Improve the ITIL process in Incident Management with matching Lean-eTOM

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May 2015
Abstract

Due to fast evolution on the services provided by telecommunication companies, the Information Technology (IT) environment has been gaining an increasingly importance inside organizations. It is no more a silent partner, involved only on the daily's operations, without any influence on the company’s strategy and management. In the recent years, Information Technology Infrastructure Library (ITIL) and Enhanced Telecom Operations Map (eTOM) have been adopted by many organizations. However, these frameworks focus on the elaboration of what needs to be done, but give only limited assistance concerning the implementation. The aim of this work is to study an innovative approach of Lean methodology applied to IT. Starting on ITIL concepts, eTOM framework and Lean methodology, it is intended to build a methodology of business process transformation in order to optimize the incident management of an operations area of a big telecommunications company.

Keywords

Simplification; Incident management; ITIL; Lean IT; eTOM; Continuous improvement
Resumo

Devido à rápida evolução nos serviços fornecidos pelas empresas de telecomunicação, as Tecnologias de Informação (TI) têm vindo a ganhar uma grande importância dentro das organizações. Já não são mais um parceiro silencioso, envolvidas apenas nas operações diárias, sem qualquer influência na estratégia e gestão da empresa. Nos últimos anos, o ITIL e o eTOM têm sido adoptados por minhas organizações. Contudo, estas frameworks focam-se apenas na formulação do que deve ser feito, dando pouco suporte em relação à sua implementação. O objectivo deste trabalho é o de estudar uma abordagem inovadora da metodologia Lean aplicada às TI. Começando nos conceitos do ITIL, na framework eTOM e na metodologia Lean, pretende-se construir uma metodologia de transformação de processos de negócio com o intuito de optimizar a gestão de incidentes de uma área de operações de uma grande empresa de telecomunicações.

Palavras Chave

Simplificação; Gestão de incidentes; ITIL; Lean TI; eTOM; Melhoria contínua
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Acronyms

BSS  Business Support System
CI   Configuration Items
CRM  Customer Relationship Management
eTOM Enhanced Telecom Operations Map
FAB  Fulfillment, Assurance and Billing
IT   Information Technology
ITIL Information Technology Infrastructure Library
itSMF The IT Service Management Forum
KPI  Key Performance Indicators
OPEX Operational Expenditures
OSR  Operations Support and Readiness
OSS  Operations Support System
QoS  Quality Of Service
SLA  Service Level Agreement
TI   Tecnologias de Informação
TMF  TM Forum
UML  Unified Modeling Language
WIP  Work in Progress
# 1 Introduction

## Contents

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One of the hottest business buzzwords is simplification. Business simplification is an opportunity to bring business and customers closer, together in ways never before thought possible, by stripping away layers of bureaucracy, letting employees do what they do best, and focusing the entire business network on what’s important to customer [13].

The connected world can be an unnecessarily complex one, so if organizations try to keep their Information Technology (IT) simplified and streamlined, they can achieve a more efficient enterprise with better business outcomes [14].

Simplifying processes and having more consistent IT services results in lower operating costs and reduced operating risks associated with more reliable IT infrastructures [15].

The third idea above is about Lean principles adapted to IT services, but not the first two, which are only about a business trend that is arising on this recent years.

For years, organizations have battled everything from a corporate culture resistant to change. As a result, most companies now have some of their processes outdated. The concept of business simplification is the new mandate. Leaders know that if accomplishing a goal ever becomes too difficult, it could lead to a brain drain of top-performing talent and clients can decide to go elsewhere. As a result, 51% of leaders place significant importance on the need to simplify, and that will grow to 67% three years from now. With simplification, there are fewer bureaucratic bottlenecks, which can keep clients satisfied and comfortable working with your business. Plus, 62% believe it can help improve productivity and performance across all lines of business [13].

Although, this idea that the business focus should be the client, and that the processes should be simplified in order to achieve that, is not a new idea. One of the most popular methodologies of processes improvement is the Lean methodology which is derived from the Japanese manufacturing industry. It is a management philosophy that considers as waste any resource consumed without the goal on creation of value for the end customer who consumes a product or service [16].

Maybe this is the time to recover these well proven management principles. In general it is reasonable that the principles of “Lean thinking” and in particular the removal of waste and pursuit of perfection can be applied to any system where product flows to meet the demand of the customer [17].

However, there is a question that arises – how to implement Lean principles on the IT and Telecommunication Services world?

### 1.1 Motivation

On the IT world, one of the most important reference model to services management is the ITIL. ITIL outlines an extensive set of management procedures that are intended to support businesses in achieving both high financial quality and value in IT operations. However, ITIL alone may present significant
implementation challenges, including potentially significant time consumption, and it does not address
the leadership issues of organizational change. Furthermore, the launch of an ITIL initiative can seem
awkward and complex. **Lean** and ITIL share a common goal, the improvement of the processes involved
in developing and providing IT services within an organization. The future of effective IT management
lies in a deliberate combination of process refinement approaches that unites the strengths of **Lean** and
ITIL while taking into consideration whether the right portfolio of services is offered [15].

On the Telecommunications world, the majority of the service providers, as well as system integrators
and vendors, work with the eTOM framework which is a reference to telecommunication’s business
processes management [3]. As both sectors are increasingly converging and overlapping, both frame-
works need to come together and that is what TM Forum (TMF) and The IT Service Management
Forum (itSMF), the organizations behind these important industry guidelines are working on [8].

**ITIL** and **eTOM** are two frameworks that began with different starting points and different objectives.
**ITIL** has grown from a perspective of IT-focused support and specification, while **eTOM** was developed
from a perceived need of setting a business context that would help with defining agreements between
Telecommunication service providers and their peers, suppliers and customers. As each framework has
developed, their scope and detail has evolved. **ITIL** in version V3 looks more extensively at the life-
cycle aspects of service management and has a broader perspective than before. Besides, the focus
of **ITIL** is still on how the IT supports the business. **eTOM** has also followed the growing complexity
of value chains in the telecommunication industry by developing an enterprise-wide view of business
processes that aims the separation of business needs in process terms from design and implementation
concerns that emerge in the Operations Support System (OSS) and Business Support System (BSS)
development cycle [8].

Despite the increasingly approach between **eTOM** and **ITIL** frameworks and the many advantages
of their integration, and the common goals between Lean and ITIL, it is not an easy task to conduct im-
provements on the operations processes of a big and complex organization without a strategy, without
a plan. In view of this difficulty, the purpose of this work is to study an innovative approach of **Lean
methodology** applied to IT, which is a methodology to organize, manage, develop and improve business
processes with the aim of “doing more with fewer resources”, and to propose the building of a methodology
of business process transformation in order to optimize the Incident Management of the Operations
area of a big telecommunications company, through the convergence between the **Lean** methodology
based on continuous development of processes, **ITIL** Incident Management process and some of the
components of the **eTOM** process framework.
1.2 Incident Management - A process to improve

The idea behind this thesis was to bring together some working experience acquired on an operational area of a big Portuguese telecommunications company (Portugal Telecom), specifically working on the support to network management systems, with an academic thesis in order to study new management methods and to provide some improvement on the working processes.

During the two years working on an operations support systems team on Portugal Telecom, I’ve realized that the processes were organized following eTOM framework, that there was a major focus on following the telecommunication standards but a smaller focus on following IT best practices. The idea was then, to optimize some of the team’s working processes based on ITIL best practices. This idea came on based on the worldwide success of this IT service management set of practices and its focus on the alignment of IT services with the needs of business. Nevertheless, the implementation of changes on a business context is not an easy task, specially on a context where the focus is traditionally the communication technology and not the IT services. So, it was important to match the ITIL best practices with the business process framework already used by the organization and followed by the majority of the telecommunication industry — the eTOM. But both frameworks have a limitation as they only provide the processes models, the goals to achieve, without providing any guidance on how to implement the processes changes needed or how to overtake the people’s resistance to change — they only provide a high level strategy for process improvement without any references to tools and procedures that can be used to conduct those improvements [2, 3].

In order to mitigate those limitations, there was the intention to use an innovative approach, but one that has been previously used on related works in order to get some ideas to test on this thesis. One of the most popular methodologies of processes improvement is the Lean methodology which have already been successfully used on some IT processes improvement projects, as will be illustrated during this thesis.

As Lean principles requires few training and much action, small teams can produce fast and visible results starting with a simple set of tools, and as the organization processes were already organized following eTOM framework and there was no need to build a process from the beginning, Lean methodology appeared as a good choice to implement the processes improvements that were needed.

As Lean principles state, there is always waste to eliminate and processes to improve [18], so there was the need to choose which operational processes required more improvements and what was the waste to eliminate. During the two years working on the team, I’ve realized that there were some inefficiencies on the incident management process, and as it is one of the most important processes of a team that does support, maintenance and operation to network management systems, this was an obvious choice to start a process improvement process.

But what was the problem to solve? The incident management was organized following eTOM
best practices, but had some issues. The major issues were: multiple incident ticket systems, multiple monitoring and alarm systems working in parallel, complex interfaces to open incident tickets, several incidents that were not logged, lack of automation on the distribution of incidents to the responsible team, and several systems without monitoring and alarms.

1.3 Thesis Organization

The resolution of these issues was then the main goal of this work, and this thesis is organized in order to explain which methodologies were chosen and why, in Chapters 2 and 3, what was the architecture proposed to solve the problem and the plan to implement that architecture in Chapter 4, and also to show the results achieved with that implementation in Chapter 5. Chapter 6 draws conclusions on the work developed and presents perspectives for future work and improvements of the solution.
2

State of the Art

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The following sections will bring a review of the research work related with the topics in study: eTOM, ITIL, Incident Management and Lean methodology.

2.1 ITIL - Incident Management

The ITIL is a set of practices for IT service management that focuses on aligning IT services with the needs of business. ITIL’s strengths include its focus on service to the customer, on processes, and on continuous improvement. It was developed by the British Government during the 1980s trying to increase efficiency, value and success in the delivery of programs and projects in the public sector. The basic goals of ITIL processes implementation are the achievement of a better quality of service, getting lower costs and a better alignment between business and IT [6].

ITIL can be viewed as delivering an IT-focused view, that responds to the organization business needs through a set of IT-oriented best practices, covering some important aspects of business activity. These best practices are expressed through process steps and organizational responsibilities. The ITIL view covers selected areas of best practice that can be linked, in order to show dependencies and interactions, which must then be mapped by the user into the organization in terms of specific processes [8].

