Aligning IT service levels and business performance: a case study

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Abstract—TSF is an Italian IT service company, focused on logistics and transportation. It is able to support customer’s business operations through a complex IT service chain, appraised by a Service Level Management (SLM) system. Because of the long term relationship (10 years) with Italian Railways, TSF developed a symbiotic relationship with its main customer, becoming co-accountable for its business performance. This aspect has highlighted the necessity of the definition of an extended SLM model able to correlate the customer business performances with the delivered IT service levels, in the perspective of an end-to-end service delivery chain. The paper illustrates the conceptual approach and the method adopted to overcome this problem in a pilot project.

Keywords: IT Service Management, Management Methods and Tools for Business and IT Alignment, Key performance Indicators for Business Processes

I. INTRODUCTION

Italian Railways (FS - Ferrovie dello Stato) delivers logistics and transportation services for passengers and freight and manages the Italian rail infrastructure. The quality of delivered services deeply relies on IT infrastructure, which is fully outsourced to Tele Sistemi Ferroviari S.p.A. (TSF). In this scenario the quality of business services provided by TSF is strictly dependent by the quality of IT services provided by TSF. For example if the ticket counter is out of order, due to IT failures, the perceived quality of ticketing services is negatively impacted. The IT incident also affects the ticket sales, with evident influence on business performance.

The service contract between TSF and FS is based on Service Level Agreements (SLAs) ([22], [9], [19], [23]), which state the IT performance expected by FS against a given fee and define the IT service metrics (such as availability, response time, and throughput) to be met by TSF. SLAs, while ensuring the provision of services at pre-negotiated levels, involve also penalties for failures, so they must be measured and managed by means of a proper Service Level Management (SLM) approach, and this is usual for IT service companies.

However, because of the long term relationship, TSF application service managers have gradually absorbed a lot of business domain knowledge from FS, becoming de facto the business process owners. This has induced FS’s business departments to have them accountable for their business performance, involving them sometimes even more than the corresponding internal IT departments, which are, indeed, the actual TSF’s customer and the legal interface in the IT outsourcing contract.

Current SLM approaches, even reflecting a mature view of IT as business support, are IT oriented and don’t evidence how IT services are related with business operations. The primary requirement of TSF is, indeed, to overcome this constraint and to develop an SLM process and system focused on FS’s business performance in order to correlate Business Quality of Services (QoS) delivered by FS with the IT service level delivered to FS, in the perspective of an end-to-end service delivery chain.

To face this problem TSF has evolved its service catalogue adding, for each service, the relevant Key Performance Indicators (KPIs), the corresponding Service Level Objectives (SLOs), the related Operational Level Agreements (OLAs) and the list of impacted internal processes. Moreover it has obtained the ITIL v.3 ([2][3]) certification for Data Services and CMMI level 2 [26] certification for Software Development.

Even if the certifications forced TSF to formalize and redefine processes, the main unsolved issue has remained about the model for correlating FS’s business performances with the outsourced IT service levels.

This is the main aim of ESITO project, involving academia, TSF and FS.

The aim of the paper is to illustrate the approach (section 4), to present the project (section 5), to discuss the results and learned lessons (section 6), after having defined the business scenario (section 2) and having analyzed the
current approaches to SLM (section 3). Section 7 is for conclusion and further works.

II. BUSINESS SCENARIO

Headquartered in Rome (Italy), Tele Sistemi Ferroviari (TSF) S.p.A. (www.tsf.it), with a turnover of some € 140 million and 700 employees located in Rome, Florence, Bologna, Genoa and Turin offices, is one of the Italian leading players for the development and management of ICT services within the Transportation and Logistics sectors. The deep domain competence has been mainly gained throughout its long term relationship (over ten years) with the Italian Railways group (Ferrovie dello Stato) as full IT outsourcer.

Today TSF’s offering for transportation-tailored systems covers the whole ICT value chain. The company additionally maintains a best-of-breed ICT technological infrastructure through which TSF is able to deliver a wide and varied range of services – from the process analysis to the complete application management activities. It includes over 1,700 local and remote servers, over 370 applications (40% of which have an I24 service level) in Windows, Unix and Linux environments, over 1,000 terabyte storage capacity, 5 robotized tape libraries, over 1,500 routers, with more than 1,900 links and over 10,000 workstations.

