

IS SCA ALLIGNED? BUSINESS APPROACH TO SDR DEVELOPMENT

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ABSTRACT

“...if you can’t measure it you can’t control it, and if you can’t control it you can’t manage it.” This has never been truer than when “it” refers to IT (Information Technology).

Almost 10 years ago, SCA (Software Communications Architecture) appears as solutions to deal with the needs of govern in the structure and correct operation of SDR (Software Defined Radio). Today, as organizations, we are defined by our software; furthermore, as the software gets more and more relevance, we are abstracting the hardware almost to the point of commoditization, so we need to find a way to measure how good the software is and how to measure its value. Due to this situation we have to define govern guidelines to assure that the services agreements are aligned with the business needs, by defining a set of best practices and a framework to measure and show how right we are doing IT.

1. INTRODUCTION

“Somewhere today, a project is failing”

Chapter 1, Peopleware 2nd Edition, Tom DeMarco

Understand and integrate IT Governance and Corporate Governance has become a daunting and a confusing duty, and this is more significant in the Software Defined Radio environment mainly because this two reasons:

- Technology language and complexity
- The inability to define value delivered by IT.

The 2008 IT Governance Global Status Report [1] shown that ‘IT service delivery problems’ are one of the main risk in the companies today. Not only is seen as the main risk but, going further, the report remarks that only 18% of the worldwide companies has been successfully implemented IT Governance, coming from 25% in 2003. Encouragingly, 58% of the companies are aware or are in process of implementing IT Governance practices in comparison with 33% in 2003.

As software developing organizations that wish to successfully reach the strategic goals, an explicit understanding of IT governance is clearly needed.

2. IT GOVERNANCE AND BEST PRACTICES

The objective of this chapter is, briefly, introduce the two frameworks that are going to be applied to software development radio governance during chapter 3.

2.1. ITIL governance framework

During the late 1980s the Central Computer and Telecommunication Agency in the United Kingdom started to work on what is now known as ITIL (Information Technology Infrastructure Library®) [2]. Large companies and government agencies in Europe very quickly adopted this framework in the early 1990s and it has since become known as an industry best practice for IT Service Management. ITIL has become the de-facto standard in delivering IT Services for all types of organizations. Both government and non-government organizations benefit from the process driven approach.

The newest version of the core of ITIL is decomposed in five volumes instead of the actual two [3]. Those five volumes are described as follows:

- **Service Strategies:** hub of the core; understanding and translating business into IT strategy. This volume will be focused in recognizing and responding to business catalyst, selecting the best practices based in the industry, etc.
- **Service Design:** It will consider IT service and Architectures design models including outsourcing, in-sourcing, etc.
- **Service Introduction:** This volume will clarify how to create a transition strategy from service design and put it into the live environment. The main topics included in this volume are change management, release management, service models and checklists for taking design into production.
- **Service Operation:** This volume will specify how to manage services in the live or production environment, day to day management issues, how to react to failures, or how to develop and monitor metrics of quality.
- **Service Improvement:** This volume will deal with the task of improve the service once deployed.

ITIL describes the management and delivery of IT Services in the context of the lifecycle of those services. The hub of the ITIL core is Service Strategy, which has input to all lifecycle stages. The cycle of lifecycle stages is Design / Transition / Operation and Continual Improvement is wrapped around it all [4].

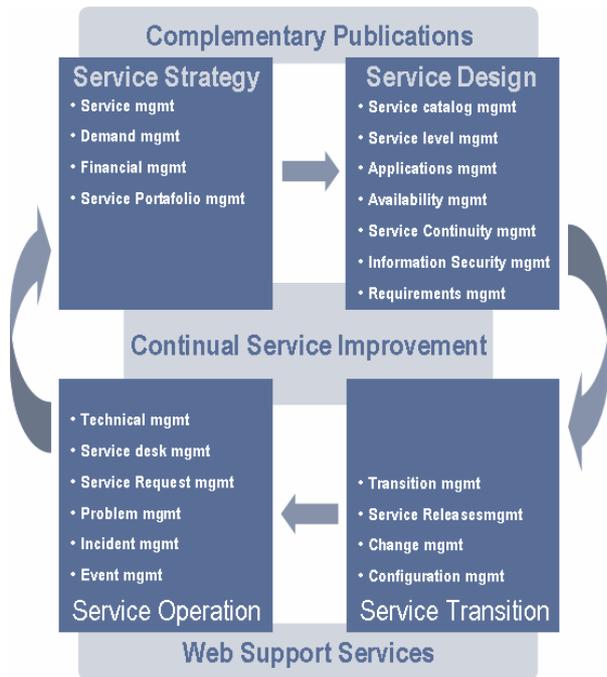


Figure 1. ITIL Lifecycle

The ITIL is the most widely accepted approach to IT service management in the world, considered the cohesive best practice framework, drawn from the public and private sectors internationally. It describes the organization of IT resources to deliver business value, and documents processes, functions and roles in IT Service Management (ITSM).