ITIL focuses on the continual measurement and improvement of the quality of IT service delivered, from both a business and a customer perspective, and it is this focus that is a major factor in ITIL’s worldwide success and has contributed to its prolific usage. Some of the benefits obtained by the organizations that already use ITIL are:

- Increased user and customer satisfaction with IT services;
- Improved service availability, leading to increased business profits and revenue;
- Financial savings from improved resource management and usage;
- Improved time to market for new products and services;
- Improved decision-making and reduced risk.

ITIL is currently on version v3 and is divided on five core publications, each of them covering a stage of the service life-cycle (Figure 2.1): Service Strategy, Service Design, Service Transition, Service Operation and Continual Service Improvement.

Service Operation has the purpose of delivering the agreed service levels to users and customers, and manage the applications, technology and infrastructure that support the delivery of the services. It is the phase of the service life-cycle that deals almost only with end-users.
Figure 2.1: The ITIL service life-cycle [1]
In what respects Service Operation, Incident Management is one of its key processes and it is one of the most important stages of a team that does support to IT systems.

The aim of Incident Management is to return IT service delivery to the required service levels as quickly as possible while minimizing any negative impact upon business operations and ensuring that the best possible levels of service quality and availability are maintained [1].

In ITIL the management of service related symptoms is divided into Incident and Problem Management. Incident Management receives symptom reports from users called incidents and is focused on the restoration of services. On the other hand, Problem Management is concerned with the analysis of underlying problems which are often defined out of one or more incidents [12].

The incidents can include failures, questions or queries reported by users that contact service desk, and are categorized to identify who should work on them and for trend analysis. They are prioritized according to urgency of the incident and to its business impact. Incidents can also be automatically detected and reported by event monitoring tools [2].

If an incident cannot be solved fast in order to comply with Service Level Agreement (SLA), it is escalated. There is a functional escalation that passes the incident to a technical support team with appropriate skills and hierarchical escalation which engages the appropriate levels of management. As soon as the incident has been solved from a technical perspective, the service desk ensures that the end-user is satisfied and working as he was, before the incident is considered "closed".

In order to improve the incident management process, it is fundamental to have an Incident Management tool for an efficient, effective and continual improvement [1].

The key steps in ITIL standard Incident Management Process are: Identification and Logging, Classification and Prioritization, Investigation and Diagnosis, Resolution and Recovery and Incident Closure [11]. The Incident Management process flow is shown on Figure 2.2. The process includes the following steps:

**Incident identification:** we cannot start working on an incident until is known that an incident has occurred. As far as possible, all key components should be monitored so that failures are detected earlier and the incidents could be resolved before they have impact on users. It is unacceptable, from a business point-of-view, to wait until a user is impacted and contacts the Service Desk.

**Logging and categorization:** all incidents must be fully logged and date/time stamped, regardless of whether they are raised through Service Desk or automatically detected via a monitoring alarm. All relevant information relating to the incident must be logged to maintain a full historical record.

**Incident prioritization:** another important aspect of logging every incident is to agree and allocate an appropriate prioritization code, as this will determine how the incident is handled by support. Prioritization can normally be determined by taking into account both the urgency of the incident
Figure 2.2: The ITIL Incident Management process flow [2]
(how quickly the business needs a resolution) and the level of impact it is causing (number of users being affected). The priority of an incident may be dynamic, if circumstances change or if an incident is not resolved within SLA target times, the priority must be changed to reflect the new status.

**Investigation and diagnosis:** when an incident is just a user seeking some information, the Service Desk should be able to respond to the user quickly and close the service request. However, if it is a fault being reported, this is an incident and may require some diagnosis and investigation. Each of the support groups involved with the incident handling will then investigate and diagnose what has gone wrong, and all support activities should be documented in the incident record, in order to keep a complete historical record of all activities and help on future related incidents.

**Resolution and recovery:** when a potential resolution has been identified, this should be applied and tested. Even when a resolution has been found, sufficient testing must be performed to ensure that recovery action is complete and that the service has been fully restored to the users.

**Incident closure:** when the incident is fully resolved it should be passed back to the Service Desk for closure action, which includes: checking if the incident’s categorization was correct; providing an user satisfaction survey; to document the incident and its resolution; to register if it is an ongoing or recurring problem and decide whether any preventive action is necessary; and to formally close the Incident Record.

For a successful *Incident Management*, besides following the ITIL *Incident Management* process flow, some challenges should be overtaken, like the ability to detect incidents as early as possible, convincing all staff that all incidents must be logged, availability of information about problems and known errors, and maintaining the registration of systems well updated.

Nevertheless, there are some risks which are actually similar to some of the challenges, they include being inundated with incidents that cannot be handled within acceptable timescales, or having inadequate support tools to raise alerts and prompt progress in adequate time.

In summary, *Incident Management* has a great value to business, as it includes the ability to detect and resolve incidents which results in higher availability of the service and consequently lower downtime to the business; the ability to align IT activity to real-time business priorities, because *Incident Management* includes the capability to identify business priorities and dynamically allocate resources as necessary; the ability to identify potential improvements to a service.

As this value to the business is easier to demonstrate than most areas in Service Operation, it is often one of the first processes to be implemented in *Service Management* projects, like the one that lead to this thesis [2].
2.2 eTOM

The eTOM is a business process framework published by the TMF that defines a process model for the telecommunications industry. The model describes business processes required by a service provider and its aim is to categorize the process elements and business activities so that these can be combined in many different ways, to implement end-to-end business processes such as Fulfillment, Assurance or Billing, which deliver value for customer and the service provider.

The majority of the service providers around the world, as well as system integrator and vendors, work with the eTOM framework. In such a complex network of business relationships it is in fact needed an industry standard framework for procuring software and equipment, as well as to interface with other service providers.

The eTOM business process framework is a comprehensive, industry-agreed, layered view of the key business processes required to run an efficient, effective and agile enterprise focused on services. At the conceptual level, the framework has three major process areas, reflecting major focuses within typical enterprises: Strategy, Infrastructure and Product; Operations; and Enterprise Management.

The business process framework model consists of Level-0 to Level-4 processes. These levels form a hierarchy, with each level encapsulating a group of processes at the next level of detail. In Figure 2.3 there is a graphic representation of the Level-0 processes of the model which are the major process areas. The representation consists of rows and columns, the intersections of which denote specific business processes. The top row includes customer facing activities such as marketing, while the bottom row includes supplier facing and support activities. In this manner the business process framework map covers the entire value chain. The interaction between processes is also presented in this model.

Figure 2.3 shows the highest conceptual view of the eTOM framework. In this view it is clear that Operations processes are separated from Strategy and life-cycle processes in two large areas. The key functional areas are also differentiated as horizontal layers across the two major process areas. The third major process area contains the management of the enterprise itself.

In Figure 2.4 the three major processes areas are decomposed into their constituent Level-1 process groupings. Specifically in the Operations process area, it can be observed in Figure 2.4 that it has four end-to-end vertical process groupings, the Fulfillment, Assurance and Billing (FAB) set, which correspond to the core customer operations processes, and the Operations Support and Readiness (OSR) group that is differentiated from FAB processes. OSR processes ensure that the operational environment is working in normal conditions in order to let the FAB processes do their fundamental job.

The horizontal functional process groupings in Figure 2.4 distinguish functional operations processes and other types of business functional processes. The horizontal functional process groupings that enable, support and direct the work in the operations process area are: Customer relationship man-
The main strengths of the eTOM framework are that:

- Provides a total enterprise-wide business process framework for the service provider;
- Addresses not only operations and maintenance aspects, but covers all significant enterprise process areas;
- Separates life-cycle management from operations and day-to-day processes;
- Can represent the framework, and be used for the process flow view, i.e., static versus dynamic view;
- Provides a process framework reflecting the most current thinking in designing and documenting processes.

eTOM can be viewed as delivering a business-focused view of service provider needs across the organization, expressed through a set of process elements and process flows that link the elements in order to visualize end-to-end activities. The eTOM view covers all areas of enterprise process within a common structure [3].
2.3 ITIL and eTOM: A combined approach

ITIL and eTOM process frameworks have been adopted in many organizations in the recent years, ITIL is a reference model to IT services management and eTOM is a reference to telecommunication’s business processes management. Both frameworks are complementary to each other and can deliver an incremental value to process optimization efforts. A combined approach between ITIL and eTOM is a response to the growing demand to integrate more effectively the IT support inside companies with their business focus.

ITIL defines a framework for good practice in IT Service Management, while eTOM defines a Business Process framework for service providers in the information, communications and entertainment sectors. As both sectors are increasingly converging and overlapping, both frameworks need to come together and that is what TMF and itSMF, the organizations behind these important industry guidelines are working on. itSMF and TMF recognize that both frameworks have strengths and weaknesses, and if combined will bring major benefits for all the companies involved with delivering convergent services.
ITIL and eTOM frameworks are based on process flows, allowing that a specific situation can be identified and addressed by showing sequences of process steps or elements linked in order to achieve some overall goal. ITIL discusses steps that deal with topics like Problem Management or Incident Management and eTOM’s model provides structure or process elements that are then used to form steps within whatever process flows are needed.

There is already some work done on this combined approach within TMF. A strategy was developed, with the participation and contribution from both the TMF and ITIL communities, which allows ITIL good practice to be implemented directly through eTOM process flows. The approach used is to position the eTOM framework as supporting the development of ITIL-aligned process-based solutions [8].

The strategy is shown in Figure 2.5 [4]. At the left of this figure, eTOM Business Process Framework provides a response to the industry need to model business process. This model can then be used to create some process flows that are compatible with eTOM and which represent viable solutions to the specific business scenarios concerned. In the middle, ITIL responds to the need for good practices in the IT domain. It illustrates how it is possible to collect ITIL-aligned flows that employ eTOM to deliver ITIL support directly.

Based on this, it is also observable at the bottom right of Figure 2.5 the subset of all the possible eTOM flows, which are those that are also in line with ITIL.
The conclusions of the joint eTOM-ITIL team are that the two frameworks are compatible, complementary and mutually supportive. eTOM and ITIL can be integrated by using ITIL best practices to specialize eTOM processes [4].

There is no conflict between eTOM and ITIL, they come from different perspectives but offering complementary strengths and being mutually supportive, as shown in Figure 2.6 [5].

The Operations area is the heart of a service provider and the core of the eTOM framework, it includes all operations processes that support the customer and network operations and management. One of the purposes of this work was to study a methodology where the ITIL Incident Management process will match with the Operations processes of eTOM framework.

Figure 2.7 position the ITIL processes against the eTOM Level-1 process grouping of operations [6].

ITIL Incident Management process, identified on Figure 2.7 by yellow circles, receives symptom reports from users called incidents and is focused on the restoration of services.

