptualized. This is why the Dynamic beauty of a piece of music can be recognized before a static analysis explaining why the music is beautiful can be constructed. In the Bing Box, these concerns can be “lean” and “agile”, that we can only use analogy to describe what a lean and agile organisation is. We can only measure the “agile” by aspects, and due to its dynamic nature, aspects can be changing as well. Examples will be given in the evaluation cases.

This is not a philosophy major thesis; the author is not going to go deeper in this “concern” concept. After identifying concerns, we “decompose” concerns into “aspects” then “recompose” aspects and “implement” into the process. The steps will be explained in the session “evaluation steps”. Here we define “aspects” in the Bing Box”.

The Aspects

Aspects of concerns are the components of concerns. Concerns are explicitly depicted by elements, while aspects are hidden behind concerns. Aspects are independent to each other. Aspects can be concrete (static quality), and can also be as abstract (dynamic quality), due to correspondent concerns. Furthermore, different aspects are contributing to concerns strongly or weakly. It’s not necessary to complete all aspects to achieve concerns. It is recommended to deal with the 20% of aspects that matters most, according to 20-80 rule of Pareto principle.

An example for concerns and aspects is that when company set a goal of “decrease time to market 5%”, then the concern is “fast” in speed. Since it can be defined by time used in process, it is a static quality concern. To achieve the concern “fast”, the aspects that we can work on are: 1. providing existing choices of products that customer can quickly pick up; 2. reduce the waste that lagging the process; 3. increase employee

productivity, etc. Aspect 1 and 2 are strongly or directly linked aspects, while aspect 3 are weakly or indirectly linked with concerns.

The KPI or Advice

KPIs or advice are the re-compose of aspects into measurable, implementable measurements in the organisation. KPIs are highly customized according to organisations and processes that cannot be easily transferred to another organisation or another part of processes, which aspects can do. An advice is the thinking logic behind KPIs together with aspects and concerns that can be re-used in the future.

Bing Box-elements-concerns-aspects-KPIs/advice seems to be alike the traditional KPI defining process: Strategy-objectives-goal-KPIs. However, the conventional KPI development treats each KPI as individual measurement. Every time change in company strategy or objectives will result in re-development of KPIs and re-optimizing of processes. Bing Box model links all these KPIs as a coherent system with the help of elements and aspects. Change categorized in the Chapter 4.2.4, which requires the adaption of KPIs as well. Only this time, a systematically way in re-designing KPIs with less rework and more accuracy is introduced. Following up, the third part of Bing Box, the most important part, "analysing method of elements in Bing Box" will be illustrated.

4.2.3 How does Bing Box work?

We manipulate it by firstly cutting Bing Box into several slices:

1. Strategy slice, where X=all, Y=Strategic, Z=all;
2. Tactical and Operational slice, where X=all, Y=Tactical and Operational, Z=all;
3. Business slice, where X=all, Y=all, Z=Business
4. IT slice, where X=all, Y=all, Z=I&O
5. Demand slice, where X=Demand, Y=all, Z=all;
6. Acquire slice, where X=Acquire, Y=all, Z=all.

A brief description of these 6 slices will be showed first in this chapter, followed with optimizing steps we are going to use in the next chapter. Then, two elements/ cases will be taken as an example in to show how the Bing Box model together with its analysing approach is used.

Slice 1: X=all, Y=Strategy, Z=all

From process perspective, best practices should be adopted with DFSS approach to ensure a defects-free demand-to-delivery. Lean environment should be built in to see wastes and optimize the processes to increase velocity. Lean strategy in the strategy level means the managers encourages team members to hold regular Kaizen workshops for wastes identifying and optimizing. Management level needs to facilitate the trend by implementing series of training and establish an innovating environment for team mem-

bers. It is also needed to adopt agile environment, to eliminate the bureaucracy, maximize the individual problem solving rather than reporting and escalating. This again reflects back on one waste in Lean IT of under-utilizing skills of employees. In a word, the goal in strategy level should be what the process and organization should be look like. And then figure out how to implement these views in the tactical and operational level to make sure changes are happening as the way they want. One of the most popular methods to make these changes is the implementing of KPIs. A good KPI will convey the goal from strategy level to individual work and thus change the behaviour of individual. A quick example might be that measuring the "% of service deliver meet the acceptance requirement of business right first time." This will guide team members to think of ways to involve suppliers in an early phase with agile principles and think of ways to decreasing re-work according to lean. Workshops should be held regularly to analyse the root cause and ways of optimizing.

Slice 2: X=all, Y=tactical, operational, Z=all

In the tactical or operational level, people are actually working together to get things done. While we have lots of KPIs to measure how well the performance of people and process is, we cannot achieve the high performance as expected. The key here is to ensure a self-organizing team environment, where people are working to their best to solve the problem and get things done, rather than coping with the KPIs and tasks from the company hierarchy. To achieve the best productivity of everyone, we need to redesign process and roles according to the objectives, where people take their ownership and responsibilities for their work.

Slice 3: X=all, Y=all, Z=Business

When we cut the box in this slice, we'll get business stands over process on 3 levels. As a publicly traded company listed in New York stock exchange, Philips has to be profitability and growing. Any IT activity should add value to the business financially. Besides that, Philips business has launched new mission and vision in 2013[9].

Mission: Improving people's lives through meaningful innovation.
Vision: At Philips, we strive to make the world healthier and more sustainable through innovation. Our goal is to improve the lives of 3 billion people a year by 2025. We will be the best place to work for people who share our passion. Together, we will deliver superior value for our customers and shareholders.
Our Guiding Statement: As a diversified technology company we manage a dynamic portfolio of businesses which we build to global leadership performance. We create value through our capabilities to develop deep understanding of our customers' needs and apply advanced technologies to create innovative solutions. With our people, global presence and trusted brand we reach customers worldwide. The Philips Business System enables us to deliver superior results by being a learning organization with a growth and performance culture, in which we combine entrepreneurship and agility with disciplined, lean end-to-end execution, leveraging global scale and local relevance.

Philips IT used to deliver service to business without caring how their service can help business. Plus, an end-to-end service means business don't care so much how IT

[9] Source: company document, Accelerate!Glossory_2014_1.6.pdf

realized functions, as long as they delivered what business needed. Thus IT should take the lead in showing what IT has achieved in terms of business realization. And proactively re-align with business to be quick response to change.

Slice 4: X=all, Y=all, Z=I&O

The strategy of Philips IT I&O is realize the I&O mission and vision described in Chapter 2.6. The core goal is to remove as opposed to reduce the unrewarded complexity of IT Infrastructure and Operations Landscape. It will be done by decommissioning, retiring and eliminating applications, servers and infrastructures wholesale wherever security exposure, reliability risk and underutilization of IT assets (no proper value/ cost equation) is found. In tactical level, I&O will drive rock solid reliability and performance into operations by adopting and implementing an ITIL Process Based operating model for Infrastructure and Operations. In operational level, I&O will ensure that SLAs reflect the criticality of these systems to business needs.

Following the same philosophy, the Bing Box can be cut into more detailed slices, with even more frameworks fitting in coming from different level. This model derives from Philips IT operating model and Demand to Delivery process, which act as a link between theoretical and practical world. With a given correlation, an element is identified with related position in the whole context: who are the stakeholders, what stage of the process is it in, which level it belongs to. Thus, a comprehensive understanding of the element will be easily mapped, with the possibility to extending out to a framework in theoretical world.

Slice 5: X=Demand, Y=all, Z=all

In this slice, we'll see the service and information flow at strategic, tactical and operational level. In demand phase, business owner or IT business partners raise demand requests. Demand will be further developed through the demand phase to be evaluated whether these demands can be satisfied by I&O. This phase reflects the service strategy in ITIL, where actual activities like "business relationship management", "service portfolio management", and "demand management" will take place in different levels. According to the I&O mission and vision introduced in Chapter 2, any demand will be checked whether it is in the business strategic road map with sector CIOs and whether it is aligned with I&O's mission and vision in strategy level. On the other hand, market information on what IT can and cannot do is communicated proactively to business on a regular basis. I&O as an organization can also do marketing and sales to business for new technology. However, Philips is still business driven company, IT strategy and capabilities are prioritized lower than business to support business goals. In this façade, the IT-Business alignment model (Chevez, 2010) can easily fit the analysing scope.

Slice 6: X=acquire, Y=all, Z=all

The information flow from I&O to supplier and the acquired service contract flow from supplier to I&O. In strategic level, I&O is removing the complexity and conflict

inherent in current services contracting and outsourcing. This strategy is focused on a decision criteria based upon a principle of 100% insourcing or 100% outsourcing I&O activities (based on an output / outcome model). The IT industry service and cost models have been driving toward the commoditization of IT services and support for the last decade and this will fully embraces the IT Industry change. On charging strategy, I&O is moving toward consumption based charging with no minimum commitment and no termination fee, that only pay for what we use for all services (PxQ for all Services) acquired from suppliers. And then chargeback to our customers based on consumption rather than allocation by IT profiles. This will support accuracy in the use and measurement of shared costs for IT services.

