IT Service Management and IT Governance: Review, Comparative Analysis and their Impact on Utility Computing

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Over the years, IT has become the backbone of businesses to the point where it would be impossible for many to function (let alone succeed) without it. As a result of its increasing role in the enterprise, the IT function is changing, morphing from a technology provider into a strategic partner. Concurrent to these changes, the IT infrastructure is moving towards a centralized, highly adaptive utility model. In this paper, we review the different open and industrial frameworks that support IT organizations in this transition and explore their impact on the next generation of IT infrastructure.

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Abstract

Over the years, IT has become the backbone of businesses to the point where it would be impossible for many to function (let alone succeed) without it. As a result of its increasing role in the enterprise, the IT function is changing, morphing from a technology provider into a strategic partner. Concurrent to these changes, the IT infrastructure is moving towards a centralized, highly adaptive utility model. In this paper, we review the different open and industrial frameworks that support IT organizations in this transition and explore their impact on the next generation of IT infrastructure.

1 Introduction

Information Technology (IT) has been serving the enterprise as a technology provider helping businesses to perform more efficiently and to expend into new directions since its early stages. Over the years, IT has become the backbone of businesses to the point where it would be impossible for many to function (never mind succeed) without it. IT is no longer separate from but is an essential element of the enterprise [1]. As a result of its increasing role in the enterprise, the IT function is changing.

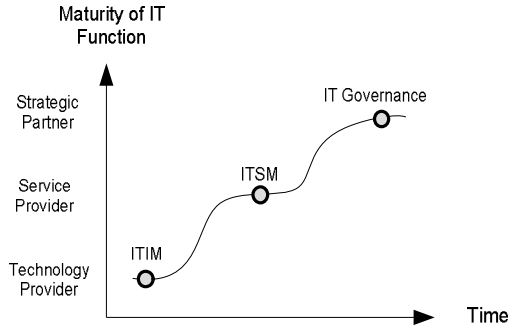

Figure 1: Evolution of the IT Function within organizations

According to [2], when evolving from technology providers into strategic partners, IT organizations typically follow a three-stage approach as depicted in Figure 1. Each evolutionary stage builds upon the others beginning with *IT infrastructure management* (ITIM). During this stage, the IT organizations focus on improving the management of the enterprise infrastructure. Effective infrastructure management means maximizing return on computing assets and taking control of the infrastructure, the devices it contains and the data it generates. The next stage, *IT service management* (ITSM), sees the IT organizations actively identifying the services its customers need and focusing on planning and delivering those services to meet availability, performance, and security requirements. In addition, IT is managing service-level agreements, both internally and externally, to meet agreed-upon quality and cost targets. Ultimately, when IT organizations evolve to *IT business value management* (IT Governance), they are transformed into true business partners enabling new business opportunities. In that stage, IT processes are fully integrated with the complete lifecycle of business processes improving service quality and business agility.

Venkatraman [3] illustrates the changes that occur in the perceived contribution of IT by the Business during the transformation from Service Provider to Strategic Partner as presented in Table 1.

Service Provider	Strategic Partner
• IT is for efficiency	• IT for business growth
• Budgets are driven by external benchmarks	• Budgets are driven by business strategy
• IT is separable from the business	• IT is inseparable from the business
• IT is seen as an expense to control	• IT is seen as an investment to manage
• IT managers are technical experts	• IT managers are business problem solvers

Table 1: IT as Service Provider or as Strategic Partner

As Van Grembergen [1] emphasizes, through those changes, "IT becomes not only a success factor for survival and prosperity, but also an opportunity to differentiate and to achieve competitive advantage".

The "new" IT should undoubtedly be achieved in IT organizations by putting in place a management of IT that is service oriented (ITSM) and by establishing an IT Governance capable of aligning IT with the Enterprise Governance objectives.

Various definitions of IT Governance have been proposed [1] in the literature. In 2001, the IT Governance Institute (ITGI) suggested that the "IT Governance is the responsibility of the Board of Directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategy and objectives". Key to this definition is the notion of alignment of the IT with the Business also referred to as Strategic Alignment [1].

The evolution of IT organizations from technology providers into service providers requires taking a different perspective on IT management. IT Service Management put the services delivered by IT at the center of IT management and is commonly defined [4] as "a set of processes that cooperate to ensure the quality of live IT services, according to the levels of service agreed to by the customer. It is superimposed on management domains such as systems management, network management, systems development, and on many process domains like change management, asset management and problem management."

The difference between IT Service Management and IT Governance has been subject to confusion and myths. Peterson [5] provides us with a clear insight into the differences between these two notions. "Whereas the domain of IT Management focuses on the efficient and effective supply of IT services and products, and the management of IT operations, IT Governance faces the dual demand of (1) contributing to present business operations and performance, and (2) transforming and positioning IT for meeting future business challenges". As depicted in Figure 2, Peterson suggests positioning IT Management and IT Governance along two dimensions, Business Orientation and Time Orientation.

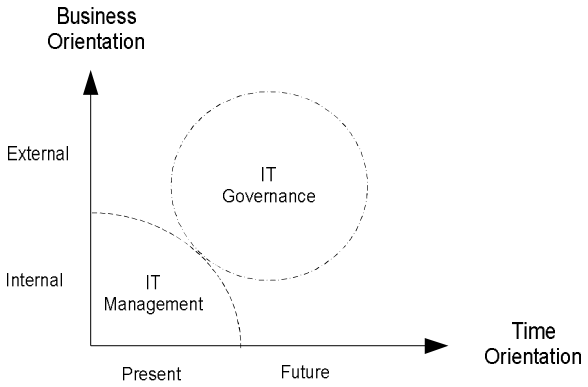

Figure 2: IT Governance and IT Management

From a conceptual point of view, one can model the relationship between IT Governance and IT Management has presented in Figure 3.

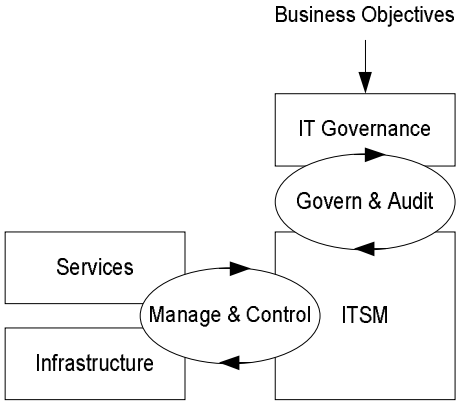

Figure 3: Relational Model between IT Governance, ITSM and IT operations and services

As we previously introduced, one of the IT Governance goals is to align with the business objectives defined by the Enterprise Governance. These high-level organizational goals and objectives are used as input to derive goals, objectives and performance metrics needed to manage IT effectively. At the same time, the auditing processes are put in place in order to measure and analyze the performance of the organization. Conceptually, the process can be seen as an "IT results chain" [6] as depicted below.

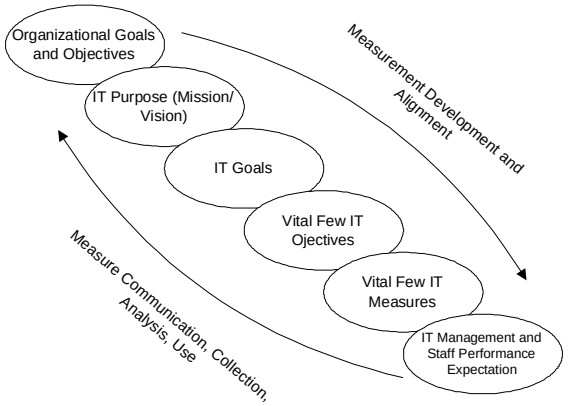

Figure 4: IT results chain

Recursively, ITSM, its people, processes and technologies manage and control the IT services and the IT infrastructure according to the objective received from the governance. Another IT results chain is design to link ITSM with the service and infrastructure.