Being the eTOM purpose to categorize the process elements and business activities, the processes and activities of a support team, typically part of a service assurance department, are described on eTOM Level-1 vertical Assurance group of process which is also part of Level-0 Operations processes area, the processes area that covers the core of operational management.

The vertical end-to-end process grouping Assurance is responsible for the execution of proactive and reactive maintenance activities to ensure that services provided to customers are always available and respecting the SLA levels. These activities include: continuous status and performance monitoring of resources (infrastructure and services) to detect failures proactively; performance data collection and
analyze to identify potential problems and resolve them in order to avoid negative impacts to customer; SLAs management; receiving issue reports from the customers, maintain the customers informed about the issue status, issue repair and restoration of systems and services, ensuring that the customer is satisfied with the services provided [3].

Figure 2.7: eTOM Level-2 Operations processes and ITIL processes [6]

Figure 2.7, shows the Assurance processes that match with ITIL Incident Management processes. These processes are:

- Customer interface management of horizontal functional group Customer Relationship Management (CRM);
- Problem handling of CRM;
- Customer QoS/SLA management of CRM;
- Retention and loyalty of CRM;
- Service problem management of horizontal functional group Service management and operations;
• Resource trouble management of horizontal functional group Resource management and operations;

• Supplier/Partner problem reporting and management of horizontal functional group Supplier/partner relationship management;

• Supplier/Partner interface management of Supplier/partner relationship management.

Customer Interface Management processes are responsible for managing all interfaces between the enterprise and customers. They deal with contact management, understanding the reason for contact, directing customer contacts to the appropriate process, contact closure, exception management, contact results analysis and reporting. CRM contact may be related to one or several of service assurance processes (service quality management and trouble or problem management). Figure 2.8 shows the Customer Interface Management process decomposition into Level-3 processes [7].

Figure 2.8: Customer interface management decomposition into Level-3 processes [7]

All customer interface management Level-3 processes match with ITIL incident management process so there is a strong correlation between them [6].

Figure 2.9: Problem handling decomposition into Level-3 processes [7]
**Problem Handling** processes are responsible for the management of problems reported by customers. The objective is to receive reports from customers, resolving them to the customer’s satisfaction and providing meaningful status on repair and/or recovery activity to the customer. These processes are also responsible for customer contact and support in relation to any customer-affecting problems detected by other processes or through analysis, including proactively informing the customer and resolving these specific problems to the customer’s satisfaction. The decomposition of problem handling into **Level-3** process is on Figure 2.9 [7]. All problem handling **Level-3** processes match with ITIL incident management process [6].

**Customer Quality Of Service (QoS)/SLA Management** processes are responsible for the monitoring, managing and reporting of delivered versus contractual QoS, as defined in the enterprise’s service descriptions or customer contracts. They are also concerned with the performance of the enterprise and its products in relation to its SLAs for specific product instances, and other service-related documents. They include operational parameters such as resource performance and availability, but also encompass performance across all of a product’s contractual or regulatory parameters, e.g., percentage completion on time for order requests, time to repair commitments, customer contact performance [7]. There is a low correlation between customer QoS/SLA management processes and ITIL incident management process [6].

**Retention and Loyalty** processes manage all activities related to the retention of acquired customers and the use of loyalty schemes in the potential acquisition of customers. Retention and loyalty processes. There is a low correlation between retention and loyalty processes and ITIL incident management process [6].

![Service Problem Management Diagram](image)

**Figure 2.10:** Service problem management decomposition into **Level-3** processes [7]

**Service Problem Management** processes are responsible for the management of problems associated with specific services. The objective of these processes is to respond immediately to reported service problems or failures in order to minimize their effects on customers, and to invoke the restora-
tion of the service or provide an alternate service as soon as possible. Service problem management processes perform analysis, decide on the appropriate actions or responses and carry them out with the intent of restoring normal operation on specific services. Nevertheless, they need to interact with the problem handling processes as these have a view on customer impact. Service problem management processes are responsible for informing problem handling processes of any potential customer problems. When the original report arises as a result of customer problems, the service problem management processes may be coordinated by problem handling processes. The decomposition of service problem management into Level-3 process is on Figure 2.10 [7]. All service problem management processes match with incident management process so there is a strong correlation between eTOM service problem management processes and ITIL incident management process [6].

Figure 2.10: Resource trouble management decomposition into Level-3 processes [7]

Resource trouble management processes are responsible for the management of troubles associated with specific resources. The objective is to manage efficiently reported resource trouble, isolate the root cause and act to resolve it. Resource trouble may relate to specific resource failures or to problems in the service domain and thus their processes need to interact with the service problem management processes that have a view on service impact. The decomposition of resource problem management into Level-3 process is on Figure 2.11 [7]. All resource problem management processes match with incident management process so there is a strong correlation between eTOM service problem management processes and ITIL incident management process [6].

The Supplier/Partner problem reporting and management processes track, monitor and report on the service provider initiated problem engagements to ensure that the interactions are in accordance with the agreed commercial arrangements between the service provider and the supplier/partner. In addition, external suppliers/partners may report Supplier/Partner discovered problems to the service provider which may impact resources and services. The decomposition of Supplier/Partner problem reporting and management into Level-3 process is on Figure 2.12 [7]. All Supplier/Partner problem reporting
Supplier/Partner problem reporting and management decomposition into Level-3 processes [7]

and management processes match with incident management process so there is a strong correlation between eTOM service problem management processes and ITIL incident management process [6].

Supplier/Partner interface management processes manage the contacts between the enterprise and its current or future suppliers/partners for Supplier/Partner supplied products. The Supplier/Partner interface management processes that are related to incidents and to the restoration of failure services or resources are correlated with ITIL incident management process [7].

The mapping of eTOM to ITIL has shown that the two frameworks are complementary, but it is only illustrative, in practice, the mappings may vary, depending on how and what processes have been implemented. This variance is due partly to the many-to-many relationships between the two frameworks, and partly because of the illustrative nature of the flows in the ITIL documentation [19].

ITIL does not have a layered view like eTOM. The layer structure is the reflection of the enterprise features, which provides services. Each layer can be used as a single business domain to deal with and they can interact with each other [9].

To illustrate how eTOM and ITIL relate, taking in account the process layering, on [8] it is shown how ITIL Incident Management and Problem Management processes can match with eTOM framework. The Incident Management can deal with various type of incidents and in particularly those related to faults or problems, where the focus is on restoring service to the user as fast as possible. Problem Management is concerned with establishing the underlying causes of an incident, its subsequent prioritization, prevention and problem resolution.

Figure 2.13 illustrates the interaction between these two ITIL processes. In eTOM’s Assurance vertical group there is a focus on the same concerns illustrated on this figure, where various processes of different layers match with these ITIL processes as explained and illustrated above.

From eTOM perspective, each incident is qualified based on its origin’s layer, an incident created
Figure 2.13: ITIL Incident and Problem Management interaction [8]

Figure 2.14: Incident and Problem Management interaction with use of eTOM layering [8]
in the customer layer may be described as customer incident, a problem identified in the service layer may be classified as a service problem. Figure 2.14, illustrates how eTOM and ITIL perspectives can be combined. If the enterprise has a layered organization, eTOM provides a way for interpreting the ITIL’s viewpoint into the layered organization. So eTOM is a valuable tool to allow ITIL to be mapped appropriately [8].

The idea of the convergence is that eTOM captures the business process needs, and forms a process model which can then be used to generate a range of process flows. ITIL captures the IT needs, and arranges them into a model of the areas of IT service delivery or support. ITIL good practice rules are then used to select out the possible eTOM process flows in line with these requirements. In the work of Zhuang [9], this eTOM and ITIL combined approach is illustrated using the eTOM Assurance processes, those that match with ITIL’s Incident Management process and were detailed above on this section, and refining the ITIL’s Incident Management process itself. The result is illustrated in Figure 3.4.

The single eTOM framework or ITIL framework is not suited to the operation management of the converged services, because the converged services are of not only the Communications Technologies characteristics, but also the IT characteristics [9].

A combined eTOM-ITIL approach will streamline and consolidate separate process environments, creating an opportunity to identify redundant areas and to implement some process improvement. It can provide the fully end-to-end service management process, sort out the relationship between the various processes clearly in top-to down manner, and strongly support the requirements of the converged

Figure 2.15: eTOM and ITIL Incident Management combined approach [9]
services [9].

This approach is able to provide the following benefits:

**Operational Expenditures (OPEX) optimization:** Redundant functions could be consolidated and integrated, reducing the cost of process operations.

**Clarity on process strategy:** A clear strategy on business process frameworks will minimize and even avoid disputes between departments and process verticals.

**Process environment complexity reduction:** An integration of two process environments into one horizontal process layout will remove vertical process boundaries and eliminate the need for unnecessary interactions.

**Clearer communication:** Simplified and reduced number of measurement points will improve the communication with the executive management around service delivery and process performance metrics [6].

2.4 Lean Methodology

ITIL defines which processes should exist, the combined eTOM-ITIL approach helps with the interaction between processes and also defines which steps are relevant for the continual service improvement process [2]. However, ITIL does not provide any guidance on how to implement the process changes that are needed, or how to overcome the people’s resistance to change, it only provides a high level strategy for process improvement without any references to tools and procedures that can be used to conduct those improvements.

In order to mitigate these limitations, there was the intention to use an innovative approach but one that should have been previously tested with success, in order to capture some of the ideas to be tested in this thesis.

One of the most popular methodologies of processes improvement is the **Lean** methodology which have already been successfully used on some IT processes improvement projects, as will be illustrated later on this section.

**Lean** principles are derived from the Japanese manufacturing industry. It is a management philosophy that considers as waste any resource consumed without the goal on creation of value for the end customer who consumes a product or service [16].

The concept of **Lean** was first introduced by Womack, Jones and Roos [18], in order to describe the working philosophy and practices of the Japanese vehicle manufacturers and in particular the Toyota Production System. More specifically, it was observed that the overall philosophy provided a focused
approach for continuous process improvement and the targeting of a variety of tools and methods to bring about such improvements [17].

Effectively, the philosophy involves eliminating waste and unnecessary actions and linking all the steps that create value. In 1996 the initial concept of Lean was more extensively defined and described by five key principles [20]:

**Specify value:** Define value precisely from the perspective of the end customer in terms of the specific product with specific capabilities offered at a specific time.