TSF’s Railways IT systems encompass an ample range of applications that support rail network operations, equipment management, passenger services, freight services and other activities. For example TSF manages systems like mobile paperless ticketing, which enables the passenger to buy a train seat via Web and to get the confirmation on his or her personal mobile phone, or real-time traffic management systems, which are essential to coordinate trains movement.

TSF Operations Division provides the whole range of IT services, inclusive of Software Development. In turn, Customer division is in charge of the relations with customers and includes a Customer Service Center, which negotiates and controls service levels. TSF uses a formal catalogue of IT services and has obtained various certifications, specifically ITIL v.3 [2][3] for Data Services and CMMI level 2 [26] for Software Development.

From its side FS corporation is split in different operative business firms (e.g. Trenitalia is in charge of the transportation services of passengers and freights, RFI is focused on the management of the main Italian rail stations) and each of them is structured with internal business units, IT, marketing and selling departments and so on. The relationship between TSF and FS is based on a service contract, aged more than ten years now. Because of the acquaintance entailed by the long term relationship, TSF functional application managers have gradually absorbed a lot of domain knowledge, becoming de facto business process experts. Like in a symbiotic relationship, this has induced FS to have TSF accountable for its business performance, involving TSF sometimes even more than the corresponding internal IT departments, which are, indeed, the actual TSF’s customer and the legal interface in the IT outsourcing contract. In this situation, for example:

- FS operations department (e.g. plant supervisors, which use the train composition application) asks TSF for system availability and quality of service (QoS), while marginally considers cost issues;
- FS IT department is focused on cost, while tends to consider the QoS as a constraint;
- TSF must comply with SLAs agreed with FS CIO, while it is asked by FS operations department to be liable for its business requirements (e.g. number of train composed per day etc.).

Moreover, for its purposes TSF monitors its infrastructure through several commercial platforms, each focusing on specific issues (e.g. incident management) and/or resource (e.g. network, servers, …). With this fragmented approach, it is hard to relate incidents to the Objectives/Penalties and even more difficult to relate FS business performances with technical service levels. In short, current monitoring is considered inadequate by TSF management, since it does not support a “customer oriented” vision. To face this problem TSF decided to redefine its SLM approach, adopting a novel customer oriented framework in the perspective of an effective end-to-end service delivery chain, and testing it on a real business process (Freight Train Composition).

III. SOLUTIONS: BACKGROUND AND OVERVIEW

Managing corporate IT effectively has always been an issue. Ideally, IT should have moved from a pure technology management to a mature and comprehensive awareness of business support. The conceptual development of management frameworks for IT organizations dates back to the late Seventies, when, with the proliferation of IT in corporations, the popular Nolan’s Stage Theory [14] emerged. Nolan identifies stages of growth of IT in organizations, driven by the expenditure growth. Each stage is profiled by a specific pattern of IT planning and control, IT organization, IT applications portfolio, technology, and expenditure growth rate. Rather prophetically Nolan assumes that the final stage of his framework is a mature one where IT is aware of business. In the Eighties a need to structure IT management led to de facto best practice standards, such as the IT Infrastructure Library (ITIL [21]), and IT governance frameworks, like the Control Objectives for Information and Related Technology — COBIT([1], [24], [25]), the Capability
Maturity Model Integration - CMMI ([4], [7]) or the Microsoft Operation Framework - MOF [6]. These methodologies reflect the growing complexity of IT in large organizations, as telecommunications providers, banks, and multinational corporations.

It has to be noted, however, that ITIL and related frameworks represent a set of guidelines for IT executives, managers, and practitioners; they are a reference when planning, designing, and implementing IT processes and services. As argued in [31], from the point of view of industrial and academic research, while these frameworks are very useful to establish a common language and a map of the research territory, they do not go very far toward providing concrete solutions. In [31] it is also outlined the birth of Business-Driven IT management (BDIM) as an international joint research effort between industry and academia. It was observed that in order to play its new role effectively, IT Service Management (ITSM) still had to evolve a bit further: it had to move on to a full business perspective and not rely only on technical metrics measured at the IT level. In order to be successful, BDIM would have to answer new questions, such as, “Among all the IT-related incidents occurring now, which is having the most impact on the business and should therefore be treated first?”. Actually the business perspective addressed in BDIM considers the economics and customer satisfaction of IT services. We foster a further step, which correlates business performance with IT service performance. For doing this it is necessary to define the concept of end-to-end visibility as the capacity to correlate business and IT service chain and the related performances.