Concurrent to these changes, the IT infrastructure is moving towards a centralized, highly adaptive utility model. Commonly referred to as IT Utility or Utility Computing, the future of IT infrastructure is geared towards a new computing model under which infrastructure is shared among customers and dynamically optimized to achieve efficient use of resources and minimize associated costs.
In this paper, we review the different open and industrial frameworks that support organizations to transition from technology providers to strategic partners. First, we study the frameworks for IT Governance. We then present the IT Service Management frameworks. We then compare and put the various frameworks in perspective. Lastly, we conclude this paper by exploring their impact on the next generation of IT infrastructure.

2 IT Governance Frameworks

2.1 Scope

Having defined previously IT Governance, it is necessary to understand its most important elements. The IT Governance Institute [7] suggests that "Fundamentally, IT Governance is concerned about two things: that IT delivers value to the business and that IT risks are mitigated". This leads to the four main focus areas of the IT Governance, all driven by stakeholder value. Two of them are outcomes: value delivery and risk mitigation. Two of them are drivers: strategic alignment and performance measurements." As noted by Van Grembergen [1], while value delivery is focused on the creation of business value, risk management is focused on the preservation of business value.

In this section we review first the Control Objectives for Information and related Technology (CobiT) framework then we present the IT Balanced Scorecard (IT BSC) as supporting mechanism for the development of IT Governance within an organization with a particular focus on strategic alignment and performance measurement.

2.2 Control Objectives for Information and related Technology (CobiT)

CobiT [8] is designed to be an IT governance aid to management in their understanding and managing of the risks and benefits associated with information and related technology. CobiT is independent of the technical IT platforms adopted in an organization, it is an open standard for control over information technology, developed and promoted by the IT Governance Institute.

CobiT creates the link between the business objectives of an entity and the specific IT and IT management tasks via statements about the Control Objectives.
CobiT is designed to help three distinct audiences:

- Managers, who need to balance risk and control investment in an often unpredictable IT environment.
- Users, who need to obtain assurance on the security and controls of the IT services upon which they depend to deliver their products and services to internal and external customers.
- Auditors, who can use it to substantiate their opinions and/or provide advice to management on internal controls.

As depicted in Figure 5, CobiT third edition consists of an *Executive Summary* highlighting CobiT main benefits, a *business orientated framework* covering all IT activities, a set of *management guidelines* enabling management to align IT activities and priorities with business requirements, 318 *detailed control objectives*, a set of *audit guidelines* and an *implementation tool set.*

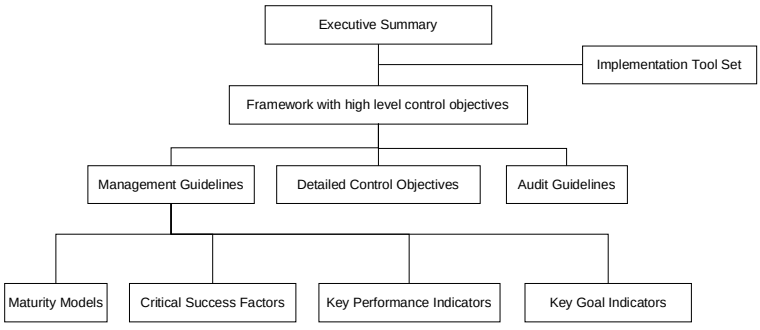

Figure 5: CobiT Structure

2.2.1 CobiT Framework

The conceptual framework can be approached from three vantage points: (1) IT Processes, (2) Information Criteria and (3) IT Resources. These three vantage points are depicted in the CobiT Cube presented in figure Figure 6.

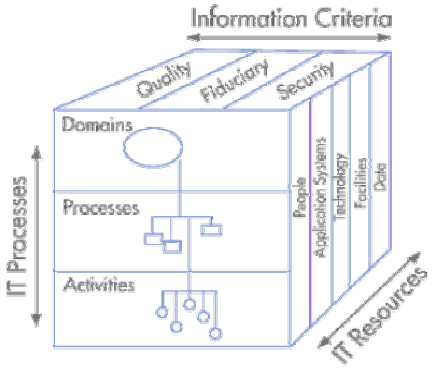

Figure 6: CobiT Cube

2.2.1.1 IT Processes

The framework identifies 34 information technology (IT) processes divided across the 4 Domains, a high-level approach to control over these processes, as well as 318 detailed control objectives and audit guidelines to assess the 34 IT processes. Activities and tasks needed to achieve a measurable result. Activities have a life cycle concept, with a need for ongoing control. Tasks are discrete units of work. Figure 7 presents the relationships between the 4 different domains.

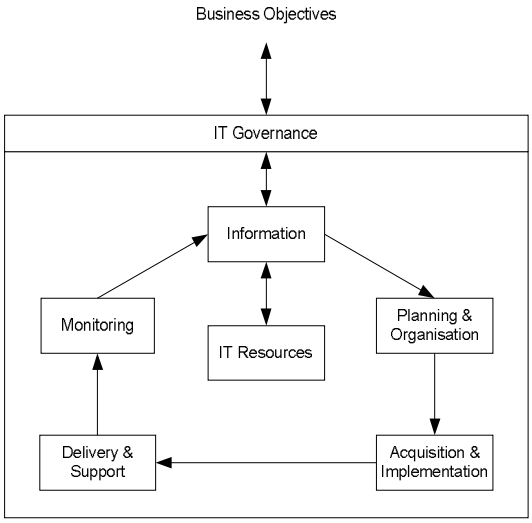

Figure 7: CobiT Domains

Planning and Organization

This domain covers strategy and tactics, and concerns the identification of the way IT can best contribute to the achievement of the business objectives. Furthermore, the realization of the strategic vision needs to be planned, communicated and managed for different perspectives. Finally, a proper organization as well as technological infrastructure must be put in place.

Acquisition and Implementation
To realize the IT strategy, IT solutions need to be identified, developed or acquired, as well as implemented and integrated into the business process. In addition, changes in and maintenance of existing systems are covered by this domain to make sure that the life cycle is continued for these systems.

Delivery and Support
This domain is concerned with the actual delivery of required services, which range from traditional operations over security and continuity aspects to training. In order to deliver services, the necessary support processes must be set up. This domain includes the actual processing of data by application systems, often classified under application controls.

Monitoring
All IT processes need to be regularly assessed over time for their quality and compliance with control requirements. This domain thus addresses management's oversight of the organization's control process and independent assurance provided by internal and external audit or obtained from alternative sources.

2.2.1.2 Information Criteria

CobiT looks at the Quality, Fiduciary Control and Security needs of enterprises providing 7 information criteria that can be used to generically define what the business requires form IT:

- *Effectiveness*: information is relevant and pertinent to the business; information is being delivered in a timely, correct, consistent and usable manner
- *Efficiency*: provision of information through the optimal use of resources;
- *Confidentiality*: protection of sensitive data from unauthorized disclosure;
- *Integrity*: accuracy and completeness of information;
  validity in accordance with business values;
- *Availability*: information is available when required, now and in the future;
- *Compliance*: complying with laws, regulations and contractual arrangements;
- *Reliability*: provision of appropriate information for management to operate the entity and for management to exercise its financial and compliance reporting responsibilities.

2.2.1.3 IT Resources

The framework defines 5 categories of IT Resources:

- *Data*: objects in the widest sense (text, graphics, sound).
- *Application Systems*: manual and programmed procedures.
- *Technology*: hardware, operating systems, middleware, networking, databases, multimedia.
- *Facilities*: environmental resources including power, buildings and water.
- *People*: staffing, skills and productivity plans

2.2.2 Mangement Guidelines

The Management Guidelines for CobiT consist of Maturity Models, Critical Success Factors (CSFs), Key Goal Indicators (KGIs) and Key Performance Indicators (KPIs).

2.2.2.1 Maturity Models

For each of the 34 IT processes, CobiT defines an incremental measurement scale, based on a rating of "0" through "5." The scale is associated with generic qualitative maturity model descriptions ranging from "Non Existent" to "Optimised".

2.2.2.2 Critical Success Factors

Critical Success Factors define the most important issues or actions for management to achieve control over and within its IT processes. They identify the most important things management must do, strategically, technically, organizationally or procedurally.

2.2.2.3 Key Goal Indicators

A Key Goal Indicator, representing the process goal, is a measure of "what" has to be accomplished. It is a measurable indicator of the process achieving its goals, often defined as a target to achieve.