**Identify value streams:** Identify the entire value stream for each product or product family and eliminate waste.

**Make value flow:** Make the remaining value creating steps flow.

**Let the customer pull value:** Design and provide what the customer wants only when the customer wants it.

**Pursue perfection:** Strive for perfection by continually removing successive layers of waste as they are uncovered.

Lean emphasizes the “learning by doing” approach, where the members of a process improvement team are those most closely associated with adding value to the product. The whole process is based on defining customer value, focusing on the value stream, making value flow, and letting customers determine the product or service they want, with a constant pursuit of perfection in a timely manner at an appropriate price.

Lean in manufacturing companies means a shift from “economics of scale” to the “economy of flow”. The manufacturing with fewer wastes can be more efficient and faster, enabling the company to adapt to changing customer requirements quickly. However, it is a relatively new approach in the IT sector where its development began fifty years later than in production in the sectors of services support, marketing, sales and administration. The application of lean principles in IT is called Lean-IT and offers large potential for cost and waste reduction in companies in order to be more competitive, as IT still brings a lot of waste, like legacy infrastructure, fragmented processes and unprofitable practices, at a time of frequent changes [21].

The mission of IT is to deliver the information processing capability required by the business at a cost that represents value. In order to follow Lean principles on IT management it is important to know how to apply the concepts to identify waste, improve effectiveness, and increase value to the business. The best way to make significant changes is to define strategic objectives for eliminating waste and redeploying capabilities and budgets to services that provide value [22].
In general it is reasonable that the principles of lean thinking and in particular the removal of waste and pursuit of perfection can be applied to any system where product flows to meet the demand of the customer, of the user or of another system. These elements are certainly true for information management and its management systems, where information flows and work is undertaken to add value to the information. The Lean concept thus, can be applied to any information processing activity and its limitations are only constrained by the ability to identify waste and define value, which are arguably less visible and more subjective than on manufacturing sector [17].

The founder of Toyota Production System, Taiichi Ohno identified seven general types of waste in manufacturing [18], where products vary significantly from industry to industry, but the wastes that are found in manufacturing environments are quite similar. The main reason for this similarity lies in the nature of the physical and tangible wastes. The seven most common types of waste found in manufacturing environments are [10, 16]:

**Overproduction:** product made for no specific customer or development of a product or process for no additional value;

**Waiting:** waiting waste occurs when a worker has to wait for the work to be released from another worker, another manufacturing process, or for material to be delivered;

**Transport:** a transportation waste occurs when material is moved more than is necessary and when a product is in motion is not being processed and therefore is not adding value to the customer;

**Inventory:** retention of unnecessary raw materials, Work in Progress (WIP), and finished products. WIP is a direct result of overproduction and waiting;

**Over-processing:** relates to spending more time, efforts, and resources to produce higher quality product than is required by the customer, or producing these products using inappropriate tools. It is considered the most difficult type of waste to identify and eliminate;

**Motion:** the excessive human movement that is unnecessary to the successful completion of an operation;

**Defects:** errors during the process Defective products need to be fixed or reworked.

In comparison to manufacturing, IT processes and activities do not produce physical wastes, thus IT wastes should be identified based on IT work rather than on manufacturing types of waste [23]. There are eight elements of IT waste which are based on manufacturing types of waste [10, 24]:

**Over provisioning:** like help desk troubleshooting that address symptoms but not root causes, systems over-dimensional;
Delays: like long help desk hold and call back times;

Transportation Issues: like poor interfaces;

Excess inventory problems: like excess information on local and shared drives;

Non-value added processing: IT and service processes are usually overflowing with non-value added processes. The trouble is that they are much harder to see and identify in an office environment than on the production line;

Excess motion: people looking for systems;

Defects: like help desk knowledge base information incorrect, incomplete or obsolete causing harm and lost productivity;

Unused employee knowledge: This waste was the latest addition to the list. It is by far the hardest to see in an organization. The best way to deal with this problem is to just encourage employee creativity as much as possible without trying to measure this waste. Brainstorming sessions and idea gathering techniques can help reduce this waste within the organization.

Based on the the five Lean key principles described above [20], the question that arises is how to implement them on the IT and telecommunication services world? A structured approach is needed to rigorously apply these key principles and can be summarized on the following steps [16, 24]:

Identify Customers and Specify Value: only a small fraction of the total time and effort in any organization actually adds value for the end customer. Observe current process and look for waste and non value add processes;

Identify and Map the Value Stream: value stream is the set of activities across all areas of an organization involved in delivering a product or service, it represents the end-to-end process that delivers the value to the customer. Start to diagnose the issues through data analysis, like looking for what stops the whole process flowing;

Create Flow by Eliminating Waste: when you are mapping the value stream you will find that only 5% to 50% of all activities actually add value. Eliminating this waste ensures that your product or service “flows” to the customer without any interruption or delay;

Respond to customer pull and make the change: this means you produce only what the customer wants, when the customer wants it. It is time to make the change and the new process should be put in place so that the team operating the process have the ability to monitor the sustainability of the change and make some adjustments if necessary;
Pursue Perfection: when creating flow and pull that link together, more and more layers of waste will be find and become visible. This process continues towards perfection, where every asset and every action adds value for the end customer.

There are many tools and techniques to support the implementation of each item of the above lean principles. Some of these tools that have been shown to be productive for Lean initiatives and that makes sense to be applied on an IT or telecommunications environment to improve processes are:

Visual Management: it can address both visual display and control. Visual displays present information, while visual control focuses on a need to act. Information needs to address items such as schedules, standard work, and quality and maintenance requirements.

Value Stream Mapping: it should play a very productive role in the entire Lean process since practitioners depict current and future conditions when they develop plans to implement Lean systems. It should be given a big and continuous focus to establishing flow, eliminating waste, and adding value [16].

Kaizen: it is a focused methodology that uses teams for making improvements. If analysis indicates that this is the best systematic approach for an improvement project, then a Kaizen event should be undertaken. It is a continuous improvement process that empowers people to use their creativity and can be used to fix specific problems, work flow issues, or a particular aspect of a business. A good starting point is to look at the way people work, identifying waste through a time and motion study of tasks with input from both workers and managers. Generic steps for conducting a Kaizen event are: Prepare and train the team; analyze present methods; brainstorm, test and evaluate ideas; implement and evaluate improvements; and results and follow-up [16].

Risk assessment: a structured assessment of what could stop the achievement of specific objectives and how this can be mitigate. Assessment of a design prior to implementation as a final challenge of the design and of the issues post-implementation looking specifically at what would stop the sustainability of the change [16].

PDCA cycle: The four steps of continuous improvement: Plan, Do, Check, Act. Plan step is to establish the objectives. Do step is when an improvement team tests solutions to the problem at hand and dynamic knowledge is generated in forms of reports, tools, or manuals, it’s the implementation step. Check step is to study the actual results and compare with the expected ones. The Act step requires taking actions and implementing suggestions for improvements, resulting in internalization of explicit knowledge [25].

Gemba Walk: Gemba refers to “the real place” where the actual action is executed. The effective use of Gemba encourages the “go-see” principle. It means getting out of office and walking through the
process with the concerned people, to help them discovering issues and fixing them. It became a mechanism for “catching” people doing the right things and getting recognized for it. Gemba walk has two major advantages. First, it is a powerful way to support continuous improvement with the support of company leaders, managers and supervisors. Second, the alignment of efforts from all team members is ensured [26].

**Process Flow Mapping:** A map showing each process step in the value stream. It is used to analyze the value-add and non value-add steps and as a tool for redesign processes [16].

In the past years, the focus turned to how organizations everywhere could transform themselves from mass producers into lean exemplars. Since the early 1990s, given the magnitude of the transformation task and its many dimensions, lean tools came to the foreground. Lean tools like 5S, setup reduction, the five whys, target costing, simultaneous and concurrent engineering, value-stream maps, kanban, and kaizen, which lead Wormack to say that the period from the early 1990s up to the present is the “Tool Age of the lean movement”. Lean tools can be employed at many entries within an organization, often by staff improvement teams or external consultants, and they can be applied in isolation without tackling the difficult task of changing the organization and the fundamental approach to management [27].

As Lean requires few training and much action, small teams can produce fast and visible results starting with a simple set of tools.

Simplifying processes and having more consistent IT services results in lower operating costs and reduced operating risks associated with more reliable IT infrastructures [15].
Related Work

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There is some work done related to IT services improvement using Lean principles and related with the convergence of processes between eTOM framework and ITIL set of good practices. Some of the approaches already applied and with similar objectives to this thesis, will be illustrated on the following sections of this chapter, showing some of the ideas that were drivers of the architecture proposed and that will be formulated on the next chapter.

### 3.1 Lean IT Related Works

This section describes some of the work related to Lean principles applied to IT management.

#### 3.1.1 Infosys: Applying Lean to ITIL Event Management process

The work “Infosys: Applying Lean to ITIL Event Management process” [28], illustrates a case study for a certain organization that implemented ITIL Event Management process, and shows that this improvement based on ITIL best practices produced some good results, like good impact of proactive event monitoring and management on the stability of IT and efficiency improvement through automation. However, after that implementation, Service Desk was overwhelmed with monitoring alerts triggered by applications. Infosys was then asked to analyze the problem.

Infosys decided to map the Lean principles of waste reduction to Event Management to achieve an optimization of the ITIL process and reduce costs. The Lean approach that was taken, consisted of three phases with the following tasks:

1. **Analysis.**
   - Map the Value Stream;
   - Collect data;
   - Identify waste;
   - Validate waste with application groups.

2. **Business case.**
   - Develop a business case (effort/savings);
   - Create the implementation plan.

3. **Implementation.**
   - Setup the implementation team;
   - Implement identified resolution;
- Validate the reduction goals for each category.

The solution proposed and implemented, focused on the elimination of waste in Event Management, has reduced manual efforts by around 44%. It also enabled the Service Desk to continually remove alerts they believed to be redundant and aid in further optimization of the process. The eliminated waste, according to the 7 kinds of waste defined on IT, were the following:

- 32% inventory;
- 24% processing time (redundant alerts);
- 13% waiting time (alerts performing reminder service);
- 11% product defects;
- 10% overproduction;
- 5% motion;
- 5% transport.

In the end, Infosys left some important advises to maintain the process optimized:

- Build and maintain a continuous improvement program;
- Identify opportunities for automation and integration;
- Consider breaking up vertically aligned support and moving towards a shared services model.

3.1.1.A Critical Analysis

This work addressed most of the Lean principles, achieving some good results on the optimization of Event Management process, and showing that the automation of manual activities on the IT Service Operations is a key factor to improve efficiency.