Both Slice 5 and 6 are concerning processes. In tactical level, process objectives including fast and maturity of process and high quality and in-time delivery of outputs. The example will be given in Chapter 4 evaluation case 2.

4.2.4 Optimizing steps

Before we go into detailed analysis of the two elements in the Bing Box, we'll first explain why and how Six Sigma and AOP are used. Traditionally DMAIC is for existing process to discover root cause of problems and improve them. And DFSS is used to design a new process according to customer's needs. In this case, we combined DMAIC, DFSS and AOP. The Table 6 shows DMAIC, DFSS and our own approach.

	DMAIC	**DFSS/ DMADV**	**Own approach**
Research objective	Existing process Eliminating negative quality	Future process Generating positive quality	In the middle of transformation
Phase 1 Define/ Identify	Define CTQs	Identify CTQs; clear definition of design	Partly identify, Mostly define
Phase 2 Measure	Operational definition Measurement system	Target value and specifications defined	Measure according to existing and to-be processes
Phase 3 Analyze	Identify root cause of problem	Best concept is finalized	For not existing process: Adopting best concept; For existing process: finding root cause
Phase 4 Improve/Design	Implementing solution	Design process and alternatives according to analysis	Improve the new process and complete with designs
Phase 5 Control/Verify	Sustainability of result	Handover to process owner	Both

Table 6 DMAIC, DFSS and own approach[10]

Define

Due to the time when the author joins the CI&OP team, the process is still not completely defined. We'll firstly define existing process and identify if needed how the not-yet existing process should be. To success in that, we need to collect voice of customer (VOC) and the voice of business (VOB). By consulting on the Bing box model, the customers of demand and acquire phase will be easily identified. Then, VOC is collected in a workshop with identified stakeholders. While VOB is collected from I&O Futures document "strategic objectives", containing I&O's mission and vision from business point of view. Then we prioritize and pick out those urgent and important objectives to start with, which are the concerns.

Measure and Analyse

According to existing and to-be processes, we'll set up measurements according to objectives. We develop measurements/ KPIs according to the VOC and VOB in the context of Bing Box model ensure KPIs are linked together to achieve both tactical goals (goals in demand and acquire processes) and strategy goals (goals in I&O). AOP is used at this moment as showed in Figure 20. It consists of two major steps: decompose and re-compose. Firstly, decompose the crosscutting concerns (objectives) into aspects. If there are existing aspects that we can use, we'll adopt it. If not, we'll create a new aspect and add them into repository of aspects, which will act as advice for later defined processes and join cut into point cuts which will save a lot of re-work. Secondly, we re-compose these aspects into KPIs for implementing, which is the translation from CTQ into measurements in Six Sigma. (Aspects are not necessary CTQs or CTBs.) With designed KPIs, we collect feedback by sending proposal to workshop participants for remarks in order to make sure effectiveness of these measurements. In the meanwhile, we also ask for opinions from strategy level. These are also called "lead from the centre and guide from the field" in the VOB, which drive out regional / local activities in such a way to ensure alignment there of (as well as of any regional / local services) towards centrally defined strategies/roadmaps/plans. This will be explained in cases: chronically case 1 demand phase is ahead of case 2 acquire phase, thus an example will be given on how advice can be join into the point cut.

[10] DMAIC and DFSS source: Antony et al., (2002) Design for six sigma: a breakthrough business improvement strategy for achieving competitive advantage. Work Study, 51, 6–8. doi:10.1108/00438020210415460

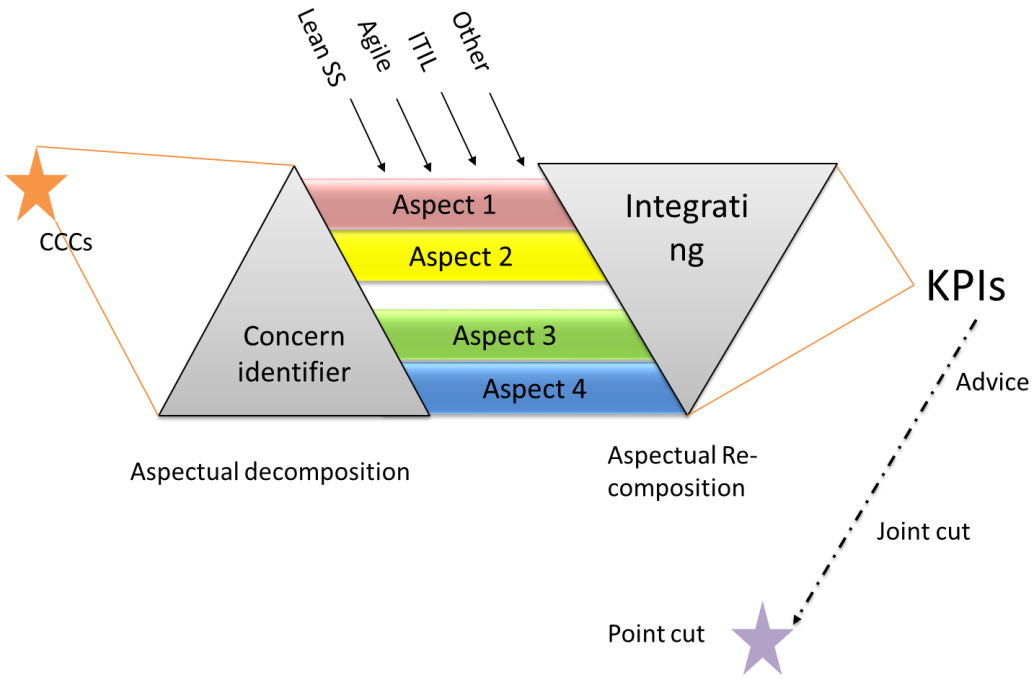

Figure 20 Bing Box with AOP

Improve/ Design

Until the author leaves the organization, no data will be collection according to the measurements. With the analysed best concept with problem we are facing in improving by interviewing key stakeholders. Further discussion on how these consolidated KPIs will help the future optimization in process and the guiding in people's behaviour. Optimizing proposal for processes will be made with potential improvements or impacts to the process. The assumptions for optimizing the processes are:

- With the time passing by, change is the only unchanged; no matter it is an incremental change or a radical change. Radical change with sudden jeopardizing to business is not often faced in day-to-day business. Thus we'll focus on incremental change.
- Incremental change happens in KPIs/advice-aspects-concerns-elements-Bing Box are following the pattern: changes are much more likely to happen in KPIs change; aspects change than in elements change and Bing Box change. Meaning KPIs are more likely to be changed in a short period of time because of change in process environment. While aspects are less easily to change if concerns/objectives are not changing. Yet with the shift of focus on different concerns in years, aspects are changed accordingly. Elements and Bing Box are the organisation structure that is much hard to change in 5-10 years.
- Adapting to change is a necessity because "the fittest wins".

Thus the process optimization is all about keeping up with the change. Then, the question is, how we predict the change and quickly optimize processes to adapt to it? Followings are more assumptions for optimizing the processes.

- Some changes can be predicted, others couldn't. Those unplanned changes (fire-fighting) are interrupting planned works, on which we have little influence. Thus we are focusing on the predictable changes.
- Predictable changes can be categorized into: weak/ indirect change that may not affect business soon or not big enough to act on it. Strong/direct change are that requires to act as soon as possible;
- Changes can be categorized into: static quality change that can be measured and identified clearly. Dynamic quality change is that immeasurable, but we can still tell the impact it may have.

This categorizing way aligns with the concerns and aspects types we mentioned in the last session. This is because "objectives"-"concerns"-"aspects" that optimizations based on are also a sort of changes that an organisation would like to bring into. By cross analysing these 4 changes, we'll get the change types matrix (See Table 7). Improvement or optimization should act accordingly. Detailed example will be in each evaluation case in the following chapters.