The rest of the section discusses how most common ITSM frameworks, namely ITIL, COBIT, MOF, HP Service Management Framework and IT MBO, address the concept of “end-to-end visibility”.

ITIL (Information Technology Infrastructure Library) is a “de facto” standard for ITSM ([2], [21]). Its version 3 focuses on managing IT as services. Monitoring service levels is referred by ITIL as “end-to-end visibility” [2]. Usually, IT organization has no visibility of the business processes they support, even if an end-to-end service is delivered by the close collaboration of business and IT. In Service Strategy, ITIL version 3 addresses the issue of effectiveness in measurement of IT services by affirming that practice highlights that monitoring discrete components is not sufficient. An integration approach which promotes cross-domain coordination is more likely to afford success. Unfortunately, as stated in [2] and [3], the common techniques are not completely satisfactory. Consequently, the lack of an “end-to-end visibility” method prevents business managers to ask “how or why, instead of the monitoring solution can only answer what and when.” [2]. Nevertheless, ITIL version 3 provides a set of principles in designing effective measurements such as (a) “Focus on what customer really want and when” or (b) “Don’t lose sight of business process”. As already observed these frameworks define a set of guidelines and don’t provide concrete solutions.

COBIT (Control Objectives for Information and related Technology [1], [24], [25]), that has achieved the status of internationally recognized standard [7], provides managers, auditors and IT users with a range of metrics, indicators, processes and best practices in order to gauge the benefits of IT in organizations and develop IT governance and control. In Control Objectives section, COBIT v4.1 addresses the issue of monitoring IT performances through the ME1 Monitor & Evaluate IT Performance process. Thus, it requires IT metrics to respond to business requirements consistently with the business strategy, and requires business processes to define a set of measurable objectives for IT. However, business impact of IT or “end-to-end visibility” neither is considered nor a method to implement is provided.

Microsoft Operations Framework (MOF) is a collection of best practices, guidelines and models designed to manage and support the mission-critical environments to achieve reliability for IT solutions and services. It is based on a service lifecycle similar to ITIL v3 and addresses service level reporting through SMC (Service Monitoring and Control) process within the Service Operation Phase. SMC is the real-time observation of success or failure conditions of services. Nevertheless, it does not define a method to provide “end-to-end visibility” or analyze business impact of IT incidents. It just addresses the issue by describing what has to be done, i.e. guidance principles such as “How important is the service to the business?”, “How dependent is the business on this service?”, and “What are the KPIs for the new IT service?” [6].

HP Service Management Framework [5] focuses on optimizing the quality and efficiency of IT processes. It is based on ITIL v3 and drives business alignment and value by three key principles (a) “maximize IT value delivered to the business”, (b) “automate IT services, processes and tasks” and (c) “mitigate risk by centralizing and enforcing processes”. Unlike previous frameworks, HP doesn’t provide a method to design an “end-to-end visibility” monitoring system.

IT Management by Business Objectives (MBO) is an approach proposed by HP Research in order to analyze business impacts for IT services. It has the ambition to provide a decision supporting tool, that suggests actions with respect to the impact on the business of IT services and processes ([20], [18]). The main ambiguity of IT MBO approach is the definition of a business performance objective. The business perspectives define financial and/or quality metrics but those are strictly related to the “business of the IT service”. For instance, Customer Satisfaction is referred to as a business metric. Still, it is a measurement of the customer satisfaction related to the perceived IT service. We focus here in “end-to-end visibility” i.e. we focus on the performance of a business service, delivered through a business process that orchestrates different activities, resources and IT services. MBO doesn’t provide end-to-end visibility for it is still focused in IT service perspective. Nevertheless, MBO is an important starting point for reflections about statistics.
methods to correlate metrics such as those discusses in [30].
In industry the concept of end-to-end visibility is already analyzed, like shown in [10] and [29]. In particular [29] focuses on availability in a Service Management scenario and defines a catalogue of “visible end to end services”, i.e. what the customer gets (e.g. web pages not exotic network paths), the correlations of the visible end to end services to the catalogue of underlying IT services, that enable them, thus allowing a cause-effect chain and the end availability and responses time held as key service objectives.