2.2.2.4 Key Performance Indicators

Key Performance Indicators are short, focused and measurable indicators of performance of the enabling factors of the IT processes, indicating how well the process enables the goal to be reached. They will often be a measure of a Critical Success Factor and, when monitored and acted upon, will identify opportunities for the improvement of the process.

2.3 IT Balanced Scorecard

Kaplan and Norton [9] have introduced the balance scorecard (BSC) at the enterprise level. Their basic idea is that the evaluation of an organization should not be restricted to a traditional financial evaluation but should be supplemented with measures concerning customer satisfaction, internal processes and the ability to innovate. The concepts of BSC have been applied to the IT function and its processes (Gold [10], Willcocks [11], Van Grembergen and Timmerman [12]). Recognizing that IT is an internal service provider, current work acknowledges that the perspective of the balanced scorecard should be changed accordingly with the following perspective: corporate contribution, customer (user) orientation, operational excellence and future orientation as presented in Figure 8.

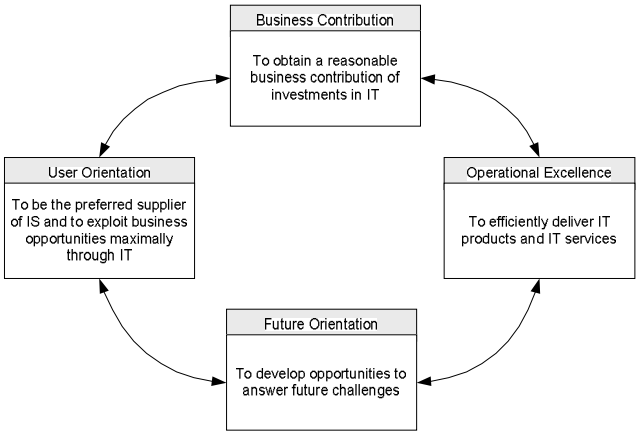

Figure 8: IT Balance Scorecard perspectives

Van Grembergen and Amelinckx [13] complement this perspective by providing concrete measures for each perspective grounded in the context of an e-business initiative as summarized in Table 2.

Measures for Business Contribution	Measures for Customer Orientation
• E-business strategic plan achievements o Completion of steps of e-business project plan • Business value of e-business initiative o Profitability of the web site o Return on investment (ROI) o Direct online contribution to revenue o Operational cost reduction o Cost reductions of acquiring a new customer o Cost reductions of customer relationship management o Cost reductions of promotional material • Compliance with budget o Actual versus budgeted expenses (ongoing development and maintenance)	• Customer satisfaction o Score on online customer satisfaction surveys o Number of customer complaints/resolutions • Customer retention o Retention rates of clients who use the internet compared with those who do not o Percentage of customer placing repeat orders • Acquiring new customers o Customer acquisition or new leads generated by the web site o Sales generated directly and indirectly by the web site • Effective internet marketing o Number of hits o Number of page impressions o Number of site visits o Number of visitors

Measures for Operational Excellence	Measures of Future Orientation
• Fulfillment process o On-time delivery of products and electronic services o Level of stock-outs o Level of shipping errors o Number of problems with customer order processing o Number of problems with warehouse processing • Availability of the e-business system o Average system availability o Average downtime o Maximum downtime • Improvement of system development o Punctuality index of e-business systems delivery o E-business systems development process excellence o Average time to upgrade the e-business system • Security and safety o Absence of major e-business issues in Internal/External audit reports o Absence of major unrecoverable e-business failures or security breaches	• E-business expertise of developers o Number of training days per developers o Expertise of developers o Acquaintance with emerging new e-business software and technologies • E-business staff management effectiveness o Rate of absence leave per developer o Average workload per developer o Percentage of e-business modules covered by more than two developers o E-business project members satisfaction rate • Independence of consultants o Number of consultant days per module in use more than two years o Number of consultant days per module in use less that two years • Reliability of software vendors o Number of releases per year o Number of functional additions Number of new customers

Table 2: Examples of Measures for IT BSC

The proposed standard IT BSC links with the business through the business contribution perspective. The relationship between IT and business can be more explicitly expressed through a cascade of balanced scorecard [14]. In this method for business and IT fusion, the IT Department BSC and the IT Operational BSC are defined as enablers for the IT Strategic BSC that in turn is the enabler of the Business BSC. This relationship is shown in Figure 9.

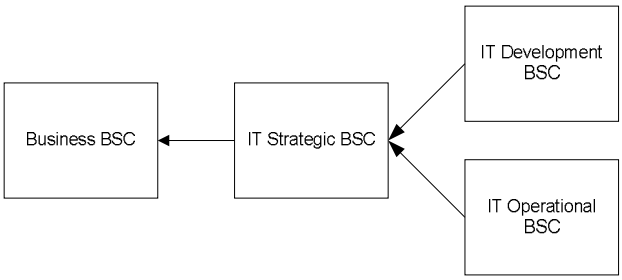

Figure 9: Cascade of balanced scorecard

This cascade of scorecards becomes a linked set of measures that will be instrumental in aligning IT and business strategy and will help to determine how business value is created through IT.

2.4 Comparing IT Governance Frameworks

CobiT is becoming the de facto standard for IT Governance. It is organized around 4 domains, Planning and Organization, Acquisition and Implementation, Delivery and Support and Monitoring. CobiT strength is on defining IT metrics and IT controls, 34 high-level control objectives and 318 detailed control objectives.

The methodology of Balanced Scorecard is a measurement and management system that can be used to support IT Governance. The key strength of BSC and IT BSC reside in its cascading capability which provides a unifying framework to support strategic alignment. There exists a clear mapping between the scorecards of the cascading model introduced earlier and the CobiT domains as presented in Figure 10.

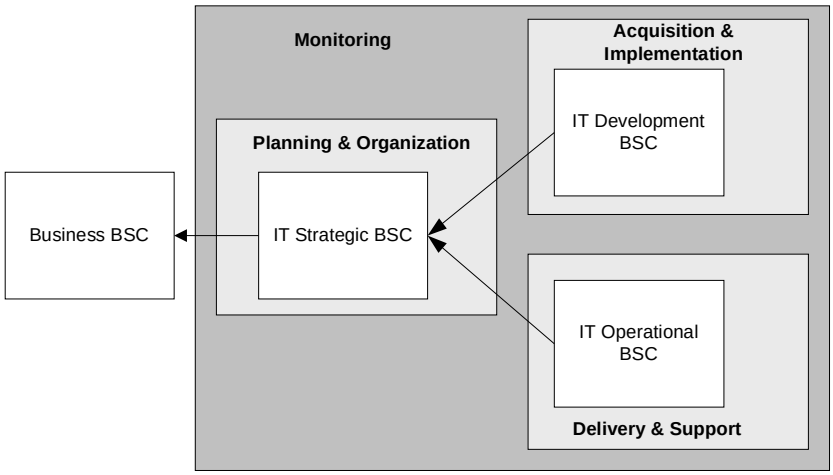

Figure 10: Mapping between CobiT and IT BSC cascading model

In a way, Figure 10 shows the limit of CobiT in terms of formally linking with the business and it shows how a BSC cascade could overcome that lack. It also shows that CobiT control objectives could be captured within BSC in order to create a consistent framework. It is also clear from the review that CobiT extends and goes into more details in terms of maturity models, auditing guidelines etc.

3 IT Service Management (ITSM) Frameworks

The evolution of IT organizations from technology providers into service providers requires taking a different perspective on IT management. IT Service Management put the services delivered by IT at the center of IT management and is commonly defined [4] as "a set of processes that cooperate to ensure the quality of live IT services, according to the levels of service agreed to by the customer. It is superimposed on management domains such as systems management, network management, systems development, and on many process domains like change management, asset management and problem management."

Over the years, various ITSM frameworks have been proposed. In this section, we first take a look at the evolution of IT management within organizations. We then review the most influential ITSM frameworks and present a comparative analysis.

3.1 Evolution of IT Management within organizations

To help organizations move along this transition path, various methodologies have been defined over the years. Figure 11 presents the evolution of these methodologies and their maturity levels in terms of Service Management.