The work shows that the waste reduction tools that had more results were the automation of manual activities, the correlation of events and the identification of event duplication. It also demonstrates that besides Event Management, there are other areas within IT Service Management where Lean Waste Reduction can be applied to optimize value, like the Incident Management process, the process in study in this thesis.
3.1.2 Waste identification and elimination in information technology organization

The main focus of paper "Waste identification and elimination in information technology organization" [10] is the identification and elimination of wastes using Lean principles and tools, in the software development and IT service operations of a medium size IT department of a company that is not identified as an agreement between that company and the research group. The IT department studied in the paper is then called ORGUS.

Through a real-life project, it is developed a new model of waste categorization, the waste elimination strategies are discussed and how they improved the daily operations by reducing the lead time by 56-60%, increasing customer satisfaction by 15.7% and saving on the operational costs.

ORGUS is an internal medium-sized IT department that provides services for more than 35,000 end users, with more than 250 employees, and an estimated annual budget of approximation $30 million. ORGUS provides a wide set of IT services including: Application and website hosting, work-group applications, system administrations, networking, project management, IT service management and data-centers.

The action research methodology was implemented during this study, implementing the Action Research Cycle by its three phases: Understanding Practice; Deliberate Improvements; and Implement and Observe Improvements.

During the first phase it has identified that the company’s services were divided into two main categories based upon ITIL best practices: Request for change and Service Request. The successful implementation of Lean initiative requires underlying changes in the organization’s culture and habits and with the support from senior management and the agreement of the employees, it was possible to transform their action strategies form Defensive Reasoning to Productive Reasoning type of employees, which in turn should help in transforming ORGUS to a learning organization that facilitates the implementation of the required changes and encourage employees to detect the wastes and eliminate them.

During the second phase – Deliberate Improvements – the design of possible improvements was carried out in cooperation with the research participants, mainly, the team leaders and directors.

The final phase of Action Research Cycle in this project was Implement and Observe Improvements where the strategies and recommendations of the second phase have been accepted and agreed upon to generate commitment to start implementing them.

The following Lean tools were used during this work:

- To represent the value stream the tool process flowchart was chosen as it covers the metrics of waste elements, like waiting time, cycle time, lead time, and Non-Value Added (NVA) versus Value
Added (VA) time.

- The identification of wastes was done by converging the process flowchart with SIPOC (Supplier, Input, Process, Output, and Customer) lean tool.

- The 5 Whys tool was employed to identify the root-cause of wastes. The brainstorming sessions resulted in nine participants (60 %) providing answers that led to the identified root-cause, while six participants (40 %) answered the questions in ways that led to lack of customer involvement as a result of the absence of well-established customer involvement strategies.

![Request for Change Statistics 2012](image)

**Figure 3.1: Request for Changes improvement [10]**

The results obtained with this Lean IT approach were very good. For the processes of service Request for change, Figure 3.1 illustrates the improvements achieved. And Figure 3.2 illustrates the improvement on the Service Requests processes.

### 3.1.2.A Critical Analysis

One of the most important conclusions from this work is that it is very important to use the lean principles when developing the waste elimination strategies, in order to eliminate the root cause of the waste and not the subsequent wastes. Conducting root cause analysis takes more time and effort than simply addressing and resolving a single problem. However, by spending more time to analyze the problem and implementing the appropriate corrective action, the cost in the long run would be much cheaper and better than finding workarounds to solve each problem individually.
Another conclusion is that making use of proven methodologies and techniques to eliminate waste is a Lean way to implement Lean, and employing continuous and incremental improvements have proven to be efficient in reducing cost and increasing quality of service.

3.1.3 Wipro Technologies – Lean principles, learning, and knowledge work: Evidence from a software services provider

On paper “Lean principles, learning, and knowledge work: Evidence from a software services provider” [23], the applicability of lean production to knowledge work is examined by investigating the implementation of lean principles at an Indian software services firm.

Wipro Technologies competes in the global software services industry. The company’s service offerings include application development, engineering services, IT infrastructure management, testing, and maintenance. Wipro is diversified across technologies and industries and in June 2007 had over 72,000 employees and brought in annualized revenues greater than $4 billion.

In mid 2004, Wipro launched a pilot lean initiative to translate ideas on lean production from manufacturing for application to software services. Wipro formed a core team that spent several months reading, visiting companies practicing lean manufacturing, and discussing ideas for implementation. To begin executing the initiative, each team member sought out a software project to implement a lean approach to software services while continuing other work as usual. The core team deemed eight of the
10 projects selected to have been successful (over 10% improvement on the pre-specified metric).

With the pilot’s success, Wipro rolled out the program across the firm, and the process was therefore exploratory. For a project to be defined as lean, a team first received training, including information on lean principles as applied to manufacturing. The team was then required to make a good faith effort to apply the lean production ideas from this training, and explicitly use and document one tool from lean. **Lean** tools that were used on the Wipro’s lean projects were: visual control boards, design structure matrices, value stream mapping, single piece flow, Heijunka, Visual control boards and design structure matrix.

Wipro presents a unique opportunity to evaluate the performance effect of a lean initiative since the initiative was rolled out on a software project-by-project basis. Therefore, opportunity exists to compare lean projects with matched non-lean projects to verify any performance difference. Detailed data from Wipro’s project management system was obtained on all lean and non-lean development projects completed between January 2005 and June 2007. After eliminating projects with missing data, the sample included a total of 92 lean and 1111 non-lean projects.

The data collected shows that the lean initiative has positively impacted operational performance at Wipro. It was found that lean projects have better schedule and effort performance than non-lean projects, but there was no significant difference in quality.

### 3.1.3.3 Critical Analysis

One important fact obtained in this work was that the **Lean** projects observed no quality improvement. That may happen because an improvement in quality will take more time. Quality can be measured in many ways, so the impact of a **Lean** system in software services maybe will be seen in other unmeasured quantities, such as customer value.

Besides the good results presented and related to the implementation of **Lean** principles on IT and telecommunications projects, unfortunately there is no reference in the work to the **eTOM** framework and to **ITIL** set of good practices.

### 3.1.4 Improving ITIL processes using a Lean Methodology

The initiatives taken to improve **ITIL** processes using **Lean** have some limitations as they do not address all the **Lean** principles and goals. André Lino and Miguel Mira da Silva [29] proposed a framework that addresses all the **Lean** principles and goals that can be used to improve **ITIL** processes.

As **Lean** states, there is always waste to eliminate, so the framework proposed can repeatedly be applied to an **ITIL** process in order to constantly improve it. It is based on the Plan-Do-Check-Act cycle [30] and consists in six phases with the following tasks:
1. Plan – Initial planning.
   - Define relevant metrics for the process;
   - Map a desirable "to-be" Value Stream;
   - Define tools to capture the Voice of the Costumer.

2. Plan – Problem analysis.
   - Understand the "as-is" state of the process;
   - Identify costumer processes and their needs;
   - Define a possible "to-be" state of the process;
   - Identify the gap between the "as-is" state and the possible "to-be" state.

3. Do – Solution definition.
   - Promote brainstorming sessions involving process managers and collaborators;
   - Define a detailed plan of actions to implement.

4. Do – Solution implementation.
   - Implement all the actions defined in the previous phases.

5. Check.
   - Map the new "as-is" Value Stream;
   - Quantify the metrics with their new values;
   - Perform customer satisfaction surveys;
   - Compare the new "as-is" state with the previously established possible "to-be" state.

   - Define new standards for the process;
   - Define a mechanism to periodically control the performance of the process.

In order to evaluate the proposed framework, it was applied in a Portuguese Public Organization. The target process was the ITIL v3 Incident Management and the initial focus was on the IT Service Desk, a service responsible for the first line of support in the organization.

The framework was implemented in February of 2009 and the results were immediate:

- The incidents started to be logged right after user contact and nowadays 100% of the incidents are logged;
• The average number of emails in the inbox decreased from an average of 4 into 0 which means that users are getting a faster response to their problems;

• The scheduler is also able to perceive the resolution state of each incident, being capable to distribute the workload more effectively among the Service Desk elements.

As a standard framework does not exist to be followed, when taking Lean initiatives it is hard to address all its principles and goals. The authors asserted however that, although the achieved results were significantly positive, the approaches studied still need to reach a higher level of maturity in order to fully explore Lean’s potential. Several iterations of the framework should be performed in order to progressively introduce small changes in each one, due to high risk of “resistance to change” from involved actors if an attempt to improve everything at once would be tried. Additionally, the authors concluded that using brainstorming sessions also contributed to reduce the “resistance to change” as everyone had the opportunity to contribute to the definition of the solutions to implement, and that the method to improve IT processes in such a way that it meets customer’s needs and expectations.

3.1.4.A Critical Analysis

With the work from Lino and Silva, it becomes clear that Lean can effectively be used to improve IT processes and matching with ITIL set of good practices, particularly it can be used to improve the Incident Management process that is the core theme of this thesis.

3.2 Lean/eTOM related work

3.2.1 Telco Business Process Transformation using Agile Lean Six Sigma and Frameworx components

The work of Benhima et al. [31], presents a methodology for Telco business process transformation harmonizing eTOM selected components with a focus on the engineering aspects related to the process, and Lean Six Sigma, which is a methodology that converges Lean and Six Sigma principles. This harmonization, called L6S-Telco, allows quicker Transformation projects and getting standardization benefits since eTOM components are used throughout the methodology where applicable as inputs for the design aspects. L6S-Telco is an approach to address business process transformation for Telco industry and might be applicable to many other telecommunications service organizations.

The methodology steps used were based on Lean Six Sigma principles, that is a step by step methodology to optimize the process performance. The steps known as DMAIC are:
Define – define the project, the team and the process.