IV. BUSINESS ORIENTED SERVICE LEVEL MANAGEMENT

The above frameworks have a high value to manage IT organization processes. However the link between the business users’ perspective (e.g. plant supervisor) and IT management is loose or unstructured. Specifically MBO nominally addresses business but it focused on the business of the IT provider. We argue that in order to partnering IT service management and business service management, it is necessary that IT management decisions and actions must consider business customer’s priorities and impacts. Thus we foster the need of models and methods able to correlate business customer performances with IT services performances and management.

The approach we have developed has been called Business Oriented Service Level Management (BOSELM). It is an approach based on a threefold service level model, shown in Figure 1, which links the three perspectives of business, IT services and IT management processes.

Business level models the business process delivering the business service and the related business performance relevant to each business service’s stakeholder. We model the business process with a structural and flow diagram and identify KPIs according to the HIGO® grid described in [11].

IT services perspective slices the IT systems supporting the business process activities into the IT service chains, filters KPIs and SLAs according with the subscribed contract.

IT management level identifies the performances of internal processes by which IT services are planned and controlled (e.g. Availability Management, Change Management, Release Management, Capacity Management etc). IT services and IT management levels are mapped by a simple grid. The specific for this level is provided by common IT management framework, such as ITIL. This level considers the impact on processes and internal performances for delivering services, SLAs and OLAs as defined on contract. The relationships among the perspectives are fundamental to analyze how and how much critical IT service chains are on business performance, which IT service chains affect what business processes, what SLOs can be achieved given the internal processes and what constraints must be overcome to provide the SLOs required by clients.

The multiple lines in Figure 1 convey the message that each activity of a business process/service is supported by multiple IT applications, and a many-to-many relationship exists between business processes and IT applications.

Figure 1. The three layers model

The method for linking the perspectives passes through the concept of UML use cases and sequence diagrams (Figure 2). The process flow is diagrammed using BPMN, where swimlanes represent both human actors and IT systems. Each time a business activity is supported by an IT system we draw a line, labeled with the IT system functionality. The line direction says whether the activity is stores data (down direction) or retrieves data from the system (up direction). These are the points to be detected in order to link business and IT services performance. The use case identified at the first level is mapped into relevant IT applications.

IT systems performance is linked to IT services performances (e.g. application management, network management, and helpdesk) through the catalogue of IT services, owned by the IT organization, and the repository of IT applications, usually contained in the CMDB (Configuration Management DataBase).

Once KPIs and the correlations for each perspective have been identified it is necessary to design the IT system supporting SLM. Generally, IT requirements of a service level management system fall in the wide field of data warehouse (for performance analysis, SLA control etc.). We use Dimensional Fact Models (DFM - [8]) to represent the information elements to be analyzed and current human computer interaction approaches to design the navigation in hypercubes, among hypercubes, and to define presentation features.

V. ESITO PROJECT: EXPERIENCE REPORT

ESITO Project has been conducted by TSF in close collaboration with Universities of Pavia and Salento. It has involved a project team made up of 10 people for 4 months (mid October 2009-mid January 2010), three out of them full time employed on the project. It has involved subject matter experts from TSF, with competences on the
process domain, a technical team from University and TSF, skilled on technologies and infrastructures, able to recover data sources for indicators and a modeling and methodology team from University, skilled on business process modeling, HIGO methodology ([11]) and on requirement engineering approaches.

TSF’s internal clients have been the Customer Service Manager and the Business Manager. A Steering Committee also including FS Chief Information Officer (CIO) was created for strategic advising and results sharing.

Starting from TSF’s Service Catalogue, its application portfolio and its process and technology architecture, Esito project aimed at defining a sustainable methodology for evaluating the impact of IT service performance on customer business and on its internal processes. The methodology has been tested on a pilot service.