	Weak (indirect) link to business	Strong (direct) link to business
Dynamic quality change	**The change**: it is not easily sensed with weak impact to business. It can be business environment change or academic framework change. E.g., other industrial change: new energy breakthrough. **The optimization**: closely observe the potential impact on our business in case of pro-action needed. **Accountable/Responsible person:** Company vision designers. (Y= Strategic)	**The change**: it is not easily defined but has a high impact on business. E.g., trend in cloud storage, cloud computing. **The optimization**: this change in trend often revolute the way we do business. New target, process redesign, thinking out of box are needed. **Accountable/Responsible person:** Company management team (Y= Tactical)
Static quality change	**The change**: it is obvious in operations, with weak impact to business. E.g., vendor service upgrade with low impact on service performance. **The optimization**: observe and prepare backup plan for any chance of strengthened impact on business. **Accountable person:** management team; (Y= Tactical)	**The change**: it is obvious in operations that have great impact to business. E.g., target sales are not hit. **The optimization**: Traditional use of Six Sigma can be implemented to find root cause and optimize. **Accountable/Responsible person:** Employees. (Y= Operational)

	Responsible person: employees. (Y= Operational)	

Table 7 Change types matrix

Comparing with the SMART principle: Specific, Measurable, Actionable, Relevant, Time-boned(Doran, 1981), static quality KPIs are suitable for these principles. What the author extended are those dynamic quality objectives, which cannot be cut into pieces and measures. What we can do is only measure the aspects of them, and since it is dynamic, we should keep up with the change by updating KPIs in a relatively short-term basis than traditional KPIs, like monthly rather than yearly updating KPI itself.

With the whole Bing Box structure mapped above, we have established a model with a big picture "Bing Box", group of concepts "elements-concerns-aspects-KPIs/advice", and approaches to use Bing Box "Define-Measure-Analyse-Improve-Control". Chapter 4.3 and Chapter 4.4 are the two examples used to illustrate how Bing Box works following the analysing procedure mentioned above.

4.3 Evaluation 1: Demand phase optimization

4.3.1 Adopting Bing box model

X=Demand, Y=Strategic, Z=Business, I&O

In this demand phase, the goal of the process (X dimension) is to ensure a faster time from demand to delivery by using pre-contracted Common IT Infrastructure capabilities to realize business initiatives. To establish more efficient cost structures through scale, repeatability and reusability of CIOP components and already existing CIOP Services. To lower procurement and legal costs by eradicating repetitive activities. And to achieve reduced Corporate Risk Profile as Security, Risk and Compliance is embedded as non-variant CIOP requirements.

In the service flow and information flow dimension (Z dimension): requesting information of business flow from business owner, IT business partner, E2E platform manager through SIOMs and take over by I&O product manager. It is simply like a customer (business owner) walk in to a shop, and trying to order something. He first reaches out to the counter (SIOMs) to go through whether there is existing product in the shop's menu (service catalogue) that can satisfy his needs. If so, the shop (I&O) will deliver directly the existing catalogue service to him, which is called fast track. If not, the business owner will sit down with a master worker (Product Manager) to see how we can

create a new service according to his needs with agreed time and budget. Agile working way is the popular trend in this phase.

In the dimension of Y, Strategic level, demand phase will be covered by most of activity in service strategy in ITIL. For example, the new demand coming in will be managed regarding Service Portfolio management in ITIL; while demand organic growth or lifecycle management will be managed regarding demand management in ITIL. Based on the I&O vision and mission, I&O will own the services but doesn't manage them. In demand phase, traditional business relationship management and financial management is also designed according to ITIL.

4.3.2 Define

In the demand workshop, participants[11] are gathered to discuss the new demand intake process, including identifying the input of demand types, the output permission to performance management (fast track) or specify (new demand).

The demand process starts with pro-active (I&O pre-sales of existing CIOP services to business) and re-active (business approaching I&O) collecting demand.

Demand Intake Review the Epics, initial Business Case together with the Business. Based on the gathered information user stories are created and the remaining demand intake information is collected. Platform Managers can be used for initial IT feasibility investigation if required.

Demand Registration Based on the predefined criteria the agreed demand intake information is registered in the Demand Portal. All other demand is registered as change in the Service Management tool of Philips I&O.

Demand Qualification Determine the priority and who needs to be involved to qualify the demand. Platform Managers are used to determine if the business initiative can or cannot be resolved with existing CIOP services. Based on the Demand Qualification the demand request is:

1) Approved and re-uses existing CIOP Services (Fast Track) with next step select appropriate blueprint and related implementation scenario;

2) Approved and needs to follow the complete CIOP Demand to Delivery process starting with a Permit to Specify;

3) Rejected.

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[11] List of workshop participants see Appendix B

Permit to Specify Check if all required input information is available and approvals are provided to be able to start the "Specify" process, including budget. Appoint a Product Owner, which will take the lead in the "Specify" process. A formal handover to the appointed Product Owner is arranged.

Key Inputs to Demand phase

- IT Service Catalogue / I&O Service Portfolio / I&O Platform Product Roadmaps
- Tactical / Strategic demand (Business initiatives, plans, priorities => programs, project, changes)
- Epics / Initial Business Case

Key Outputs from Demand phase

- Approved Business Case (business needs translated in requirements and expected value, agreed user stories, BIA process outcome, stakeholder information, priority setting, timeline for delivery, service acceptance criteria)
- Project Charter / budget to specify & satisfy the business need
- Permit to Specify
- Appointed Product Owner

During the workshop, the author takes down the voice of customer in a naturally expressing environment. According to its coordination, business objectives should be prioritized most important. Business objectives include profitability, growth in the market. Meanwhile, I&O's commitment is to realize the business objectives in time, in budget and in high quality.

- Clarity: Every demand request should be clear and complete information on "demand description", "business case", "business owners", "decision makers", "expected values", etc.
- Alignment: Demand request should be contributing to strategy of both business and I&O. Reject requests that not aligned with business or I&O strategy.
- Speed: Less waiting time from different disciplines.
- Maturity: less re-work, Avoid too much or too long (waste), Simplicity: No redundant work, increasing re-using cycles, allocating to life cycle management for reducing works. Feedback loop.

Strategic Objectives on customer centric, VOB:

- Choice of Products / Services: By offering "make-sense" choice of products/ services to customer, we'll achieve fit-for-use in terms of money and features. One size no longer fits all across Philips.
- Improved Net Promoter Score (NPS): Customers need to be satisfied with the service levels and confident in the ability of the I&O to continue providing doing so and also improving it over time and always adapting the services based on the changing customer needs.

- Visibility: Delivering transparency in technical, operational, experimental and financial performance and service offerings allowing informed decision at all levels of Philips Leadership and Management to drive awareness. It includes two aspects: visibility in clarity of service catalogue (Service catalogue is easy to understand and easy to order) and visibility in accuracy in performance reporting (Finance, performance, etc.) The objective is allowing informed decision at all levels of Philips Leadership and Management. All technical, operational and financial information, data and performance will be made visible within Philips via aggregate and drill-down capability on demand via a Philips IT Infrastructure and Operations internal web site. Thus ensuring the implementation of a single source of truth with an easy to use interface for all information need.
- Customer Centric Service Strategy: Value creation to the customers by having perspectives, positions, plans and patterns to meet the customers' needs.
- Agile Workforce: Ability of employees to respond strategically to uncertainty. How to implement agile principles that will increase competitive advantage by mobilizing employees to meet the demands of volatile markets with speed, flexibility and nimbleness.
- Decreased Time to Market: Providing new services and configuration of existing services to the customer in decreased time based on the changing needs / requirements swiftly.
- Increased Productivity: Improve the productivity of the customers by providing and facilitating platforms, tools, and mechanisms to reduce waste.
- Regular re-alignment to business: To identify customer needs and ensure that the I&O is able to meet these needs as business needs change over time and between circumstances.

With all the objectives above, we prioritize and select most important concerns/ objectives to start with. Stakeholders select concerns that exist both in VOC and VOB. At the early age of implementation of the demand to delivery process, what stakeholders would like to achieve most are the concerns like “Fast” and “customer centric”, which is also the result of their position in Bing Box. With the time going by and the maturity of the process going up, stakeholders will shift the concerns in the future, while we can easily use the same optimizing steps with the same aspects we’ve defined already to save time and maximize utilization of resources. We will not have example for shifting in future concerns, but we will have examples for the shifting in the tactical level. Evaluation case 2 in acquire phase will illustrate how the following aspects of concerns reused in optimizing acquire process.

4.3.3 Measure and Analyze

Decompose

When we decompose the concerns into aspects, with the help of all the related objectives, we can map out the following aspects. (See Table 8) This example only listed part of aspects to narrow down the analyzing scope, while in the real world this list could be added for the need of business. As we can see, Lean IT and Agile principles are designed in the aspects to support better realize concerns. The aspects concerning "fast" can be infinite when we break down all the activities in process and measure them. Thus the evaluation criteria for selecting which aspects to measure should be the most important according to business and I&O mission and vision.

Concerns	Aspects
Fast (Static quality)	Optimize resources; Choice of product and services; Visibility
	Eliminate waste of rework and waiting
	Increased productivity
Customer Centric (Dynamic quality)	Agile workforce, Regular re-alignment to business
	Improve customer satisfaction

Table 8 Demand phase: Concerns to aspects

Recompose

Translate concerns and aspects into KPIs. (The Table 9 is the example given.)