The key tools and activities related to the Define phase are:

1. Capture the process organization using SIPOC (Suppliers, Inputs, Process Steps, Outputs, Customers) Lean tool
2. Build the high level business process flow and identify or designate the process owner
3. Capture the Voice Of Customer which highlights the customer needs
4. Identify the Critical to Quality where measurable performance indicators are defined for the customer needs
5. Identify the quick wins
6. Perform a quality gate review for the Define Phase

Measure – validate the measurement system and collect process data

The key tools and activities related to the Measure phase are:

1. Build the Value Stream Map where process steps and their related performance data are captured
2. Identify the quick wins if any
3. Refine the deliverables of the previous phase(s) where applicable

Analyze – analyze the process data in order to identify the root causes for the problems

The key tools and activities related to the Analyze phase are:

1. Generate a list of possible causes (Xs) for non process performance
2. Evaluate the impact of each X on the performance indicators (Ys)
3. Identify the quick wins if any
4. Refine the deliverables of the previous phase(s) where applicable

Innovate – find, evaluate and set the processes improvement ideas

The key tools and activities related to the Innovate phase are:

1. Confirm the critical X(s)
2. Select and optimize the solution
3. Perform Risk Analysis
4. Perform a pilot run of the solution
5. Identify the quick wins if any
6. Refine the deliverables of the previous phase(s) where applicable
• **Control** – ensure a sustainable process improvement

The key tools and activities related to the Control phase are:

1. Develop a Control Plan
2. Implement the process changes, controls and documents
3. Calculate the final financial and process measures
4. Identify the quick wins if any
5. Refine the deliverables of the previous phase(s) where applicable

The case study was about improving the Order To Cash/Payment related to the MTN Business operations in the Ivory Coast and the benefits obtained with this L6S-Telco harmonization could be seen from three different perspectives:

1. **Customer Experience** – Increase in % of orders delivered by committed date by 67%
2. **Operational Efficiency** – Decrease in the Mean Time Order To Activation by 36%
3. **Revenue & Margin** – Increase of the Revenue Breakdown by 55%

3.2.1 A Critical Analysis

On Benhima’s work, besides having a small reference to a eTOM/ITIL processes mapping, the focus is to present a methodology for Telco business process transformation harmonizing eTOM and Lean Six Sigma, so it uses some of the Lean principles in study in this thesis, thus it is a good example to show how Lean principles can be used to optimize a Telco organization with their business processes based on the eTOM framework.

3.3 eTOM/ITIL Related Works

The eTOM and ITIL processes convergence have proved they are worth, and in the following sections some of the related work already performed in this area will be analyzed.

3.3.1 A management process defining approach for converged services based on eTOM and ITIL

The paper “A management process defining approach for converged services based on eTOM and ITIL” [9] proposes the convergence of eTOM and ITIL to build the management process framework and thus taking advantage of their respective strength in the management process areas. These approach is
verified during the work through defining Incident Management process, Change Management process and Customer Order Handling process.

Figure 3.3: A management process defined approach for converged services based on eTOM and ITIL [9]

The specific idea of this convergence is that eTOM captures the service providers business process needs, and forms a process model which can then be used to generate a range of process flows that are compatible with eTOM. ITIL captures the practice needs, and arranges them into a model of the areas of IT service delivery, service support, etc. ITIL good practice is then used to select out the possible eTOM process flows in line with these requirements. This management process approach for converged services is illustrated on Figure 3.3.

In this Zhuang et al. paper [9], the approach of the management process for the converged services has been applied in some telecommunications operator’s service management process. One of the approach’s application was on a Network Operator, that remains anonymous during the paper, and focused the Incident Management process. The approach taken based on Figure 3.3, can be resumed on the following steps:

1. Process pattern definition: Requirements analysis for incident management, and broken down into
procedural flow in top-to-down manner

2. Best process element definition: Describe the relevant process element, utilizing the 3rd process element in eTOM framework, and supplement and update the process element according to the actual requirements

3. Process flow definition: Connection of the best process elements, refinement of the flow referring the ITIL process. The other relevant processes such as Service Impact Analysis, Change Management, Test Management, Problem Management and Knowledge Base, are added. When dealing with the element of Isolate Problem, the strategic decision is added.

![Incident Management Process](image)

**Figure 3.4:** Incident Management process defined by the approach [9]

The resulting Incident management process defined by this approach is illustrated on Figure 3.4

3.3.1.A Critical Analysis

The Zhuang et al. paper [9] shows that the single eTOM framework or ITIL set of good practices is not suited to the operation management of the converged services, because the converged services are of not only about the communications technologies characteristics, but also about the IT characteristics.

With Zhuang et al. work, we have a demonstration applied on telecommunication service providers with good results, how eTOM and ITIL can converge, and particularly how ITIL Incident Management can be mapped into eTOM framework. However, the paper only gives a big picture of how the approach should be applied and only demonstrates the final result of the convergence of two processes. It does
not give any clue about the best way to change the processes and obtain the converged result. But it is a good example to know how the incident management process should be after an eTOM/ITIL processes conversion.

3.3.2 Aligned Software and Process Models with Both the eTOM Framework and the ITIL Processes

The 2013 paper from Denda and Drajic [11], has the main purpose of the definition and implementation of an optimized Incident Management process between three different telecommunications companies that operate in three different countries, Serbia, Hungary and Montenegro, and incorporate both eTOM and ITIL frameworks.

The paper presents the following main goals:

• The use of ITIL set of good practices for the purpose of conducting the AS-IS processes and consolidate one TO-BE process

• Analysis of the Incident Management process with references to eTOM Customer, Service and Resource Problem Management processes as appropriate

• Align Incident Management processes between three companies and to the industrial standards, ITIL and eTOM

• Process Assessment methodology process

• TO BE process design principles and main deliverables

There are some notes we can take from the main goals proposed and implemented on the work:

• The process assessment done followed a step wise approach, including the following steps:

1. Detailed AS-IS Assessment:
   A detailed AS IS assessment of current Incident Management process in three companies was done and this “AS IS” process was captured using process flow diagrams. Detailed information in regard to every sub step was captured in SIPOC-S table (Supplied, Input, Process, Output, Customer and Systems).

2. Mapping AS-IS process to ITIL and gap identification:
   This AS-IS process was then mapped to standard ITIL Incident Management process and broad gap areas were identified.
3. Broad recommendations and their Prioritization:

Based on mapping with standard ITIL Incident Management process, as well as IBM’s experience and knowledge of Incident Management best practices, broad recommendations in terms of business process, systems and organization roles were compiled.

4. Validation:

The results of the AS-IS assessment of Incident Management process, the identified gaps as well as the broad recommendations were then validated in all three companies.

• The TO–BE Incident Management consolidation process incorporate both ITIL and eTOM frameworks taking in eTOM process definitions within the context of the wider ITIL processes

• The new TO-BE process looks like a traditional IT network help desk application work-flow as outlined in ITIL processes, but it supports both ITIL and eTOM frameworks for all faults, outages, events, problems and incidents

• Some improvements were done as part of the new TO–BE consolidate process design, like:

  1. Automation tasks in place for upfront ticket enrichment and problem isolation
  2. Key Performance Indicatorss (KPIs) for measurement of process success and failure are defined to ensure proper process monitoring and optimization
  3. Well defined owners and their roles and responsibilities
  4. Automated tracking and monitoring of customer order progress
  5. Automate sub steps of incident management process (Incident assignment, routing or notifications)
  6. Incidents to be prioritized on the basis of business impact (severity of impact, number of affected users)
  7. Centralized solution reference database to be created and updated with all incident resolutions (Knowledge database related to Incident Management)

The high level Incident Management process proposed for Network Management Center process is shown on Figure 3.5 and high level Incident Management process for Mobile Service Management Center is shown on Figure 3.6.

3.3.2.A Critical Analysis

Denda’s and Drajic’s multinational work demonstrates the utility of converging eTOM and ITIL processes, as traditional ITIL aligned tools do not have the flexibility and sophistication to manage telecommunications networks, and traditional eTOM aligned OSS solutions are sophisticated enough, but the
Figure 3.5: Incident Management - Network Management Center Process [11]

Figure 3.6: Incident Management - Mobile Service Management Center [11]
architecture followed by the industry does not provide for flexible solutions and its focus isn’t the IT service management.

It also shows how the converged approach enables the process automation for network and service assurance for multi-vendor and multi-technology resource infrastructures.

We can observe here that eTOM and ITIL only shows how the processes should be organized and interact, they do not provide means to implement the improvement of processes. Denda and Drajic proposes a methodology that uses some management tools and techniques in order to analyze the status of the processes and to get the service’s inefficiencies to improve. For example, it is used a tool to obtain the status of the service – the SIPOC (Supplied, Input, Process, Output, Customer and Systems) table, that is used in methodologies like Lean and Six Sigma.

In is there demonstrated that in the case of incident management and problem resolution, the eTOM is not very prescriptive on degrees of problem resolution. A fault is a fault and the piece of equipment is either broken or has been fixed. So to optimize incident management, it is important to converge eTOM framework with ITIL set of good practices.

The improvements obtained with the new TO–BE consolidate process design, like automation of tasks, prioritization of incidents on the basis of business impact, bring some very good ideas to implement on a project of incident management processes improvement.

3.3.3 Munich Network Management Team: Refining ITIL/eTOM Processes for Automation in Service Fault Management

Hanemann's paper [12] presents a refinement of service fault management processes for automation and tool support. After a brief review of the service fault diagnosis processes in eTOM and ITIL, it is explained how these processes have been refined for automation and tool support giving some more details about a selected part of the work-flow. The extension of these work-flows for service fault management and service management in general is also discussed.

The paper states that the separation of fault and performance management has proven to be useful for eTOM’s resource management but the separation is imprecise on the eTOM’s service management layer. Here, a degradation of service quality have to be mapped both onto resource performance and also onto resource faults since a fault in a redundant service implementation may only lead to a service performance degradation, but not to a complete unavailability of the service.

The refinement of service fault diagnosis that is addressed uses Unified Modeling Language (UML) activity diagrams for detailing the steps. In each of them the possibilities for tool support are examined, with the business-oriented aiming two goals: a reduction of the effort spent on service fault management; and an improvement on the diagnosis time to ensure the fulfillment of SLAs.
The input work-flow deals with the reception of symptom reports at the interface between provider and user. Here, the idea is to promote the use of web interfaces for the symptom previous diagnosis.

In addition to the monitoring of resources and their interactions, the provider also should make use of possibilities to monitor the services from an external perspective. This tests are called user experience tests and uses applications that act as virtual users and perform typical user interactions.

The proposed work-flow is centered on the diagnosis of service symptoms which can be regarded as a refinement of the eTOM’s Diagnose Problem process and is illustrated on Figure 3.7.

The paper brings a relevant matter for discussion. An important area of research in business-driven IT management is impact analysis, where the service degradation onto customers and their SLAs are examined. ITIL recommends the estimation of impact based on incidents which may be inaccurate when few information is given in the beginning. It may not be obvious that incidents are related so that the impact estimation is done separately for each incident. The automated correlation of incidents as service events should therefore be considered so that more accurate information is given as basis for impact.
analysis.

The work-flows that have presented deal with service fault diagnosis and possibilities for its automation. These have been prototypical implemented for services at the Leibniz Supercomputing Center.

3.3.3.A Critical Analysis

Hanemann [12] demonstrates also that eTOM and ITIL frameworks focus on the elaboration of what is needed to be done, but give only limited assistance concerning the implementation. Despite that, in this paper, there is no reference to which methodologies or tools should be adopted to implement the processes improvement, but gives a reinforcement on the need to use well proven management methodologies or tools to achieve the convergence proposed.