Figure 2. The method for correlating business performance with IT services and internal processes

The main deliverables have been the document about the methodology and the pilot project documents, including the business context (i.e. a description of the business process, organization and the supporting IT systems), the needs (depicting the stakeholders, the critical success factors, the KPIs and the relationship among them), the IT system requirements analysis (containing DFM and specification about IT system’s navigation and presentation) and the masterplan for extending the model to other critical services.

The case study has concerned “Freight Train Composition”, a business run by Trenitalia Cargo division that transports freight on behalf of a customer (e.g. a steel factory) and/or a freight operator. “Composition” is critical to the overall Freight Transportation business. A negative performance of Composition (e.g. high delay) has an immediate negative impact on Trenitalia that should pay penalties to its customers.

The business process is quite complex. For the service involves two business organizations Trenitalia (the carrier) in charge of the transportation of the goods, and RFI in charge of the train composition. They are both part of FS group. The scenario involves the following stakeholders:

- Customers request the service and receive the output (= freight delivered)
- Trenitalia Cargo Division is in touch with customers to collect orders and plan freight transportation (dates of delivery, goods, cars needed, etc...);
- RFI division physically composes freight trains;
- TSF provides related IT services through a service gate provided by DSI, Trenitalia’s IT Department and DICT, RFI’s IT Department.

The process involves about 3000 people spread out in 200 plants in Italy. Usually everyday 800 trains are composed and 40,000 wagons are managed. In order to define the context, business analysis has been conducted with the aim to define stakeholders, process and supporting IT systems.

Stakeholders classes have been defined by specialization of the grid, defined in [11] as shown in Figure 3 (lower rows show customized classes):

- Plant supervisor is the owner of the Composition. His goal is maximizing the amount of goods in transit on the rail network and the load factor, given the realization of the perfect output. His key performance is business efficiency.
- Seller is the internal customer of train composition. His goal is to minimize claims related to delays or errors. His key business performances are the rate of perfect orders and the customer satisfaction.
- Freight train assembler is in charge of the composition of the train through the creation of orders that will lead operators to physically compose the freight train. His key performance is the speed (in terms of time) of order generation.
- Operator is the actor who physically composes the train by connecting wagons. His key business performance is cost (in terms of time) of the composition.
- Freight train inspector inspects the composition quality. His key performance is the cost (in terms of time) of the inspection.

Once the stakeholders have been identified, the workflow can be modeled, as in Figure 4. The process is
directly supported by SIR IT system, represented by a swim lane. When a train arrives to the station, the assembler notifies SIR. Afterwards he verifies the train composition by checking each car. Subsequently, SIR provides information about the allocations of cars for new transportation. Finally, the assembler generates rail shunting orders that are sent to operators.

The messages exchanged between freight train assembler and SIR are high level use cases, that can be further detailed by UML Use Case diagrams and/or Sequence Diagrams. Sequence diagrams are useful to describe IT systems interactions.

HIGO grid has also supported in the definition of business KPIs for each stakeholder class. Business KPIs have been mapped on IT services KPIs, based on IT services acquired by FS to manage SIR:

- Application management
- Infrastructure management
- Network Management
- IT Service Desk Management

For each IT service, two KPI classes have been defined:

- Performance: measures if a service is responsive, effective and provides the expected Information Quality.
- Availability: measures that a service is on-line and ready for access [28].

Of course, each KPI class has been specialized according to the nature of the IT service. For instance, a performance measure for a Network Switch is the Throughput (Data transmitted/Bandwidth) while DB Server performance is measured by response time or Query / Hour. Finally the Business KPIs have been mapped on IT Service KPIs. Mapping (Table I) considers the impact that an IT service KPI (Column) could have on the Business KPI (Row). The mapping grid has been validated by TSF management and by the internal domain experts. The last step is to map the IT Service KPIs on the IT process KPIs. In particular TSF is compliant with ITIL v3 [2] processes. A preliminary step is to map the IT services over the IT processes delivering them; this allows us to be more selective in the mapping. After this high level mapping we can map punctually the KPIs as we performed in the previous step (Table II).