Fast							
KPIs	**Comment**	**Frequency**	**Who**	**How**	**Baseline/ threshold**	**Following up**	**Objectives**
% of demand goes to fast track. (type3-5)	1. New CIOP services (incl. retirement) 2. New functionality for existing CIOP services 3. Lifecycle projects for existing CIOP services 4. Organic growth for existing CIOP services 5. Existing CIOP service catalog item	Monthly	Demand manager (platform manager)	Now manually go through demand requests and classify them. In the future, we have mature demand portal to classify with one-click.	Now relatively small % of demand goes to fast track. But, with the time goes by, we'll see more services go to fast track. Eventually, 80-90% demand will go to fast track.	This will help updating, maintenance of CI&OP component catalogue and IT service catalogue	Choice of products, Visibility
% of demand requests rejected for rework from specify, acquire or performance management.	Predefined reasons: 1. Initiated by unauthorized requesters (authorized requesters are ITBP, Platform managers.) 2.Business case not complete; 3. Withdrew by business; 4. Not aligned with I&O strategy; 5. Too long timeline. 6. Technical impossible. 7. Compliance issues	Monthly	ITBP, Platform managers, Product manager	Every time there is a rework comes to demand, we record in number and reason.	Now relatively high % of rework. We'll learn to reduce rework to 10%	By analyzing the data, we'll be able to reduce waste of re-work with accumulated knowledge.	Eliminate waste, Eliminate rework/ defects

Productivity	E.g., No. of time productivity tools used. The assumption is the more use in productivity tools, the more productive people can be.	Yearly	Project management office	Check online/ offline learning time.			Productivity

Customer Centric							
KPIs	**Comment**	**Frequency**	**Who**	**How**	**Baseline/ threshold**	**Following up**	**Objectives**
No. of hours per employee trained on Agile principles		Yearly	Project management office	Check online/ offline learning time.		Seeking improve in average training time	Agile working force
End User Satisfaction Score		Yearly	SIOM, business owner	Survey		Breakdown and analysis of satisfaction survey score in reasons	Customer satisfaction

Table 9 Demand phase KPIs

4.3.4 Improve or Design

After designing KPIs, the next step is improving the process accordingly. As we explained in Chapter 4.2.4, we will use the following Table 10 to position the KPIs in the change catalogue table. The assumption is that new KPIs are changes themselves that will be brought in the company and result in improvement of behaviours. In this session, action plan is set along with responsible stakeholder in Bing Box coordination to have actual impact in the process.

	Weak (indirect) link to business	Strong (direct) link to business
Dynamic quality change	Productivity	No. of hours per employee trained on Agile principles End User Satisfaction Score
Static quality change		% of demand goes to fast track.(type3-5) % of demand requests rejected for rework from specify, acquire or performance management.

Table 10 Demand phase change matrix

Productivity. (Indirect dynamic quality change) It is a never-ending topic for organisations, companies, societies, and even individual human beings to fully unveil the potential, the innovative genes, in order to achieve more and to "live a better life". The KPIs listed above are not even KPIs; it's a memo for company vision designers to keep up with the worldwide development on psychology, technology, even art to set up new visions for the next decades. They need to think what are the business productivity rely on, and what IT can contribute to improve them. An interview with Personal IT lead (Y=Strategic) in I&O addresses the ultimate problem lies on: "How to further identify the productivity of business with the help of IT?"

End User Satisfaction Score, No. of hours per employee trained on agile principles (Direct dynamic change)

These KPIs are focusing on providing right product for the right customer at right time in the right budget, no matter what method used. To achieve that, management team is responsible for set right targets for right people to achieve. This is more about efficiency of KPIs on what to measure. In this two example, if achieving ends user satisfaction is our goal. Then what should be measured as a "satisfaction score"? Interview and feedback from a User Platforms & Automation Platform manager (X=Performance management, Y= Tactical, Z= E2E platform) believes:

- By offering “make sense” choice of service to customer, we’ll achieve fit-for-use in terms of money and features. The problem we are facing now is how to define a “make sense choice” according to customers?
- To measure the “improved Net Promoter Score”, I&O need to align with SIOMs’ questionnaire to end-user.
- In “Agile workforce” besides the trainings of Agile, I&O also can measure and reward those who get “thank you” note on social cast, based on how they helped customer.

% of demand goes to fast track (3-5). This KPI will encourage people to flourish the service catalogue. Lean Six Sigma can be further used to analyse why demand services are not in the component catalogue yet. And then people will seek improvement. This will result in a fast demand to delivery cycle that greatly benefits business. We have interviewed a product manager (Y=Operational). He described a happy day for him would be: “Demand from customers are well satisfied by our service catalogue.” The accountable people will be those who work on CI&OP program.

% of demand requests rejected for rework from specify, acquire or performance management. According to Lean IT, re-work is a waste we want to eliminate. After we breakdown the reason of rejection, we’ll be able to analyse the root cause of the re-work and seeking to solve them. Process managers in each phase (Demand, Specify, Acquire, and Performance Management) and Project managers for each new service are taking accountable and responsible for the optimization.

With the analysis above, both an improvement plan and its potential problem facing are described.

4.4 Evaluation 2: Acquire phase optimization

4.4.1 Adopting Bing box model

X=Acquire, Y=Tactical, Z=I&O, Supplier

In this acquire phase, the goal of the process (X dimension) is to deliver faster blueprint / implementation scenarios based on choice that are best fit for use and fit for purpose as defined in the Service Level Framework using the pre-contracted suppliers and CIOP Component catalog, after which a creation of product release package containing all information needed for a smooth handover will be transited to Performance Manage.

In the service flow and information flow dimension (Z dimension): Product owner in I&O will act as the accountable person for the end result of acquire activities. Multi-

disciplinary Team[12] (MDT), who take over the customer needs and translated them into IT language in specify phase, will be responsible in acquire phase to negotiate with suppliers on the technical blueprint requirements. This information flow to supplier and supplier build the blueprint and implementation scenarios, which will flow back for confirmation/permission from I&O product managers and business owners (IT business partner and SIOMs). At the same time architects, project management office will be consulted on service transition process.

In the dimension of Y, tactical level, based on Service Integration principles: we do only direct / manage parties during their design-build-test-pilot phases. According to ITIL, these activities including: transition planning and perform, release & deploy, service validation & testing, change management, SACM (service asset &configuration management), change evaluation, knowledge management.

4.4.2 Define

In this workshop, participants are gathered to discuss the to-be process in acquire, including identifying the input from specify, the output to performance management and the process of how to acquire. Process flow:

Manage CIOP Component Catalogue Setup catalogue structure and qualify-, maintain- , review- and improve- the CIOP Component Catalogue items.

Request for Blueprints / Implementations scenarios the initial handover of the Service Level Framework to the selected suppliers is executed in the Specify process. The definitive timeframe for blueprints / implementations scenarios are agreed and any remaining questions are answered by the MDT.

Blueprints / Implementations scenarios creation the selected suppliers are designing the blueprints / implementation scenarios (functional and non-functional) within the agreed timeframe. The suppliers present their designed blueprints / implementation scenarios to the product owner and MDT. The suppliers' presentation of the blueprints / implementation scenarios may include the setup of a sandbox / Proof of Concept.

Select Blueprint / Implementation scenarios Product owner and MDT select the best designed blueprint / implementation scenarios that are "fit for purpose" and "fit for

[12] Multi-disciplinary team includes people from continuity and Risk, Security and Compliance, Architecture, Legal, Finance, Performance Manage representative, procurement (especially indirect material services, IMS)

use" based on the Implementation scenario evaluation worksheet, which is derived from the created Service Level Framework. Feedback of the evaluated blueprints / implementation scenarios is provided to the selected suppliers. Store selected blueprint / implementation scenarios.

Permit to Acquire Definitive approval is required by product owner, business owner and IMS to start with the selected implementation scenario(s).

Build & Test Procure, build, configure the CIOP components, testing the (new/updated) service in sandbox (incl. UAT), request to go live (using TM Handbook)

Permit to Consume Formal handover to Performance Manage by creation of an agreed Product release package, preparing components to live environment. Final check executed by Performance Manage (completed / approved TM Handbook), arrange early-life support, Service Catalogue is updated. Stakeholder management and risk mitigation is performed throughout the whole process chain. Workarounds should be in place.

Key Inputs to Acquire phase

•Approved Service Level Framework document

•Selected suppliers for blueprinting / implementation scenarios

•Permit to Blueprint / Implementation scenarios

•Supplier Input and Market input for the CIOP Component catalogues

•Fast track ordering requests for CIOP services / CIOP components (Startup onboarding new suppliers in case required)

Key outputs from Acquire phase

•Product release package (e.g. communication toolkit, FAQ, pricing information, knowledge articles, support model, contact information)

•Tested product (accepted testing, verified against specifications)

•Operations budget, approved release, Permit to Consume

•Signed SLA / UC / OLA

•Dashboards (towards customers / IT/ for supplier management)

The author takes down the customer (performance management people, or the operating people) in a naturally expressing environment.