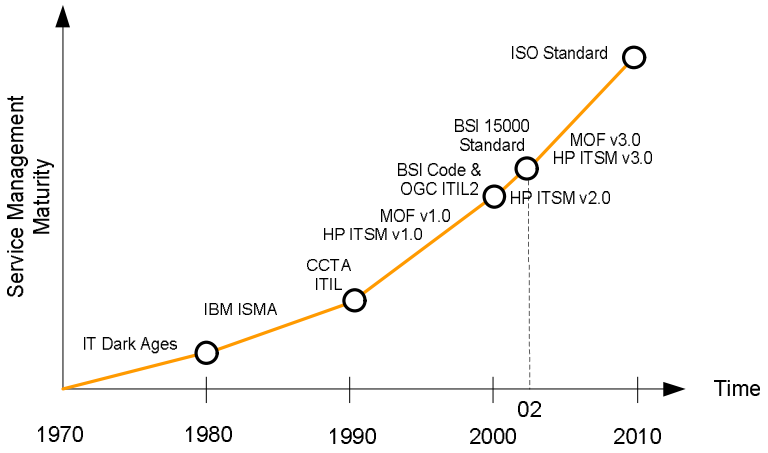

Figure 11: Evolution of IT management methodologies

From the 1970s to the 1980s, IT management lived its dark ages. The focus was on IT operations and the notion of management of IT systems was not yet on the radar scope. By the end of this period, as systems became more and more complex and interconnected, management of the IT infrastructure started to attract attention. In the early 1980s, IBM documented the concepts of systems management in its Information Systems Management Architecture (ISMA). During the 1980s, disciplines such as Network Management, and Applications Management became the center of attention of the IT management community with the creation of standards such as Simple Network Management Protocol in 1988 (SNMP) for instance. By the end of the 1980s, it had become evident that a comprehensive management of the IT function was very much needed. The IT Infrastructure Library was created by the UK government Central Computer and Telecommunications Agency (CCTA) in the late 1980s. In the midst of a serious economic downturn, the UK government was forced to lower costs and to better manage IT service delivery. It needed to develop innovative ways to improve IT service efficiency. ITIL was introduced as a new approach to IT Service Management with the objective of ensuring better use of IT services and resources. Industry frameworks such as HP ITSM and Microsoft MOF soon adopted ITIL which rapidly became the de facto standard for IT management. The first ITIL version grew rapidly in popularity, both in the UK and, slowly, across the world. However, as IT itself changed, so did ITIL. The CCTA, now known as OGC, eventually updated ITIL, and published version two in 2000. As of today, the latest development in IT Service Management has been the release of British Standards Institution's Standard for IT Service Management (BS15000) in 2002 that supports the best-practice processes promoted in ITIL. HP released in 2003 the version 3.0 of its ITSM reference model and Microsoft published the version v3.0 of MOF in 2004. Finally, experts in the field foresee that the end of the decade should see the standardization of ITSM processes under ISO[15].

Assessing the penetration of IT Service Management concepts in organizations has been difficult.
According to [16], the Dutch foundation "Exameninstituut voor Informatica" (EXIN) and the UK "Information Examination Board" (ISEB) have delivered so far more than 50000 certifications to IT professionals in over 30 countries and that number is growing rapidly. The examination statistics indicate rapid growth – a 27% increase in 2003 and a forecast increase of 33% in 2004. In a survey conducted by TechRepublic [17] over 1800 respondents, 24.1% of IT managers at large organizations are familiar with ITIL standards, compared to 17.4% of IT managers at small and medium-sized organizations. Furthermore, of large organizations whose IT managers are familiar with ITIL, 44.3% apply ITIL standards to their operations. The survey also shows that although ITIL and ITSM have been popular for some time in Europe, they have been slow to be adopted in the US although recent trends show that they are gaining ground in that region.

Many high-profile U.S. organizations have adopted the best practices described in ITIL. Companies such as Procter and Gamble, IBM, Caterpillar, Shell Oil, Boeing, and the Internal Revenue Service have all reported great success and significant operational cost savings as a direct result of ITSM adoption. Procter and Gamble publicly attributes nearly $125 million in IT cost savings per year to the adoption of ITIL, constituting nearly 10% of their annual IT budget. Similarly, Shell Oil utilized ITIL best practices when they overhauled their global desktop PC consolidation project, encompassing 80,000 desktops. After this project was completed, they can now do software upgrades in less than 72 hours, potentially saving 6000 man-days working days and 5 million dollars.

3.2 Review of the current ITSM Frameworks

3.2.1 ITIL

The Information Technology Infrastructure Library (ITIL) was established in 1989 by the United Kingdom's former Central Computer and Telecommunications Agency (CCTA) to improve its IT organization. ITIL is now managed by the UK's Office of Government Commerce (OGC) and is supported by the IT Service Management Forum (itSMF).

ITIL [16] consists of an inter-related set of best practices for lowering the cost, while improving the quality of IT services delivered to users. As presented in Figure 12, ITIL is organized around five key areas (dark grey shade): Business perspective, application management, service delivery, service support, and infrastructure management. Although there is no specific ITIL module dedicated to Security Management, it is addressed by reference to other modules or through a culmination of other processes. Finally, a future

ITIL module will address the key area of planning and implementing programs to optimize IT Service Management.

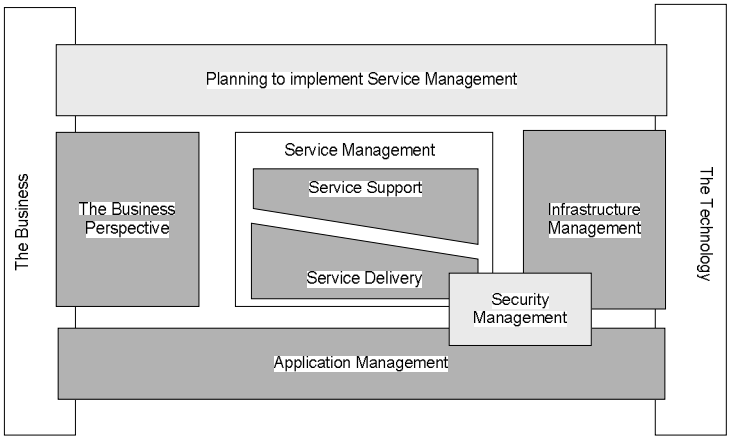

Figure 12: ITIL Service Management Solution

In the rest of this review, we focus on the two most popular areas of ITIL: **service support** and **service delivery.**

3.2.1.1 Service Support: ITIL Operational Processes

The five disciplines of the ITIL Service Support are Release Management, Configuration Management, Incident Management, Problem Management and Change Management. Figure 13 presents the relationships between each of the five processes.

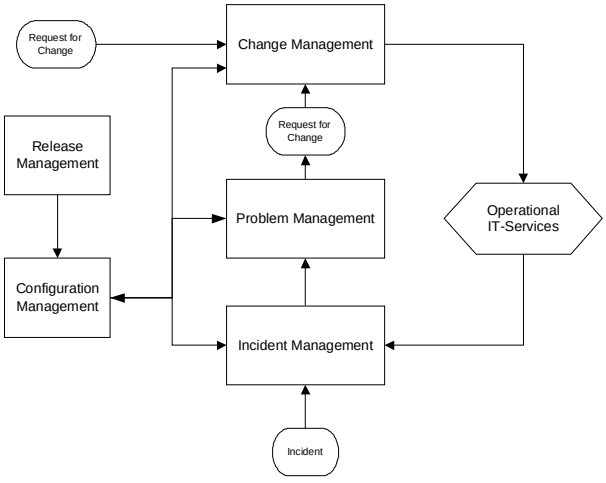

Figure 13: Operational Processes

In this section we present the definition and the high level activities for each of the operational processes. The interested reader will refer to [18] for more detailed information.

3.2.1.1.1 Configuration Management

ITIL defines the notion of *configuration item* (CI) to refer to all the components that are or are to be part of the IT infrastructure. The objective of Configuration Management is to manage the IT infrastructure by identifying, recording and controlling all configuration items. The high level activities are: CI Level Definition, Scope Definition, Identification and Registration, Verification, Status Accounting.