The virtual users suggested in this paper are a good solution to improve a service fault management, it permits that some service fault could be detected and solved before the user realizes the fault. This can be implemented by software application or using software application together with physical devices like probes.

Other crucial suggestion to improve fault management is the automation and correlation of service events, that can bring a great improvement on incident management process and a significant reduction on the service costs.

The last matter discussed on this paper is very important to future work, as brings the need to change from an infrastructure fault management to a service fault management, in order to correlate the incidents from the same service to get a more accurate impact analysis and to obtain service availability performance indicators. This need is of course, for those organizations that did not already implement this changeover.
4

Architecture and Implementation

Process

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4.1 Architecture

There was a problem of inefficiency on the Incident Management process, as described in Chapter 1. Nevertheless, there was no need to build a new service nor the need to create new processes, there were only some issues to solve and some processes to improve, related to the service we were providing.

The organization has its processes organized following eTOM framework, which was described in Chapter 2. Inside the organization, there were some good examples of IT teams that already optimized their processes following ITIL good practices, a set of good practices that was also described on Chapter 2. After some research, it came clear that eTOM and ITIL could and should converge, as demonstrated on Chapter 2, and that some work about converging eTOM and ITIL processes has already been done, in particularly to map ITIL Incident Management with eTOM Assurance group of processes, as described in Chapter 3.

However, eTOM and ITIL do not provide any tool or technique to change and optimize the processes, thus a methodology of processes management was necessary. Through the analysis of the related works, presented on Chapter 3, it became possible to verify that Lean may be used in the IT services area. Besides, as Lean requires few training and small teams, it can produce fast and visible results starting with a simple set of tools. Moreover, it was intended to study a different approach to combine the concepts proposed on ITIL with the eTOM framework, so it was decided to apply the Lean principles to this Incident Management process improvement project.

The methodology used for the project of the Incident Management process improvement, is based on the Lean principles described on Chapter 2, and can be summarized on the steps illustrated in Figure 4.1. Following one of the most important principles of Lean, which states that there is always waste to eliminate, this methodology can be continuously applied to the process in order to constantly improve it. The objectives and tasks from each step are going to be described on the following sections:

4.1.1 Identify Value

The objective of the first step is to identify value from the process customer perspective, as only a small fraction of the total time and effort in any organization actually adds value for the customer. With the value identified, all the non-value activities or waste can be marked for elimination. The tasks needed to achieve this objective are:

1. Identification of the process customers.
   It’s necessary to involve the people who run these processes daily and get their knowledge.

2. Voice of Customer capture.
   This will help the understanding of what is important to the customers who are affected by the
process. It’s captured in a variety of ways: surveys; field reports; observation; direct discussions or interviews; customer specifications; or complaint logs.

4.1.2 Map the Value Stream

The next step after understanding what the customer wants and values more, is identifying how the service is being delivered. The objective of this step is the observation of the current processes, looking for the causes of their inefficiency, listening to the people that work daily with the processes, and mapping the desirable TO-BE Value Stream. This step consists in the following tasks:

1. Mapping the AS-IS Value Stream of the process through Lean tool Gemba Walk. Observe the process where the work is done – Gemba walk, and create a process flow mapping with the activities that compose it.

2. Identify Value-Adding (VA) and Non-Value-Adding activities. With the AS-IS process mapped and having collected the customers expectations, it is possible to categorize the activities in the process as Value-Adding or Non-Value-Adding activities.

3. Mapping of the desirable TO-BE Value Stream by using the Lean tool Process flow mapping. This is done first by evaluating the existent best practices related to the process to improve and
then creating the process flow mappings needed, based on those best practices.

### 4.1.3 Create Flow by Eliminating Waste

Knowing how the service is being delivered and having the understand about what is more valuable to the customer, on this step 3, it’s time to eliminate wastes and design the change in order to get the value-creating activities occurring in tight sequence, so the service will flow smoothly toward the customer. These objectives can be accomplished by executing the following tasks:

1. **Map a possible TO-BE value stream.**
   A possible TO-BE value stream represents a state for the process that is possible to achieve on the short term. Use Kaizen strategy: Conducting brainstorming sessions (Kaizen workshops) with process managers and collaborators, preparing the team to relevant Lean tools like the 7 kinds of waste and value stream maps; analyzing present methods; testing and evaluating ideas through pilot systems.

2. **Design the change plan in order to eliminate the waste identified.**
   This is done using the process flow mapping created and the desirable TO-BE Value Stream Map as a reference. Analyze the existing bottlenecks and identify the gap between the AS-IS and the possible TO-BE.

### 4.1.4 Establish pull and make the change

This step is where the improvements are implemented with appropriate training and measures, so that the team responsible for the change process have the ability to monitor it and make adjustments if necessary. It is created a schedule for the implementation with time objectives and if necessary or possible, the changes are tested first on a controlled manner before the implementation on the production system.

### 4.1.5 Seek Perfection

As value is specified, value streams are identified, wasted steps are removed, and flow and pull are introduced, the objective of this step is to begin the process again and continue it until a state of perfection is reached in which perfect value is created with no waste. This fifth step consists on the following tasks:

1. Check the new AS-IS value stream through Lean tool Gemba Walk and create the new process flow mapping.
2. Quantify the metrics and evaluate the variation results
   Define relevant metrics for the process. Metrics are needed to evaluate the process quantitatively. The metrics should follow the ones defined by the process best practices, or metrics already used on other papers and case studies.

3. Make process customer surveys

4. Define a periodic process control mechanism

5. Establish new plan if needed or return to the first step of the cycle.

4.2 Implementation Process

The methodology presented above was followed in order to improve the incident management process on an Operations team at Portugal Telecom. In the following sections, there is a description of the implementation process, step by step, detailing all activities done and the decisions made during the project.

4.2.1 Identify Value

1. One of the first tasks to do on a Lean based methodology is identifying the process customers. As our team is responsible for the support, administration and configuration of the network management systems, the customers of the incident management process are the end users of those systems which can be internal or external customers, supplier/provider workers and also our own team members.

2. The Voice of Customer was captured in a variety of ways:
   
   • Observation – by working for more than 2 years in this team, with roles of administration and support of network management systems, working daily with the process, I have the role of “Employee” on the Voice of Customer, and because of that the directly observation has being done by me for more than 2 years.
   
   • Direct discussions and interviews – Direct discussions with the internal customers and the other team members; and interviews with different managers.

   The following needs, concerns and complaints, regarding the incident management process were identified:
   
   • The need to have a unique and much simpler system to open incident tickets.
• The need to have all incidents and requests logged with a ticket.
• The need to have an alarm pattern with a list of the alarms that all network management systems must have.
• The need to have all network management systems being monitored by supervision team.
• The need to have more automation between alarm and ticketing systems.
• The need to reduce the number of alarms not recognized, not treated and without an associated incident ticket.
• The need to have all the alarms from network management systems centralized on an unique group of an unique alarm system.
• The need and complaint about the lack of documentation about the systems managed by the team.
• The need to have all network management systems registered with a Configuration Items (CI).
• Complaint about the incident notifications and requests from the customers were arriving from: direct email; team email address; telephone; two ticketing systems; and only the last ones were logged but having the difficulty to manage tickets in two different systems.
• Complaint about having too many alarm systems, doing related work in parallel.
• Complaint about being flooded with notifications from ticketing system.
• Complaint from system administrators of not receiving any alarm from some systems and having knowledge of some incidents only from external customers.
• Complaint from supervision teams that some alarms reporting incidents didn’t have any procedure nor any indication about what to do with that incident and to which team they should report the incident.
• Concern about the possibility of being flooded by too many alarms.

4.2.2 Map the Value Stream

1. The process was observed where the work is done, daily and during more than 2 years of working on the team – Gemba Walk. The AS-IS value stream of the process created with Lean tool process flow mapping is illustrated on Figure 4.2.

2. With the AS-IS process mapped and having collected the customers expectations, we can categorize the following activities from the AS-IS mapping, as Non-Value-Adding:

   • Having incidents not logged;
Figure 4.2: Incident Management "AS-IS"
• Having two ticket systems to perform, in parallel, the activities of incident identification; incident categorization; incident prioritization; and incident closure.

All the other processes from the AS-IS mapping can be considered as value-adding activities.

3. The desirable TO-BE Value Stream for the incident management is the ITIL Incident Management process flow, illustrated on Figure 2.2 of Chapter 2, and mapped with the eTOM Assurance processes: Customer interface management; Problem handling; Service problem management; Resource trouble management; Supplier/Partner problem reporting and management; and Supplier/Partner interface management; which are the eTOM Assurance processes that have a strong correlation with ITIL Incident Management process, as explained on Chapter 2. The desirable TO-BE Value Stream process flow defined by the matching described above, is illustrated on Figure 2.2 of Chapter 2.

4.2.3 Create Flow by Eliminating Waste

1. With the Non-Value-Adding activities identified and the customers expectations collected, it was time to conduct some brainstorm sessions with process managers and collaborators, in order to map the possible TO-BE value stream and to identify the waste to eliminate. It was decided that there was the need to have only one ticket system to eliminate all the non-adding-value activities, and that system should have a simplified application in order to help customers on the incident identification and to motivate all the customers about the need of logging all the requests, incident and change requests. This application should also have a view of the CIs in order to categorize all the incidents and distribute them to the correct team. Looking also to the customers complaints and concerns about the alarm systems, it was indicated also that there was a need to change some of the processes that are part of Event Management (ITIL process). It was decided that we should eliminate several alarm systems, we should only have one umbrella of alarms mapped with the Ticketing System and that we should create an architecture in order to implement alarm monitoring on all team's systems.

2. In order to eliminate the waste, the change plan created was divided in two parallel projects: one to implement the application to simplify and improve the incident ticketing opening, and other to eliminate the wastes related with the Event Management. This last project was called “Network Management Systems Monitoring”. To implement this monitoring project, it was decided to use a PDCA (Plan, Do, Check, Act) Cycle of continuous improvement with a goal of five months to implement an alarm pilot system.
4.2.4 Establish pull and make the change

The ticket system simplification was accomplished by creating the “ET” system, an application that provides a simplified way to open incident tickets or make change requests. This application communicates with Ticket System 2 and does not need any training as it is “user friendly”. Other change implemented is that all the incidents and change requests have to be registered now by a ticket. For the “Network Management Systems Monitoring” project, a three member team was formed, coordinated by me, with the following tasks:

• Perform a complete survey of all existing and non-existing monitoring.