An objective in process design is to achieve 2 main goals: maturity in process and quality in deliverables. In the maturity of process, I&O will try to

- Manage vendors other than doing all the works by Philips I&O, focusing on high value creation.
- High rate of re-use the existing service component and existing vendors. This also means the updating of service catalogue should be properly maintained.
- The process should be lean according to Lean IT: no waste in rework and waiting.

In the quality in deliverables the sub-goals are:

- To ensure reliable & seamless IT operations to the customers. It means low incidents rate in performance management phase. And faster recovery when there is an incident. Clear communication toolkit, user manual, and dashboard. Increase "fit-for-use" and "fit-for-purpose".
- On-time delivery, speed in decision and automate authorization process. High first-time pass rate.
- In-budget: transparency in cost. Consumption based charging in performance management.

At the same time, the related VOB objectives are:

- Reduced change cycle time: Change requests need to be handled swiftly and efficiently. Streamlining multiple efforts to yield an efficient process resulting in cost and timesaving and improving customer satisfaction.
- Plug & Play supplier integrity: Philips has a highly heterogeneous technology environment comprising several disparate applications running on a variety of platforms. An architecture, which helps in easier integration to the suppliers, is required. Philips can migrate functionality into a centralized middle tier environment, thus creating centralized enterprise components for easier integration with any external provider.
- Sustainability: Providing infrastructure, services and operations which serves Utility (Fit for purpose) and Warranty (Fit for Use); (to serve the current and future requirements); continuously useful over its entire life; Resilient and adaptable to changing external circumstances.
- Reduced MTTR & Failures: Reduced main time to repair/ recover and reduced failures.
- Consumption based IT infrastructure:
    - Pay only for what we use: It is Philips intent to acquire standard catalogue based services and components in a true P*Q model. Focusing on actual usage, not allocated resources/ components, usage per day or the smallest possible time denominator.
    - Elasticity, scalability up & down: Philips expects that services acquired from the CI&OP supply base are scalable instantly, following demand from Philips' businesses, without the need for contract change notes.
    - No required minimum commitments: The CI&OP consumption based model is free of any start-up costs, does not entail volume commitments and/or contract durations, and has no termination costs and/or penalties when business demand drops. Charging starts from the moment Philips is consuming services.

  - Self-Provisioning – Consumer driven: Providing Philips the ability to scale up, and limit demand up to the preferences of Philips, where automated processes are embedded in the model. Including the ability to design budgetary ceilings and alerts where required.
  - Real-time visibility to usage & performance: Philips' vision is to become a real-time company where CI&OP is an instrumental organization enabling this vision. All CI&OP services need to provide full visibility on usage and performance.
- Transparency: Providing visibility on the consumption and the cost of IT to the business; E.g., what do we charge to the Sectors for end user devices, telecom or WAN, or the costs on the services provided. TCO visibility enables informed decisions on optimal use of IT resources.
- Regional best price: This will significantly reduce one of the key drawbacks in Global Pricing Schedules with our suppliers - the impact of "some win, some lose" in foreign exchange fluctuations. This strategy helps minimize the foreign exchange impacts.

According to the coordination, the acquire phase is in tactical level. Stakeholders are concerning mainly on the "process maturity" and "process input/output", also aligned with their relative position in Bing Box. Process maturity is how well process performs. Process input/ output are how good the products we provide to our customers. A good process may not result in fit-for-use product for customers. On the contrary, even we have developed products met customer needs; the process may take too long that.

4.4.3 Measure and Analyze

Decompose

The example aspects to measure in each concern are listed in Table 11, with re-used aspects from evaluation case 1. The reasons why aspects can be used again in different concerns are because these concerns are somehow linking together in the Bing Box context. While traditionally KPIs are developed in different phase separately, which will result in duplicated work and waste of emotion.

	Aspects	**Re-used aspects**
Acquire process maturity	Optimize resources Resources are the CI&OP component catalogue items that can be reused. In "demand- specify- acquire" each phase, we want to satisfy customers with existing IT service catalogue items.	Optimize resources; Choice of product and services; Visibility
	Eliminate waste	Eliminate waste of

	According to Lean IT, waste can be defects, overprovisioning, waiting, non-value added processing, transportation, excess inventory, and excess motion, unutilized employee skills/knowledge. We want to measure how much is the waste and try to eliminate them.	rework and waiting
	Tooling Tooling is the interacting systems, or communicating tools we use. We want our tools to be supportive, easy to use/find, self-explaining and automation.	Increased productivity
Acquire input/output	Do we meet our committed time?	Improve customer satisfaction
	Does the output quality meet acceptance criteria? How accurate/complete is the input? How many goals we achieved. (Story points) Is the service we delivered what clients wanted? Have we achieved our I&O business? Do we achieve what committed: consumption based?	
	Do we deliver within budget?	

Table 11 Acquire phase: re-use aspects

Re-compose

Translate into KPIs in Table 12.

"Acquire" Process							
KPIs	**Comment**	**Frequency**	**Who**	**How**	**Baseline/ threshold**	**Following up**	**Objectives**
% of blueprint/implementation scenarios done with existing suppliers. (No new onboarding required)	Due to startup of CIOP we will onboard a lot of new suppliers. After Release 2, 3 the number of onboarding new suppliers should decrease	Monthly	Platform managers, Product manager, CI&OP component catalogue owner	Count monthly how many % of services acquired with existing suppliers. (No new onboarding supplier)	Now relatively low % of re-use. With the increasing on boarding suppliers, % of re-use will increase.	Analyzing which suppliers is the key ones and improves the supplier relationship. Reconsider continuation the MSA for low re-using suppliers.	Optimize resources, Increase re-use
% of acquire requests rejected for rework from demand, specify or performance management.	Rework from demand: late demand requests coming in; Rework from specify, late specification coming in, rework from performance management acceptance criteria couldn't be meet.	Monthly	IOM, project manager, Demand manager, specify manager, acquire manager	Every time there is a rework comes to acquire we record in number and reason.	Now relatively high % of rework. We'll learn to reduce rework to 10%	By analyzing the data, we'll be able to reduce waste of re-work with accumulated knowledge. Thus increase first-time pass	Eliminate waste, Eliminate re-work/ defects
% of new services in IT Service catalogue without going through all appropriate toll gates.	Workaround of demand phase is possible in the early phase. CIOP process is not implemented yet.	Yearly	Project manager	Review % services without going through all appropriate toll gates in the IT service catalogue.	Ideally 0% of service should be in the IT Service catalogue without follow the entire CIOP Demand to Delivery process.	Find root causes of workarounds and eliminate them.	Eliminate waste, Eliminate re-work/ defects

Acquire input/output							
KPIs	**Comment**	**Frequency**	**Who**	**How**	**Baseline/ threshold**	**Following up**	**Objectives**
% of services	Differs from the KPI	Quarter-	Product	Quarterly count %	Increase first-time	Analyzing data for root	Quality

meet service acceptance criteria right first time. (Or pass Permit2 Performance Management first-time)	above, this measures not only the performance of suppliers, but also the performance of I&O.	ly	manager, platform manager	of first-time pass against all the services acquired.	pass to a balanced ratio. (Quality/ time balance)	cause of low first time pass rate. Raise attention in details of service quality; Seeking more mutual understanding among business, IT, suppliers.	
% of IT commitment and Business requirements met	Business requirements include story points or other quantity/ quality requirements. IT commitments: 1. Pay only for what we use 2. Elasticity, scalability up & down; 3. No required minimum commitments; 4. Self-Provisioning – Consumer driven; 5. Real-time visibility to usage & performance.	Per service	IMS, Acquire manager	Every time a service contract gets signed, go through the list 1-3 to tick whether we have achieved our IT commitments. 4-5 will be survey to customers.	Currently we may not be able to strictly keep our commitments. Thus a low % of service will achieve all 1-3 commitments. With this information visible to all, we'll be able to increase them in the following service contract.	Provide wide visibility to people for driving attention when signing service contracts.	Quality

Table 12 Acquire phase KPIs

4.4.4 Improve or Design

	Weak (indirect) link to business	Strong (direct) link to business
Dynamic quality change		
Static quality change	% of new services in IT Service catalogue without going through all appropriate toll gates. % of blue-print/implementation scenarios done with existing suppliers. (No new on boarding required)	% of services meet service acceptance criteria right first time. % of acquire re-quests rejected for rework from demand, specify or performance management. % of IT commitment and Business requirements met

Table 13 Acquire phase change matrix

Here by taking a comparison between evaluation case 1 and 2 on the change matrix in Table 13, we'll find out that dynamic quality change is less. The more dynamic quality a KPI is, the harder it can be measured, and while the more flexible it is in managing it. This gives the strategic level managers much more free space to think wider than limited aspects for solution. Metrics needed to be translated into concrete definable, measurable KPIs, from strategic level to tactical and operational level (Y dimension). For operational employees, it is easier to micromanage how to achieve those targets.