3.2.1.1.2 Incident Management

ITIL defines an *incident* as a deviation for the (expected) standard operation of a system or a service. The objective of Incident Management is to provide continuity by restoring the service in the quickest way possible by whatever means necessary (temporary fixes or workarounds). The high level activities are: Detection, Recording, Classification, Investigation, Diagnosis, Resolution and Recovery.

3.2.1.1.3 Problem Management

A *problem* is defined in ITIL as a condition that has been defined, identified from one large incident or many incidents exhibiting common symptoms for which the cause is unknown. A *known error* is defined as a condition identified by successful diagnosis of the root cause of a problem when it is confirmed that a CI is at fault. The objective of Problem Management is to ensure the stability of the IT services by identifying and removing known errors in the IT infrastructure. The high level activities are: Problem Control, Error Control, Proactive Problem Management, and Management Information.

3.2.1.1.4 Change Management

A *change* is an action that results in a new status for one or more CI. A *request for change (RFC)* is the main input to the Change Management Process. The objective of Change Management is to ensure that standardized methods and techniques are used for efficient and immediate handling of all the changes to the IT infrastructure while minimizing change related incidents. The high level activities are: Acceptance and Classification, Assessment and Planning, Authorization of changes, Control and Coordination, Evaluation.

3.2.1.1.5 Release Management

The objective of Release Management is to ensure that only authorized and correct versions of software are made available for operation. The high level activities are: Release Planning, Distribution and Implementation of software and hardware into production, Management of Definitive Software Libraries and Definitive Hardware Store.

3.2.1.2 Service Delivery: ITIL Tactical Processes

The five disciplines of the ITIL Service Delivery are Service Level Management, Capacity Management, Availability Management, IT Continuity Management and Financial Management. Figure 14 presents the relationships between each of the five processes.

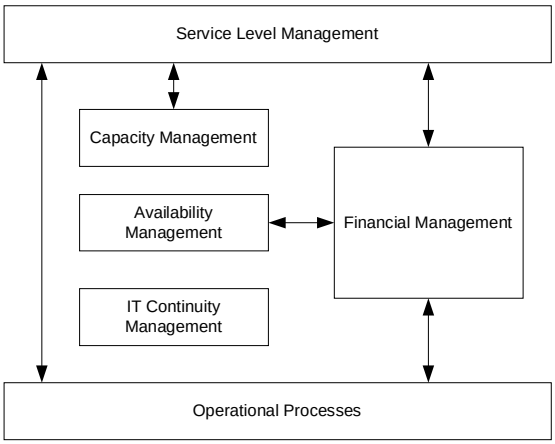

Figure 14: Tactical Processes

In this section we present the definition and the high level activities for each of the operational processes. The interested reader will refer to [19] for more detailed information.

3.2.1.2.1 Service Level Management

Service Level Management ensures continual identification, monitoring and reviewing of the optimally agreed levels of IT services as required by the business. This is done in close cooperation between the IT services providers and the customers. The high level activities are: Establish Function, Implement SLAs, Manage Ongoing Process, Review Periodically.

3.2.1.2.2 Capacity Management

Capacity Management supports the optimum and cost effective provision of IT services by helping organizations match their IT resources to the business demands. The high level activities are: Application Sizing, Workload Management, Demand Management, Modeling, Capacity Planning, Resource Management, and Performance Management.

3.2.1.2.3 Availability Management

Availability Management allows organizations to sustain the IT service availability in order to support the business at a justifiable cost. The high level activities are: Realize Availability Requirements, Compile Availability Plan, Monitor Availability, and Monitor Maintenance Obligations.

3.2.1.2.4 IT Continuity Management

IT Continuity Management helps to ensure the availability and rapid restoration of IT services in the event of a disaster. The high level activities are: Risk Analysis, Manage Contingency Plan Management, Contingency Plan Testing, Risk Management.

3.2.1.2.5 Financial Management

Financial Management provides insight into, monitors and if necessary recovers cost of IT services from customers.

3.2.2 BS15000

In November 2000, the British Standards Institutes (BSI) published a new standard for IT Service Management, the BS 15000 [20]. BS 15000 promotes the adoption of an integrated process approach to effectively deliver managed services to meet the business and customers requirements.

In a first part, BS15000 defines high level requirements for a management system that includes policies and a framework to enable the effective management and implementation of all IT services. It then gives recommendation using the Plan-Do-Check-Act methodology for planning and implementing service management. It comprises of:

- Planning service management (Plan)
- Implementing service management and providing the services (Do)
- Monitoring, measuring and reviewing (Check)
- Continuous Improvement (Act)

BS15000 then provides recommendation concerning the planning and the implementation of new or changed service in order to ensure that new services and changes to services are deliverable and manageable at the right cost and service quality.

Finally, BS15000 organizes the IT processes into five categories as presented in Figure 15. and gives recommendation for managing efficiently these processes.

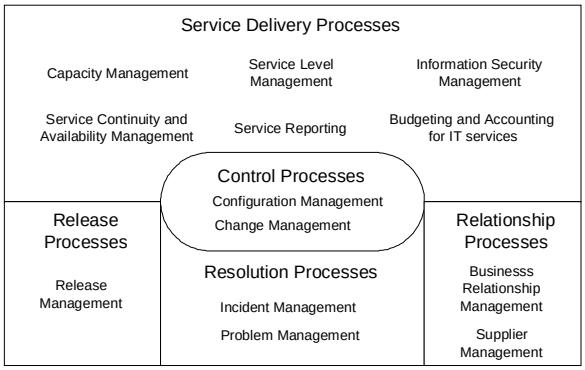

Figure 15: Service Management Processes

In particular, BS15000 specifies the objective for each process as listed below:

3.2.2.1 Service Delivery Processes

- **Service Level Management**: To define, agree, record and manage levels of service.
- **Service Reporting**: To produce agreed, timely, reliable, accurate reports for informed decision making and effective communication.
- **Availability and Service Continuity Management**: To ensure that agreed obligations to customers can be met in all circumstances.
- **Budgeting and Accounting for IT services**: To budget and account for the cost of service provision.
- **Capacity Management**: To ensure that the organization has, at all times, sufficient capacity to meet the current and future agreed demands of the business.
- **Information Security Management**: To manage information security effectively within all service activities.

3.2.2.2 Relationship Process

- **Business Relationship Management**: To establish and maintain a good relationship between the service provider and the customer based on understanding the customer and their business drivers.
- **Supplier Management**: To manage third party suppliers to ensure provision of seamless, quality services.

3.2.2.3 Resolution Processes

- **Incident Management**: To restore agreed service to the business as soon as possible ot the respond to service requests.
- **Problem Management**: To minimize disruption to the business by proactive identification and analysis of the cause of service incidents and by managing problems to closure.

3.2.2.4 Control Processes

- **Configuration Management**: To define and control the components of the service and infrastructure and maintain accurate configuration information.
- **Change Management**: To ensure all changes are assessed, implemented and reviewed in a controlled manner.

3.2.2.5 Release Process

- **Release Management**: To deliver, distribute and track one or more changes in a release into the live environment.

3.2.3 HP IT Service Management Reference Model

The HP ITSM Reference Model [21] is a high-level, fully integrated IT process relationship map. The model provides a coherent representation of IT processes and a common language for defining IT process requirements and solutions.

The model was first released in 1997, followed by a second iteration in 2000. The current version of the model as been release in 2003. The objectives of the model are as follows:

- Run IT as a business that is capable of managing the cost, quality and risk of IT services while ensuring business agility.
- Relate IT services, staff and management technology to IT processes.
- Assess current and desired states and identify potential gaps.
- Prioritize work efforts.
- Facilitate organizational realignment discussions.
- Identify areas to apply process-enabling technologies.
- Identify in-sourcing and out-sourcing opportunities.
- Manage the lifecycle of IT services.