• Create a Pattern of Alarms, that consists on a list of alarms that all team’s systems should have.

• Create an architecture of monitoring systems, with only one umbrella of alarms.

• Create monitoring and alarms related to the systems that does not have any monitoring and complete the configuration of monitoring for the systems with incomplete monitoring.

• Prepare all the processes to deliver the monitoring of the systems to the supervision team, with all the alarms organized and well formed, and with all the necessary procedures in order to indicate to the monitoring team, which tasks should they perform for each alarm.

• Remove all the events that should not be an alarm.

• Correlation of alarms and automation of manual events.

This monitoring project is being implemented by a PDCA Cycle of continuous improvement, and started on September 2014 with the following steps:

1. It started with the Plan step where it was done a complete survey of all existent monitoring and monitoring systems. This survey was documented and is available for all team members. After finishing the survey, it has been proposed an architecture to implement a pilot to test one monitoring solution on some production systems. Systems that we have checked, on the survey, that had few configured alarms or any at all. The destiny of the alarms is a single alarm umbrella system that should receive the alarms directly from the systems being monitored or from other collecting alarm systems. During the pilot, the Pattern of Alarms was improved with the alarm test results obtained.

2. On the Do step, the alarm’s pilot was implemented only with 3 systems but of different types: different physical systems, different operating systems, and from different teams, to test all the possibilities from the beginning. The pilot had a goal of 5 months to be completed and to check the results.
3. The Check step took place after the 5 months pilot, during February 2015. In this phase we have checked the results obtained with the pilot. Comparing the results obtained on the pilot with the survey completed on the first step, it has been decided to proceed with all the configuration to all systems and to establish a schedule to implement all the monitoring needed and configure all alarms on the umbrella system. On the Check phase we have realized that we had to add another collector system due to technical and commercial limitations.

4. The Act step started also on February and proceeded until April. In this phase we have decided to implement regular brainstorm sessions, one per week, with all team members, in order to obtain faster and better results on this project. The following tasks were implemented on the last step of this PDCA cycle:

- Creation of the monitoring needed.
- Configuration of the alarms.
- Configuration of procedures and alarm manuals.
- Correlation of alarms.
- Automation of manual events, like automatic ticket opening for some alarms.
- Cleaning of the monitoring system to ensure only genuine alert.

At the end of the configurations, we have introduced a new member to the team, without any knowledge of the project, with the objective of monitoring the alarms and check if all alarms are well formed, with clear procedures and to help on cleaning of the monitoring system.

4.2.5 Seek Perfection

1. The new AS-IS value stream mapping, after the implemented changes, is illustrated on Figure 4.3.

2. It was decided to use the following metrics based on ITIL KPIs: Number of incidents; Number of automatically monitored services and systems; Number of automatically created event messages; Rate of automatically created event messages with following necessary correction needs;

3. Make process customer surveys

4. We are continuously checking the alarms to prepare the transition of the monitoring of the alarms to the external team responsible for the alarms monitoring. There is a weekly checking to the incident tickets, in order to check if all solved incidents are closed, and if all incidents were solved within the SLA.
Figure 4.3: The new Incident Management AS-IS
5. A new plan was establish in order to continuously improve the processes. Until now we have only infrastructure alarms. We establish a plan to create monitoring based on the service instead on systems. Other task to perform in the future is starting to collect the performance indicators from the network management systems and create reports based on these indicators.
5 Evaluation of the Results

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The results obtained during this work will be evaluated on this chapter.

5.1 Waste reduction evaluation

Comparing with the 8 elements of IT waste, described on the section “Lean” of Chapter 2, 4 types of IT Waste were identified before the implementation process:

1. Over provisioning.
   In the excessive number of monitoring system doing equal work in parallel.

2. Transportation Issues.
   Like complex interfaces to open tickets.

   Because of the existence of two different ticket systems working in parallel.

4. Defects.
   Wrong or lack of information on the alarm procedures.

After the implementation of the new methodology, all kinds of waste identified were eliminated: Over provisioning, transportation issues and non-value-adding-processing.

1. Over provisioning.
   There was as important reduction on the number of monitoring systems that were doing equal work in parallel. This waste elimination, achieved by removing 3 of the 5 monitoring systems, represented a 77% OPEX reduction related to monitoring systems on our team.

2. Transportation Issues.
   The creation of the “ET” interface has been a great success. On the first 4 months of 2015, 700 of 1030 change request tickets and 600 of 1227 incident tickets were opened on “ET” interface, as can be observed in Figure 5.1 and Figure 5.2.

   Another important figure is that more than 300 incident tickets were opened automatically by alarm systems. Related to the identification and categorization of the incidents, we can see by the results that the new interface has decreased the number of tickets needed to be manually identified and categorized. With the ticket system that was eliminated, on 2014 in 9319 tickets opened, 5792 were automatically categorized and distributed to the correct team. This year (2015), on the first 4 months, the new “ET” interface has categorized and distributed correctly all of the 567 tickets opened on this interface.
Total OTs - 1030

Figure 5.1: ET Change Requests

Total TTKs - 1227

Figure 5.2: ET Incident Tickets

This waste was eliminated as we now only have one ticket system as we can see on the new AS-IS value stream mapping after implementing the changes as illustrated on Figure 4.3 on Chapter 4.

4. Defects.

We have created a general procedure for all alarms that consists on the information to call to our team’s telephone number. For the exceptions, we are creating new procedures but at this moment all alarms from our systems, have a procedure configured.

5.2 Monitoring project evaluation

The monitoring project has given already some good results. Figure 5.3 shows that the number of alarms has increased on the start of the pilot, but when we entered on the final phase – week 15, starting with the monitoring, cleaning and correlation of alarms – the number of online alarms without any treatment (red line on the graphic), has started to decrease. But there is still some work to do in order to reduce the number of alarms and the number of alarms without any treatment, that is still around 2000 alarms per week, and only related for our team’s systems.

![Figure 5.3: Evolution of alarm cleaning](image-url)
Conclusions and Future Work

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The type of methodology presented in this work can be applied to any project of processes improvement of an Operations area of a service provider. The implementation was done, we have managed to eliminate some waste, but as **Lean** principles state, there is always waste to eliminate and processes to improve.

The following sections will draw some conclusions related to all the work performed and give some suggestions of future work.

### 6.1 Conclusions

This thesis started with one objective, the improvement of the Incident Management process, one of the core services provided by my team at Portugal Telecom, as it is a team that does the Support and Administration of Network Management systems. The team belongs to the Assurance department of Operations management and it is responsible for several eTOM processes from the vertical Assurance group of processes, the processes that map the Incident Management.

This objective was accomplished as it was demonstrated during this thesis. Today the Incident Management process at Portugal Telecom is more simple, with less waste and more efficient. The major benefits are: the simplification of the incident logging process; the simplification of processes regarding the management of the incident ticket; having only one ticketing system and with all the incidents being logged; the major reduction on the OPEX related to management systems (-77%); the creation of monitoring and alarms for all the network management systems, centralized on one unique *umbrella* of alarms, which will help on the monitoring and will improve the incident management, as will reduce the reaction time to an incident and thus helping with the main objective of Incident Management, that is the recovery of a failed Service as soon as possible. And a cleaner and more reliable alarm monitoring system will reduce, in theory, the number of unnecessary interventions in response to false or minor alarms.

Another important conclusion that can also be drawn is that the **Lean** methodology was implemented with good results, as 12 of the 15 needs, concerns and complaints collected from the Voice of the Costumer were solved with the work that was developed and the methodology that was implemented. The following 3 needs and complaints are the only that remain to be addressed:

- The need and complaint about the lack of documentation about the systems managed by the team.
- The need to have all Network Management systems registered with a CI.
- The need to have more automation between alarm and ticketing systems.

The **Lean** key principle, of learning by doing approach was another principle followed with success during this work, more specifically, during the implementation of the monitoring Pilot. This Pilot was a
Despite the major improvements obtained, there is always waste to eliminate and processes to improve, and we can see on the new AS-IS process flow that the improved process is not yet equal to the desirable TO-BE process based on ITIL good practices and on the eTOM framework. The absence of a functional escalation process and the absence of a special process to deal with critical incidents are the main improvements needed, in order to follow the best practices.

As we can see from the major benefits obtained and described above, we have started with a single objective, the improvement of the Incident Management process based on ITIL and mapped with the eTOM Assurance Processes, and have finished to also apply the designed methodology for the Event Management process improvement, following the ITIL set of good practices and converging that process with Assurance processes from eTOM framework. This convergence is fundamental for the present and for the future, as the telecommunications business processes are being increasingly supported by IT systems.

But the methodology implementation that was done for this thesis was not a “bed of roses”, it had some drawbacks, the most important related with the difficulty to promote significant changes on a big and complex organization. At the beginning of the project, we did not manage to involve the team on the project in a correct manner and because of that we were not obtaining the necessary feedback to our requests. This situation have only changed, when we have started with weekly brainstorm sessions with the entire team, in order to listen to their ideas and suggestions of improvements, and establishing minor but feasible weekly objectives, obtaining small achievements to start the changing of the processes. This Kaizen principle of building a culture where all team members are actively engaged in suggesting and implementing improvements to the team, was and is the key of the success of the team work.

6.2 Future Work

Following the good results obtained with the convergence between eTOM and ITIL processes and the improvement achieved following a Lean methodology, the work done for this thesis should be extended to the other ITIL Service Operations processes and matching with eTOM Operations processes.

There is still some improvements to do on Incident Management process, like the creation of a quality control process to check if the SLAs are being fulfilled and if the incidents are being correctly closed.

One project already presented to the organization, which have received some good feedback, is to transform the monitoring based on infrastructure, on a monitoring based on Service, as incidents are not equal, some of them represent a failure on a service, but others represent only a small failure on a component without impacting the service provided to the client. This service monitoring project can utilize all the work developed in the scope of this thesis, as the basis of Service monitoring is “all the
monitoring" of infrastructures and applications created on the current monitoring project.

Other future project also presented to the organization is the Performance Indicators Collector, which will be very important in order to better understand the behavior of our systems in long term, to be able to investigate root causes of problems, to improve the Problem management process, and to create reports of system and service performance.

There are also some other minor improvements that could be implemented in the future such as, the creation of a customer survey to be sent automatically to the customers on the incident closing, in order to get an evaluation of the service provided; end user experience monitoring using the probes that are spreading over the country;

However, the most important future work to do is the continuous improvement of the processes and services provided to the customer. In order to continue with this improvement, the simplification and the convergence of processes are two key principles to follow, they are not only transitory business trends.
Bibliography