% of new services in IT Service catalogue without going through all appropriate toll gates.

This KPI is a perfect example of separated accountable and responsible person. The reason why there are services acquired directly from suppliers, without going through all the processes they should go, is often because strong escalation from management team in business and IT. Management team should be accountable for the end result, and giving pressure for all services request go with the procedure. While operational employees are responsible to execute the process. An interview product manager of CI&OP program confirms this KPI will help us to be better in process. He addresses a bad day for him would be "someone posted we want service A on connect us (Philips internal SNS), and everybody say it's a good idea, no full demand processes (conducted)." Business together with IT start discussing about solutions: acquiring and realizing service A without a formal demand process. He suggests, "they should be told (by management team) to go back to the formal process".

% of blue-print/implementation scenarios done with existing suppliers. (No new on boarding required)

It is the same aspects of best use of existing resources. Instead of customizing every time for each business sectors, I&O is moving towards standard service catalogue. Due to the business silos from legacy time, every sector has their own preferred suppliers in delivering works. I&O is simplifying IT landscape by decommissioning unnecessary and duplicated applications and services. At the same time, fit-for-use is also equally important. This requires joint effort of product manager, platform manager to "sell" our existing services to better meet with customer needs; demand manager to decline those requests not complained with I&O strategy; acquire manager to manage supplier pool quickly and smartly.

% of services meet service acceptance criteria right first-time.

Interview with transition manager commented in the emails:

Generally, if you look through ITIL recommended KPIs for Service Transition, you will see very few references to time measurement. They are more interested in counting numbers of rejects, or re-work and number of incidents arising in operation as a result of poor testing. It's all about being right first time and the rest will follow as a natural consequence, including lowering the cost of non-quality.

To achieve that, it requires an accurate request input, with clear and specified parameters for the services, a fast process with efficient and effective communication. By adopting Lean and Agile to increase the first time pass. It will be greatly helps the transition and performance management in the future. An interview with product manager also emphasis that "for demand requests from customers that are not existing in the service catalogue, we will deliver the blueprint/implementation scenario in time and accepted quality."

% of acquire re-quests rejected for rework from demand, specify or performance management.

Same logic with the re-used aspects in evaluation case 1. This is when Bing Box model helps to greatly save time and effort by modularized optimization processes.

% of IT commitment and Business requirements met

When a project manager of CI&OP talks about demand phase, he said "I need to know whether it (the demand request) is on the roadmap of healthcare." Besides that, "If it is a legacy demand, I will not do it (permit to specify)" "If it is new infrastructure demand, I will do it." For any demands we need to confirm what first whether it aligns with business and IT needs. After we finish, we also need to get feedback from business and reflect IT ourselves to see whether we have delivered what we committed. He added, "Is the service deliver is what you (business) needed, in other words, did we meet the objectives (of business)".

4.5 Results and recommendations

Philips I&O follows proven best practices in IT Service Management, represented by ITIL, in order to ensure that the IT Strategy is aligned to the Philips Strategy in order to enable the Philips business meeting their ambitions derived from this Philips Strategy.[13] Bing Box is the philosophy inherited from this idea that the box is drawn based on practical Philips business IT operations and then seeking guidance on wherever needed from whatever framework. This is the step "adopting Bing Box model". In the evaluation case 1 and 2, after adopting Bing Box model, we firstly described the context and the environment of these 2 elements. In this step, wide information is gathered from ITIL principle and organization background in elements perspectives. In this way, we'll find inner causal relationship and "neuron" links between elements. The Table14 are the relationship of these 2 example elements.

	Evaluation case 1	Evaluation case 2	Relationships between 2 elements
X=	Demand	Acquire	Demand phase is the prerequisite of acquire phase in the process.
Y=	Strategy	Tactical	Lead from center, guide from field. IT organizes in a way that ensures all activities / services are aligned across the global and maximize performance. On the other way, strategies are also derived from problem faced in the day-to-day activities.
Z=	Business, I&O	I&O, Suppliers	Early involvement of stakeholders, visibility in the process, and business priority on top of IT to achieve quick respond to change.

Table 14 Evaluation cases comparison: Elements

Then we define from different elements, the process, input, and output, together with VOC and VOB. The following table shows how concerns in evaluation case 1 and 2 related with each other. (See Table 15)

	VOC/ Customer concerns	VOB/ Business concerns	Selected Concerns
	Voice of customers is the	This is where we filter whether those	We prioritize

[13] Philips internal document, Process objectives, ITIL based service strategies, May 2014.

	urgent and important objectives we need to start with. (But these objectives often limited in time and maturity.)	VOCs are aligned with strategic roadmaps of the company.	and pick out several concerns to start the optimizing process.
Evaluation case 1	Clarity Alignment Speed Maturity	Choice of Products / Services Improved Net Promoter Score (NPS) Visibility Customer Centric Service Strategy Agile Workforce Decreased Time to market Increased Productivity Regular re-alignment to business	Fast Customer Centric
Evaluation case 2	Maturity in process High quality in deliverables	Reduced change cycle time Plug & Play supplier integrity Sustainability Reduced MTTR & Failures Consumption based IT infrastructure: Transparency Regional best price	Process maturity Process input/ output quality

Table 15 Evaluation cases comparison: Concerns

This is to define what the business and IT really wants. Concerns are then decomposed into aspects, from which hides how we can realize those concerns. We then take what is already in the best practices, ITIL, agile and Lean IT as aspects. Table 16 shows how this worked in evaluation 1 and 2.

	Concerns	Aspects	ITIL	Agile	Lean IT
Evaluation case 1	Fast	Optimize resources	Demand management		
		Eliminate waste			Waste of "TIMWOOD"
		Increase productivity	Service portfolio management	Working software over documentation	Theory of Constraints
	Customer Centric	Agile workforce		Collaboration over negotiation	

		Improve customer satisfaction	Business relationship management	Individual over process	Pull vs. Push
Evaluation case 2	Process maturity	Optimize resources (Re-use)	Release and deploy management	Working software over documentation	
		Eliminate waste	Service asset and configuration management		Waste of "TIMWOOD"
		Tooling			Pull vs. Push
	Process input/ output	Time	Transition planning and support		Waste of "TIMWOOD"
		Quality	Knowledge management	Collaboration over negotiation	
		Budget	Request fulfillment		

Table 16 Evaluation cases comparison: Aspects

The number of concerns and aspects can be infinite. It's all about prioritizing what to do first. Aspects are collected in an "aspect repository" that will be further re-used in other concerns. (See Figure 21) The reason why aspects of concerns connect with frameworks is because the assumption that the optimization starts with a "optimization goal', which best practices and principles can provide. This theories help explores and detail out the nature of concerns. After that, optimization plans with re-composing aspects and concrete KPIs will guide and bring changes to individuals.