The definition of KPIs in each level and the mapping process from Business KPI down to IT processes enabled us to define:

- Information requirements of the reports, which we have modeled in terms of facts, DFM [8], dimensions, aggregation hierarchies and data sources
- Navigation requirements through reports by the mapping matrixes Business KPI-IT Service KPI and IT Service KPI-IT Processes KPI
- Presentation layout with the main business rules

![Simple Freight Train Composition process flow](image)

### Table I. High-level association between Business KPIs and IT Service KPIs

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>KPI</th>
<th>Application Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Plant Supervisor</td>
<td>Number of Freight Trains</td>
<td>Jobs Planning</td>
</tr>
<tr>
<td></td>
<td>Load Factor</td>
<td>Jobs Execution Time</td>
</tr>
<tr>
<td></td>
<td>Human Resources Productivity</td>
<td>Application Recover Time</td>
</tr>
<tr>
<td>Seller</td>
<td>Output Conformity</td>
<td>Incident Resolution Time</td>
</tr>
<tr>
<td>Freight Train Assembler</td>
<td>Execution Cost</td>
<td>X</td>
</tr>
</tbody>
</table>
TABLE II.  HIGH-LEVEL MAPPING BETWEEN IT PROCESSES AND IT SERVICE

<table>
<thead>
<tr>
<th>IT processes / IT Services</th>
<th>Availability Mgmt</th>
<th>Change Mgmt</th>
<th>Incident Mgmt</th>
<th>Problem Mgmt</th>
<th>Release Mgmt</th>
<th>Capacity Mgmt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application Mgmt</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Infrastructure Mgmt</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Network Mgmt</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>IT Service Desk Mgmt</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</tr>
</tbody>
</table>

VI. LESSONS LEARNED

The study of BOSELM has been highly successful and has been regarded by both FS and TSF as a breakthrough. The success of our experience relies on the awareness of FS that TSF is a partner that collaboratively impacts in the QoS provided to end customers, i.e. Railways customers. Such awareness is fundamental in the growth of relationship between contractors.

Several specific key factors have enabled this success.

- TSF management was not only committed but also interested; for they contributed by informal reviews to the quality of the analysis and therefore fostered a wide acceptance.

- Management involvement has been fostered by the confirmation approach used to identify business KPIs: based on the HIGO® grid, analysts have proposed KPIs and TSF staff just refined them. This method didn’t bother TSF people with cumbersome interviews to elicitate requirements. As a further proof, selected business KPIs were matched against indicators stored in existing business intelligence system.

- The cooperation with university enabled reciprocal trust since the academic team was interested in excellent results and, therefore, shared the objectives of TSF management.

- The analysis of a pilot real case (Freight Train Composition) enabled all project team to face with concrete examples instead of theory.

- In order to be independent from FS, Trenitalia’s business customers were replaced by domain experts from TSF. Thus analysis has been much more efficient.

- In order to define a sustainable approach, the masterplan has included only the critical services. Since a comprehensive analysis of all business services supported by TSF was out of the scope, we propose to use the training period of TSF team on the method to make an extensive map of delivered services and after that produce the final masterplan.

Of course some critical points also emerged. The lucky union of motivated management and academic team is uncommon. This raises the question: can this approach be reproduced? Also the analysis implies relatively high costs and skills, because it blends extensive business modeling and IT management practices. In our opinion, the answer to these two critical points is in industrialized, tooled approach. In this view, analysts simply customize platforms and KPI patterns.

VII. CONCLUSIONS AND FURTHER WORK

We have presented a case study on a project which aims at aligning IT service performances and business performances in a Service Level Management scenario. The objective has been to define the model and the method to proceed and to validate it with TSF’s customer service managers in order to evaluate the understandability and sustainability. Customer service managers declared very satisfied about the approach, because it would help them to understand incidents impact on clients’ business and on contractual penalties TSF should undergo to undergo. The methodological tool would also be effective to improve business client’s awareness about the actual relationship between IT service level contract and business performances.

The key achievement of the analysis model is the link between business and IT performances, and a systematic approach that enables to step from business value down to IT resources and IT management processes. This alignment could actually enable the continuous improvement cycle that is in the final stage of CMMI [27].

Esito project will proceed to implementation on the whole service portfolio by using an SLM software platform.

Further developments include the automation of the method (that could be a competitive asset for TSF) and, also, an advanced industry practice to be plugged in IT management frameworks.

REFERENCES