The reference model is structured around five groups:

- **Business-IT alignment:** Provides IT strategies and defines service portfolios to increase the value IT brings to the business.
- **Service design and management:** Provides detailed services specifications to balance service quality with service cost.
- **Service delivery assurance:** Provides service agreements, information and coordination to execute against service commitments.
- **Service development and deployment:** Provides project-based, tested service releases to minimize service activation risks and reduce implementation costs.
- **Service Operations:** Provides daily monitored services and handles customer service requests to meet agreed service levels and increase customer satisfaction.

Each of the five groups includes multiple processes as presented in Figure 16.

Figure 16: HP ITSM Reference Model and IT Processes

3.2.3.1 Business-IT alignement

- **Business assessment:** assesses the market for services, determines business needs and defines the business requirements that drive IT strategy and contribute to the corporate value chain.

- **Customer management:** understands customer needs, anticipates new customer requirements, communicates the business value of IT services to each customer, measures customer satisfaction and engage in joint problem solving.
- **IT Strategy and architecture planning:** determines IT overall value proposition and generates a coherent IT strategy and IT architecture plan.
- **Service planning:** sees to it that each new service is properly planned for and that the IT organization understands the risks associated with it. It also involves new ways of maximizing ROI of new and existing services.

3.2.3.2 Service design and management

- **Continuity management:** enables IT organizations to continue providing predetermined service levels to customers following a serious interruption to the business.
- **Security management:** defines, tracks and controls the security of corporate information and services.
- **Availability management:** defines, tracks and controls customer access to services.
- **Capacicty management:** defines, tracks and controls service capacities to confirm that service workloads are ready to meet agreed-upon performance levels.
- **Financial management:** determines the cost of providing services and to recover these costs via charge allocation structures.

3.2.3.3 Service development and deployment

- **Service build and test:** develops and validates a functional version of a component, service function or end-to-end service.
- **Release to production:** creates one or more production copies of a new or updated component, service function or end-to-end service for a specific customer, based on a detailed production plan known as a master blueprint.

3.2.3.4 Service operations

- **Operations management:** manages and perform the normal, day-to-day processing activities required for service delivery in accordance with agreed-upon service levels.
- **Incident and service request management:** quickly restores service availability, minimize service disruptions and respond to customer needs.
- **Problem management:** reduces the number of incidents in the production environment by addressing the root causes of closed incidents.

3.2.3.5 Service delivery assurance

- **Configuration management:** registers, tracks and reports on each IT infrastructure component –known as configuration items (CIs)-- under configuration control.
- **Change management:** uses standard methods and procedures for handling all production environment changes in order to minimize the impact of change-related problems on service quality.
- **Service-level management:** defines, negotiates, monitors, reports and control customer-specific service levels with predefined standard service parameters.

3.2.4 Microsoft Operations Framework

Microsoft Operations Framework (MOF) [22] provides technical guidance that enables organizations to achieve mission-critical system reliability, availability, supportability and manageability of IT solutions build with Microsoft products and technologies. MOF's guidance addresses the people, process, technology, and management issues pertaining to distributed, heterogeneous IT environments.
MOF consists of three models: *process*, *team* and *risk* models.

3.2.4.1 Process Model

The process model is a functional model of the processes that operations teams perform to manage and maintain IT services. It is organized around four quadrants and twenty Service Management Functions SMF) as illustrated in

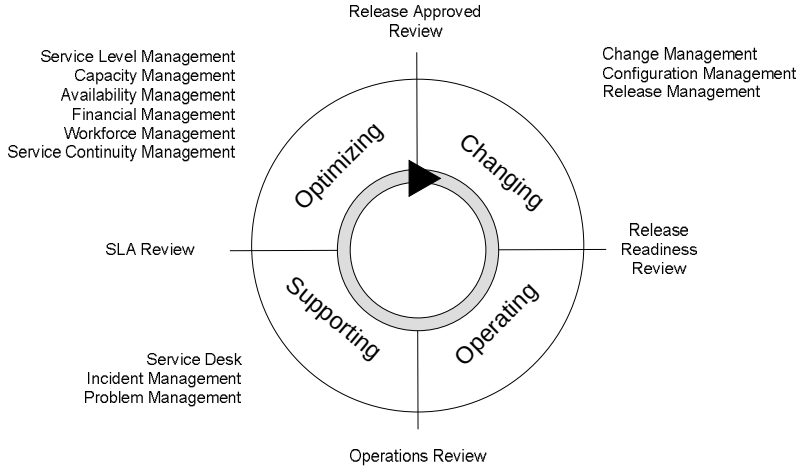

Figure 17: The MOF process model

Each quadrant contains several SMFs and are defined as follows:

- **Changing:** Introduce new service solutions, technologies, systems, applications, hardware and processes
- **Operating:** Execute day-to-day tasks effectively and efficiently
- **Supporting:** Resolve incidents, problems and inquiries quickly
- **Optimizing:** Drive changes to optimize cost, performance, capacity and availability in the delivery of IT services.

3.2.4.2 Team Model

The team model simplifies the view of team roles and helps management focus on organizing people effectively. It is based on the acknowledgement that an operations team must achieve a number of key quality goals to be successful. The model describes best practice role clusters to structure operations teams. The role clusters define six general categories of activities and processes:

- **Release:** Identifies resources and track them at a detailed level, documents processes clearly and maintain history of changes.
- **Infrastructure:** Defines physical environment standards, manages physical assets, maintains the IT infrastructure and oversees architecture's evolution.
- **Support:** Sets and meets high standards of support for internal and external customers.
- **Operations:** Ensures that daily routine tasks are performed reliably.
- **Partner:** Defines and manages partnerships in a mutually beneficial and cost effective way.
- **Security:** Ensures data confidentiality, integrity and availability.

The processes within a role cluster all support the same quality goal. Functional roles or function teams found in typical operations organization are mapped to the six role clusters.
The team role clusters generally align with the four process quadrants of the process model as presented below:

Quadrant	Role Cluster
Changing	Release
Operation	Operations and Security
Supporting	Support and Partner
Optimizing	Infrastructure, Security, Partner, Support

Table 3: MOF Team role clusters and their alignment to the MOF process model

3.2.4.3 Risk Model

The risk model helps organizations manage risk while running their business. It is composed of a set of guiding principles and a risk management process.

The risk model advocates the following principles:

- Assess risks continuously
- Integrate risk management into every role and every function
- Treat risk identification positively
- Use risk-based scheduling
- Establish an acceptable level of formality

Figure 18 presents the Risk Management Process.

- **Identify:** Determine the source of risk, mode of failure, condition, operational consequence and business consequence.
- **Analyze:** Determine the risk's probability and impact and use these to calculate an exposure value to help rank risks against each other.
- **Plan:** Define mitigations that avoid the risk entirely, transfer it to another party or reduce the impact or probability or both.
- **Track:** Gather information about how various elements of the risk are changing over time.
- **Control:** Execute planned reaction to certain changes.

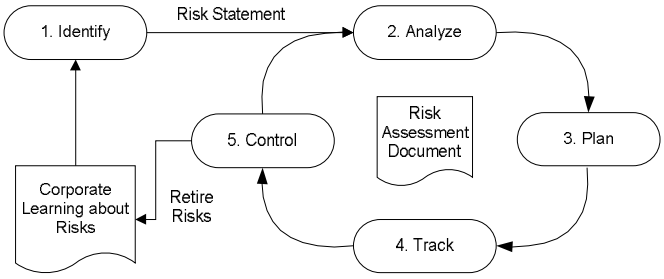

Figure 18: MOF Risk Management Process

3.2.5 IBM's Systems Management Solution Lifecycle

IBM's Systems Management Solution Lifecycle (SMSL) [23] provides a high-level consulting road map. The four-phase process depicted in adopts "closely mirrors the ITIL-recommended Process Delivery Methodology – 1) Process Assessment, 2) Process Improvement Definition, 3) Analysis & Design and 4) Pilot Deployment." The IBM approach further extends this model to provide an integrated and comprehensive solution.