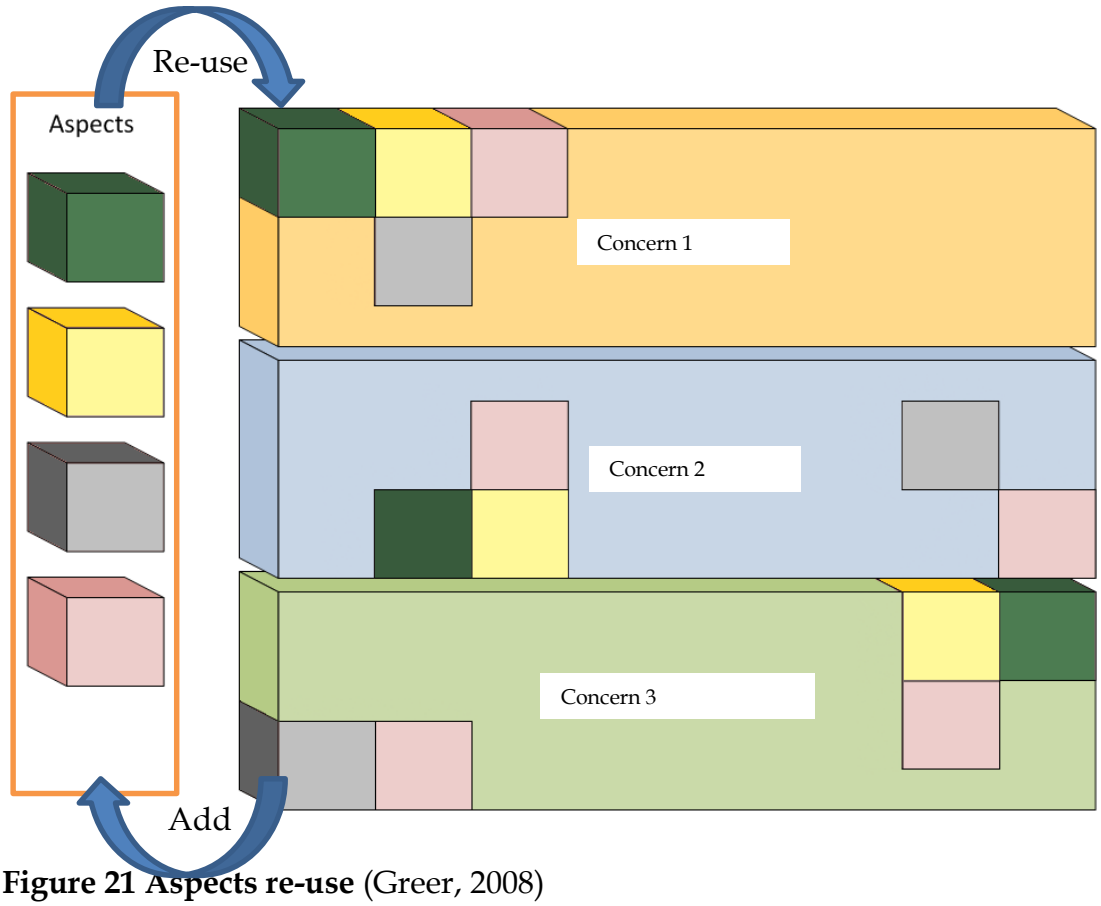

Figure 21 Aspects re-use (Greer, 2008)

In both evaluation cases, the KPIs are designed and some are even approved to implement in the company. What we did next is prioritize and set up action plan for the KPIs, according to the "change matrix". (See Table 17) These KPIs in the matrix are equally important in its nature. However, it is easier to start with the direct and static quality KPIs, since these are traditional measurements that are easy to set up and will have direct impact to business. They are normally long term KPIs with a lifecycle in years and tied to individual bonus system. While those dynamic KPIs are also important, but due to its nature we cannot set one KPI for a long time. We need to adjust KPI itself according to the dynamic change in the environment. For example, "Number of hours per employee trained on agile principles", after most people done enough trainings on Agile in a short time. We need to measure another aspects of Agile: "% of scrum teams and standup meetings conducted per project". Then, when growing projects are agile friendly, we need to adjust KPIs to "% of problems raised in standup teams are solved internally" to encourage a self-organizing team. These KPIs are only monthly old, that couldn't be linked to yearly bonus points, which requires a new way of managing them.

	Weak (indirect) link to business	**Strong (direct) link to business**
Dynamic	Productivity	No. of hours per employee

quality change (Dynamically adjust KPIs in months)		trained on Agile principles End User Satisfaction Score
	Responsible/ Accountable: Y=Strategic Next step: organisational culture	Responsible/ Accountable: Y=Tactical Next step: guide from field
Static quality change (Traditional KPIs adjusted in years)	% of new services in IT Service catalogue without going through all appropriate tollgates. % of blue-print/implementation scenarios done with existing suppliers. (No new on boarding required)	% of demand goes to fast track.(type3-5) % of demand requests rejected for rework from specify, acquire or performance management. % of services meet service acceptance criteria right first time. % of acquire re-quests rejected for rework from demand, specify or performance management. % of IT commitment and Business requirements met.
	Responsible: Y=Tactical, Operational Accountable: Y=Tactical Next step: lead from centre	Responsible/ Accountable: Y=Operational Next step: Six Sigma to find root cause

Table 17 Evaluation cases comparison: Change matrix

This table of categorizing KPIs also cast a dim on how we take next steps accordingly. After data collected from direct and static quality KPIs, we'll easily use Six Sigma method to analyse and find root cause of the problem to improve. While for the direct dynamic quality KPIs, we'll implement temporary KPIs to encourage people take actions, and collect guides for the other aspects of measurements from field of actions. For indirect static quality KPIs, its indirect link often cause neglect of people, where lead from centre is needed to enhance performance. The above three parts are relatively easy to manage. For the last part, indirect dynamic quality objectives, even management teams often neglect them or take them for granted. These are objectives like organisational culture that are hard to define and measure but affects a lot. Decision makers should make long-term plans according to these objectives.

5 CONCLUSION AND DISCUSSION

5.1 Conclusion

The Philips transformation is basically moving from separated legacy systems into one Philips IT: integrated and standard IT organization. While what the author is doing also resembles the trend: integrated and standardized KPI design and process optimization. Since there is no single theoretical framework that works everywhere, frameworks work best where they fit best. Bing Box model provides a comprehensive structure and approach to help organizations adopt right framework in the right process, with the right responsible people at the right strategic level. However, this also is the weakness of the current Bing Box: it fits best for Philips IT organization, which needs great amount of work on restructuring the box before adopted by other companies.

The first and second research questions of this thesis are to combine business, IT and its corresponding knowledge and theories all together. It solves perfectly by the Bing Box from practical world to absorb theories from academic world, which will fit for the use of company. The model works firstly by cutting organizations into different slices, assigns with coordinates that indicates relationships among elements. ITIL provides the best practices in service strategy, service design, service transit, service operation and continuous improvement, from which Bing Box model absorbs what a specific organization needed according to company strategy. Thus a Bing Box modeled structure of the organization is built, waiting for modularized optimization cycles to be attached, following Six Sigma and ITIL continual service improvement steps. Elements with their coordinates in the Bing Box have specific concerns that can be decomposed into aspects. These aspects also will absorb related theories Agile, Lean IT etc. to contribute to the elements. We re-compose this information into consolidated KPIs for implementing. After which optimizing procedures will be conducted correspondently. Figure 22 shows the whole Bing Box and its working philosophy.

The third purpose was to see whether this designed artifacts work in the organization. If it does, what change, impact and benefit it will bring to the organization. After two evaluations in the company, we see a positive feedback from field. Though the evaluation is not fully extended to data-driven analysis, we see impact and benefits shed in different levels in the company.

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.

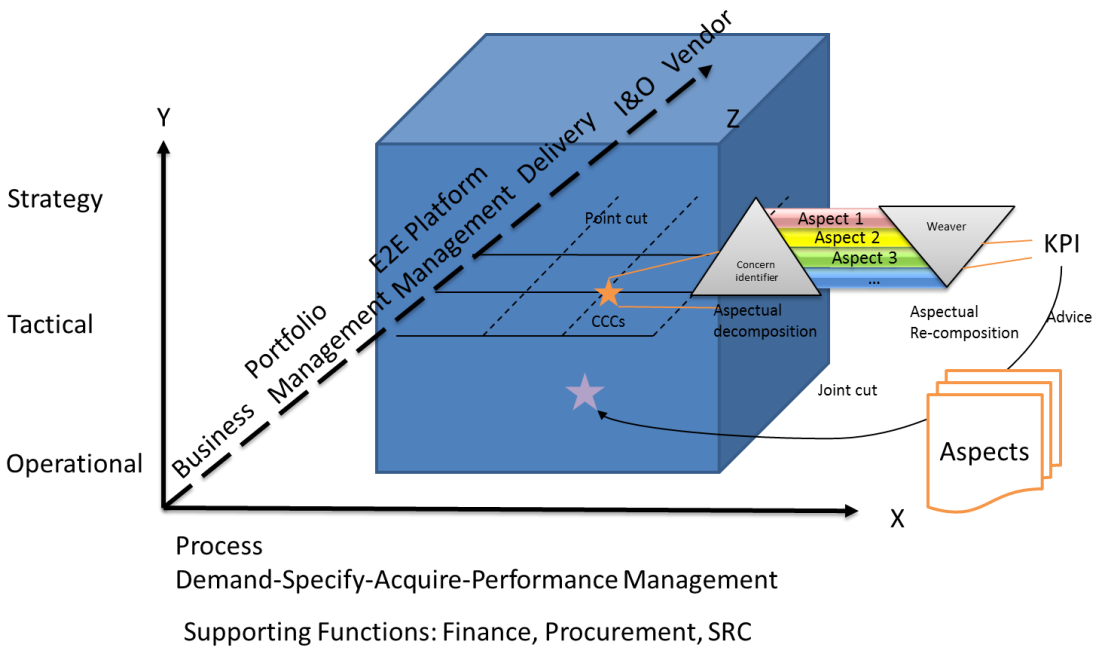

Figure 22 Bing Box and its working philosophy

5.2 Limitations of the study

This research was based on a case study within a single organization. As mentioned above, we cannot generalize the current version of Bing Box model for optimization without first reconstructing in different organizational contexts. Furthermore, due to time constraints, the analysis weren't proved by data in a wide organizational implementation. Nevertheless, the optimization does have a due weight as they are in line with theoretical frameworks and practical needs. Another key limitation is that the entire research was conducted by action research, where the author is fully involved that can result in subjective view of the research.

5.3 Ideas for further research

According to the limitations, following further research could be done to complement the model.

Extend application and evaluation of Bing Box model in Philips: at this moment, a high level of strategic objectives is mapped out. The crosscutting concerns are only used in a small part of process. A further growth of aspects repository will be build and opti-

mization modularized cycles will be actually running in the organization with actual impacts on business.

Adjust Bing Box model in different industries and organizations, where IT and business need to be linked closely to each other. The dimensions of X, Y, Z will be adjusted in different governance structure, and the philosophy and analyzing method can be further developed.

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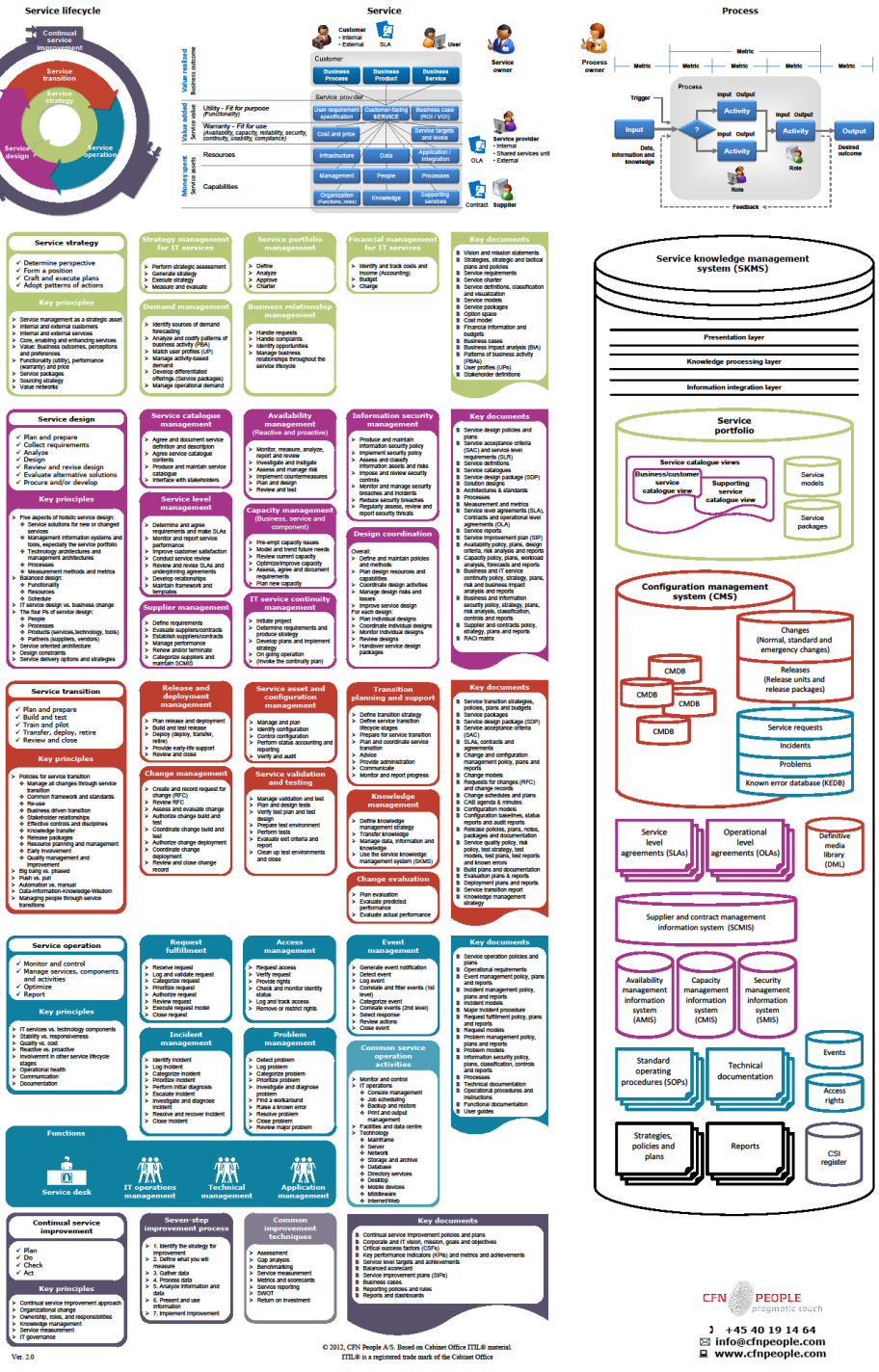
APPENDIX A: ITIL 2011- THE BIG PICTURE



APPENDIX B: LIST OF WORKSHOP PARTICIPANTS AND CONDUCTED INTERVIEWS

No.	Position	Date	Main topics	Outcome
1	IOM	Feb	Introduction	I&O and business relationship
2	I&O Controller	Feb	Introduction	I&O charging mechanism
3	I&O Financial manager	Feb	Introduction	I&O financial strategy
4	ITBP	Feb	Introduction	Business' concerns regarding IT
5	I&O Controller	Mar	Verification	Financial process mapping
6	Risk manager	Mar	Introduction	Risk evaluation system
7	IMS	Mar	Introduction	Procurement in CI&OP
8	Platform manager	Apr	Introduction	ITIL and CI&OP
9	Process expert	Apr	Introduction	CI&OP process
10	Operational Team Lead	May	Verification	KPIs for Acquire process
11	Project manager	May	Verification	KPIs for Demand process
12	ITIL expert	May	Verification	ITIL-based process

Demand Workshop: time 10th April, Workshop Participants list

Initials	Position	Role in workshop
B	Solution Expert, Service Process & Automation	Process design and organizer of the workshop
S	Process Expert, Service Processes & Automation	Process design
Bingcheng (the author)	Intern	KPI define
A	Global PMO, demand & portfolio manager, Infrastructure Transformation & PMO	Participants
T	IOM, Solution Expert IT4R&D, Computing Platforms / IT4 R&D	Participants
T	IOM, sector lighting	Participants
P	Collaboration cloud, demand management	Participants
A	N&T Platform, Transport cloud	Participants
A	IOM, sector lighting	Participants
H	IOM, sector healthcare	Participants

Acquire Workshop: time April 10th 2014. Workshop participants list

Initials	Position	Role in workshop
B	Solution Expert, Service Process & Automation	Process design and organizer of the workshop
S	Process Expert, Service Processes & Automation	Process design
Bingcheng (the author)	Intern	KPI define
V	IT Manager, Operational Excellence Management	Participants
C	Computing & IT4R&D Platforms Manager, Infrastructure Platforms	Participants
C	Lead Service Transition Manager, Infrastructure Transformation & PMO	Participants
G	Architect Connected Business, Platforms - Architecture	Participants
H	Technical Integration Specialist, Platforms - Architecture	Participants
H	Infrastructure & Operations Manager, Sector Engagement Healthcare	Participants
H	Operational Team Lead ERP, Healthcare, Global Applications Operations HC	Participants

APPENDIX C: SEMI-STRUCTURED INTERVIEWS

General questions

- Please describe your position in the company.
- Describe your role in the new process/ program.
- Definition of objectives from your perspective.
- What are your suggested objectives (concerns) that we can start with?
- What are your suggested measurements?
- What do you think our proposed measurements?
- Who and how we can measure these KPIs?
- Impacts/benefits after implementing KPIs.
- Problem facing when implementing these KPIs?
- What is a good day for you? What is a bad day for you?

Specific questions

- What is the relationship among time, scope and budget in demand/ specify/ acquire phase.
- Is the current data source ready for data driving?
- What are the roadmaps of the organization?
- When will the data source be ready in the future?
- How will the tooling (in each phase) contribute to the objectives?
- What are related ITIL principles that adopted in the new processes?
- What are the strategies of implementing principles? (ITIL, Agile, Lean IT, etc.)
- What are the strategies of SIOMs? (Or other positions)

APPENDIX D: STAKEHOLDER POSITIONS IN BING BOX

Position	X (Process)	Y (Level)	Z (Stakeholder group)
SIOM	All	Strategy	I&O
IOM	All	Tactical	I&O
IT business partner	Demand, acquire, performance management	Operational	Business
Platform manager	All	Tactical	E2E platform
I&O Controller	Supporting function (Finance)	Operational	I&O
I&O Financial manager	Supporting function (Finance)	Tactical	I&O
Operational team lead	Performance management	Operational	I&O