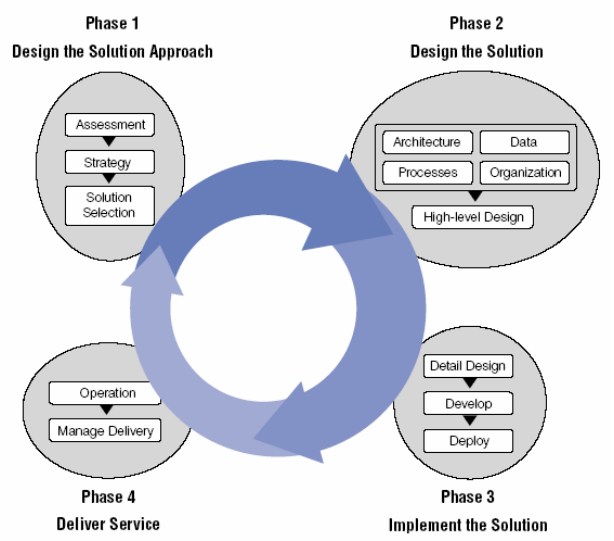

Figure 19: IBM Systems Management Solution Lifecycle

3.3 Comparing ITSM frameworks

Figure 20 shows the relationships between the different ITSM frameworks. In the IT Service Management landscape, ITIL acts as the de-facto standard for the definition of best practices and processes that pertains to the five disciplines of **service support**, and the five disciplines of **service delivery**. MOF extends the ITIL framework with guidelines specific to Microsoft technologies. In a way, MOF is much more operational than ITIL. HP ITSM Reference Model embraces all ITIL processes and extends the framework with processes derived from its domain expertise. Finally, IBM's SMSL is supported by the Infrastructure Resource Management, a suite of predefined solutions derived from ITIL.

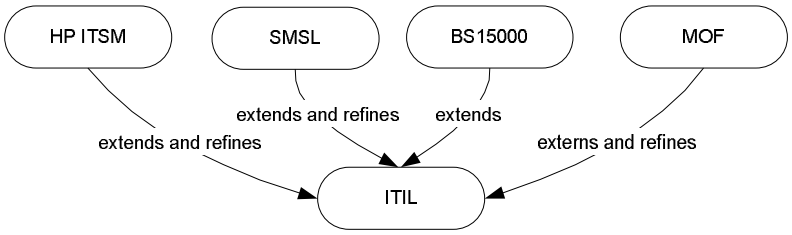

Figure 20: Relationships between ITSM frameworks

BS 15000 uses the Code of Practice DISC PD 0005 and the PD 0015 work manual for self evaluation. Used together, BS 15000 and PD 0005 build a framework for comprehensible Best Practices. BS15000 is tightly integrated with ITIL as presented in Figure 21.

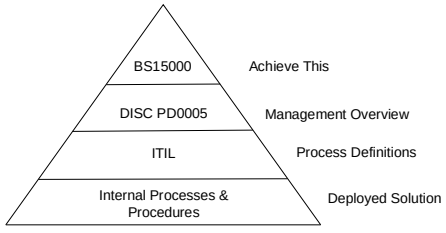

Figure 21: ITIL and BS15000

Significantly, ITIL and other ITSM frameworks teach the same essentials that are used to deliver quality improvement. Although, ITIL has by far the longest track record and the largest following, frameworks such as HP ITSM. MOF and SMSL offer specific emphasis on technologies and domains. As far as BS15000 is concerned, it has not so far emerged as a widely adopted standard. The likelihood that there won't be an ISO standard for IT Service Management certification by 2006 is estimated [15] to be 80%. However, experts agreed that all improvement efforts in IT Service Management should be done with ITIL and BS15000 as a frame of reference and baseline, despite BS15000 being in its infancy.

4 Putting IT Governance and IT Service Management frameworks in perspective

As presented in the introduction, IT Governance and IT Service Management serve two different purposes. IT Governance is often perceived as defining the "what" the IT organization should achieve and ITSM as defining the "how" the organization will achieve it.

In their presentation to itSMF, Carter and Pultorak [24] suggested that one can categorize IT frameworks following the six dimensions of:

- Structure and Roles: The assignment of responsibility for performing specified activities to specific groups or individuals.
- Metrics: The assignment of measurements to people, processes, technology and controls to ensure that they comply to what they are intended for.
- Processes & Practices: The interrelated series of activities that combine to produce products or services for internal and external clients.
- Technology: The technology that is supporting the IT delivery
- Controls: The assignment of controls to IT processes to ensure that they deliver efficiently and effectively in line with clients requirements.
- People: The people that support effective and efficient IT service management

Figure 22 presents how the reviewed IT frameworks fit in that space. For clarity of the diagram, when ITIL is mentioned, it does indeed mean ITL along with the ITIL-based framework: HP ITSM, Microsoft MOF, IBM SMSL

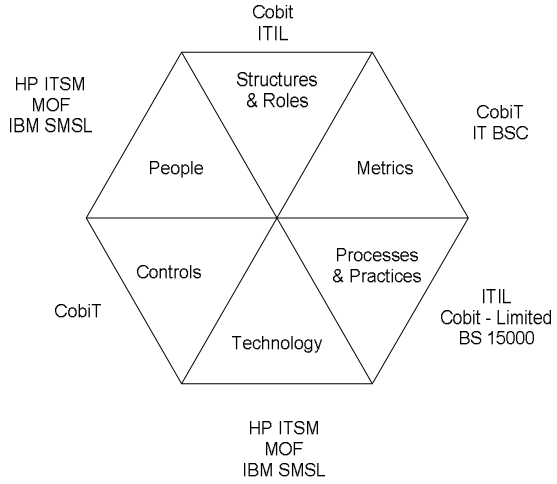

Figure 22: Positioning IT Frameworks

As pointed out in [25], ITSM and IT Governance frameworks are not mutually exclusive and could be combined to provide a powerful IT governance, control and best-practice in IT service management. Indeed, one can map ITIL process onto the perspective of the standard IT Balanced Scorecard as presented in Table 4.

IT BSC Business Contribution	IT BSC User Orientation
o Financial Management	o Service Level Management o Availability Management o Continuity Management o Incident Management o Financial Management
IT BSC Operational Excellence	**IT BSC Future Orientation**
o Problem Management o Service Level Management o Change Management o Service Level Management	o Service Level Management o Capacity Management o Change Management o Financial Management

Table 4: Mapping ITIL processes to the standard IT Balanced Scorecard

A similar mapping exists for the CobiT processes. For instance, in the delivery and support domain such as *define and manage service levels, manage performance and capacity, ensure continuous service, etc.* maps well onto one or more ITIL processes such as *service level, configuration, capacity, availability management etc.*

More interestingly, it is possible to map in great details BSC, CobiT and the HP ITSM reference model as presented in Figure 23. For that matter, we reuse the mapping of CobiT and the BSC cascade introduced earlier to which we add the mapping of CobiT domains to HP ITSM domains and processes. The CobiT Planning & Organization domain maps to one process, IT business assessment, of the IT business alignment domain (BA) of HP ITSM. The other processes of that domain map to CobiT Acquisition & Development along with the HP ITSM domain Service Development and Deployment and the design part of the Service Design and Management domain. Finally, The CobiT domain Delivery & Support maps onto the management part of the Service Design and Management domain of HP ITSM along with the Service Operations and Service Delivery Assurance domains. For clarity of the design, the Monitor domain of CobiT does not figure in the diagram as it doesn't have direct mapping to domains in HP ITSM and that he underpin the three other CobiT domains. It has to be noted that similar mappings could be achieved with ITIL, MOF and SMSL.

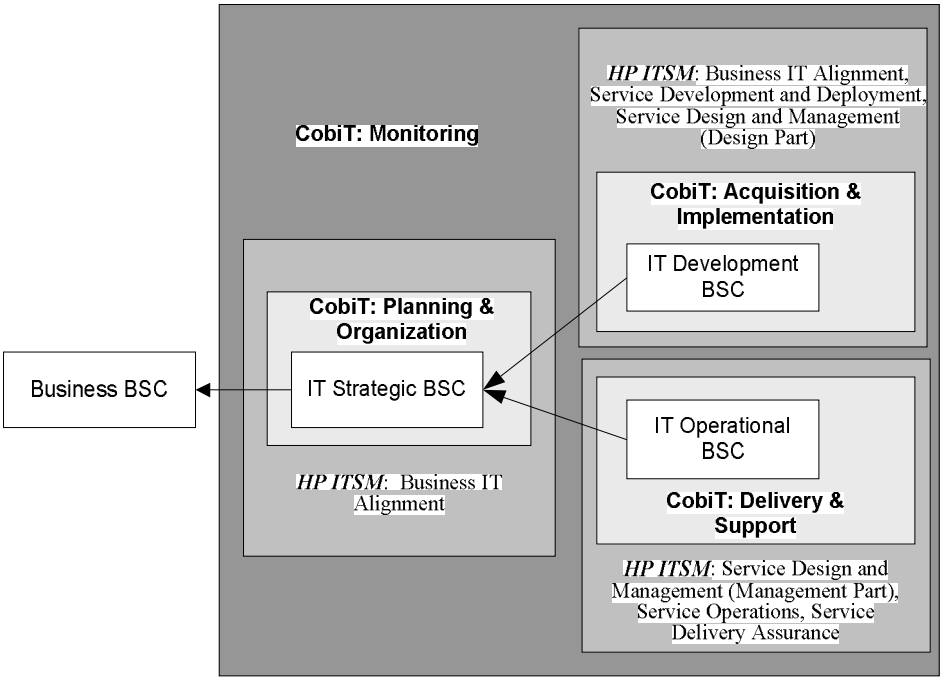

Figure 23: Mapping BSC, CobiT and HP ISTM

Finally, MOF is the only ITSM framework that introduces explicitly the dimension of risk analysis which could be used as an enabler to achieve one of the two outcomes of the IT Governance: risk mitigation.

5 Conclusion

IT Governance and ITSM are increasingly being adopted by IT organizations and there is no doubt that this trend will continue. As detailed in [26] and as depicted in Figure 24, ITIL and by extension other ITIL based frameworks are forecasted to reach their maturity plateau in the next two to five years.

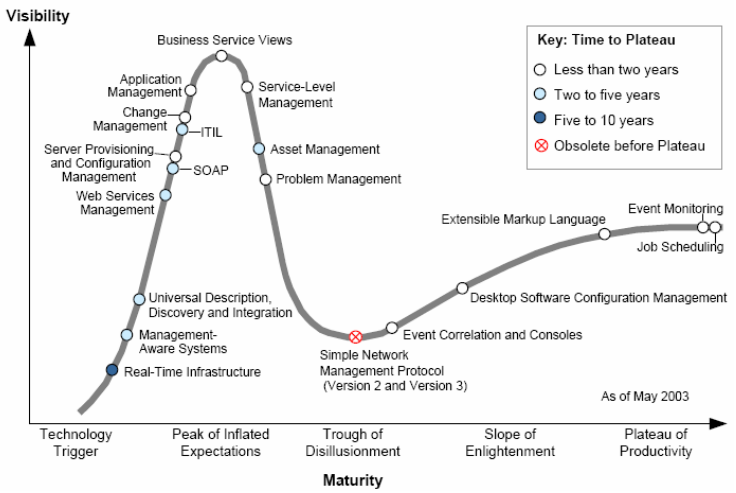

Figure 24: Hype Cycle for Enterprise Systems Management, 2003
(Source: Gartner Research – May 2003)

It emerges from this review that the management of IT is taking a clear and radical shift in response to the needs of being more efficient and strategically aligned. At the same time, the IT infrastructure is embracing the new paradigm of utility computing. IT Utility promises an adaptable IT infrastructure organized around the three main properties of *self-configuration, self-healing* and *self-control*.

It is our conclusion that the concepts of ITSM and IT Governance need to be rethought to be adapted to this new kind of IT environment. Not only is it necessary for IT Utility to understand how the various disciplines of ITSM and how the concepts of strategic alignment apply to an automated infrastructure but it is also necessary for the IT Governance and ITSM frameworks to look ahead and understand the fundamental impact that IT Utility will entail in the IT landscape.

As a starting point, we suggest that most of the ITSM disciplines[1] (using the ITIL framework) map nicely to the characteristic of a utility infrastructure as described below:

- Self-configuration: configuration, change, release management.
- Self-healing: incident, problem, change management.
- Self-controlled: capacity, availability, security, service level management.

This mapping allows us to look at the various IT management disciplines as they exist today and to understand the requirements that a utility model will impose on them. For instance, it is clear that capacity and availability management will be completely automated in a utility environment. It is therefore necessary to understand from an ITSM standpoint how those disciplines will react to change, how one will

[1] The disciplines of IT continuity and financial management do not find a direct mapping and should be investigated further.

be able to measure and audit the performance of those automated management systems in order to assess their efficiency and what will be the processes for improvement. From a utility infrastructure standpoint, one needs to understand the discipline of ITSM and their new meaning and implication. For instance, in conventional IT, incident management is the first line of response and sees to it to fix incidents as quickly as possible to bring services back up. In a utility model, incident management could be as simple as rebinding virtual resources to new concrete resources. On the other hand, problem management relies on the analysis of root causes to determine known errors and to remove those to ensure stability of the system. How will IT Utility ensure proper problem management? Will it be completely automated, or will a hybrid solution be necessary?

Parallel to this thread of work, it is more than ever necessary to put the notion of strategic alignment at the core of the IT Utility. Key to this will be to drive the dynamics of a utility infrastructure in terms of the business value that it generates and its capacity to align with the business objectives. Strategic alignment concerns all the characteristics of the IT Utility and therefore must apply holistically to the various management disciplines that will regulate the infrastructure. We suggest that strategic alignment can be achieved in a utility infrastructure by introducing the discipline of management by objectives (MBO). As depicted in Figure 25, a management by objectives system leverages from the knowledge of the business objectives to assess various management options (options to solve a problem, options to allocate resources, etc.) with regards to their strategic alignment and to determine the best aligned option. Such a system therefore ensures that the decisions taken within the automated systems of the utility are informed of the business expectations therefore resulting in a better aligned usage of IT resources.

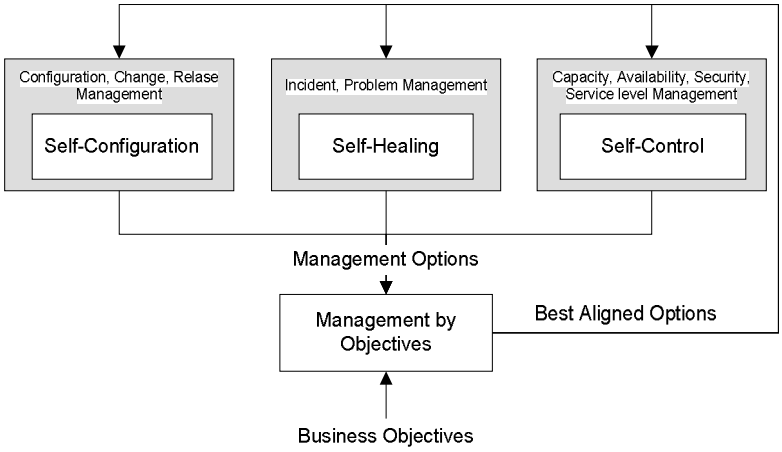

Figure 25: Achieving strategic alignment in an IT Utility

As introduced earlier, an MBO system strives to achieve strategic alignment with its inputted objectives. It is therefore necessary to propagate properly the enterprise business objectives through the IT Governance and the IT function using frameworks such as CobiT and BSCs. To that extent, we suggest in the context of IT Utility to expend the framework introduced in Figure 23 by extending the BSC waterfall with a dedicated IT Utility BSC that would capture the strategic objectives pertaining to the IT Utility and that would be linked to the IT Operational BSC. Objectives would then propagate through CobiT KGIs to specific goals applying to each of the three characteristic of the utility infrastructure expressed as KGI over the revisited ITSM processes. Such a cascade of objectives will enable an accurate strategic alignment and provide the IT Utility with a strong auditing capability.

To conclude, IT Governance, IT Service Management and IT Utility cannot ignore each other whilst trying to bring about the new vision of a highly adaptive, on demand IT infrastructure. We suggest that ensuring the ability of this new infrastructure to align to business objectives whilst adopting a service oriented approach to its delivery and management of IT will be key its success.

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