The focus of ITIL today is integration of IT into the business, assuring the delivery of business value and the treatment of services as business assets. ITIL describes the life of a service from conception to retirement, within a Service Portfolio. The earlier part of the portfolio is the Service Pipeline, which is all the services in planning and development, and the later part the familiar Service Catalogue, which contains the services in use or being offered for use.

2.2. CobIT: Controlling IT Governance

CobiT® (Control Objectives for Information and related Technology) [5] provides good practices across a domain and process framework and presents activities in a

manageable and logical structure. They are strongly focused more on control, less on execution. These practices will help optimise IT-enabled investments, ensure service delivery and provide a measure against which to judge when things do go wrong.

Management needs to have an appreciation for and a basic understanding of the risks and constraints of IT in order to provide effective direction and adequate controls. CobiT helps bridge the gaps between business risks, control needs and technical issues. In order to achieve this objective CobiT will:

- Provide an internal control system or framework to manage business requirements for effectiveness, efficiency, confidentiality, integrity, availability, compliance and reliability of information.
- Ensure that due diligence is exercised by all individuals involved in the management, use, design, development, maintenance or operation of information systems.
- Enable the development of clear policy and good practice for IT control throughout organisations, worldwide.

Whilst information criteria provide a generic method for defining the business requirements, defining a set of generic business and IT goals provides a business-related and more refined basis for establishing business requirements and developing the metrics that allow measurement against these goals. If IT is to successfully deliver services to support the enterprise's strategy, there should be a clear ownership and direction of the requirements by the business (the customer) and a clear understanding of what needs to be delivered, and how, by IT (the provider). The next figure illustrates how the enterprise strategy should be translated by the business into objectives related to IT-enabled initiatives (the business goals for IT).

To govern IT effectively, it is important to appreciate the

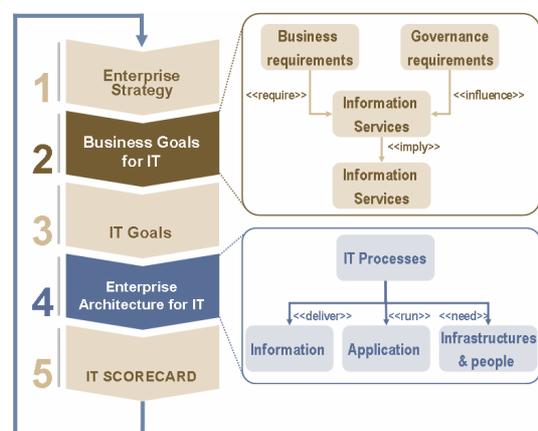


Figure 2. How the business goals are translated to IT goals

activities and risks within IT that need to be managed. Within the CobiT framework, these domains are called:

- **Plan and Organize (PO)**. Provides direction to solution delivery (AI) and service delivery (DS)
- **Acquire and Implement (AI)**. Provides the solutions and passes them to be turned into services.
- **Deliver and Support (DS)**. Receives the solutions and makes them usable for end users.
- **Monitor and Evaluate (ME)**. Monitors all processes to ensure that the direction provided is followed.

2.3. Getting the best of both worlds

The growth in the use of standards and best practices creates new challenges and demands for implementation guidance [6]:

- Creating awareness of the business purpose and the benefits of these practices
- Supporting decision making on which practices to use and how to integrate with internal policies and procedures
- Tailoring to suit specific organisations' requirements

Implementing ITIL or CobiT by themselves in an organization, is quite useful, but the perfect scenario is achieved when you combine the both best practices.

ITIL, as has been shown in previous chapters, is focused on the IT best practices processes for IT Service Management, and most important, it shows a clear roadmap to achieve it. Whilst CobiT will show how far from that road are the processes, providing a framework to measure them performance.

CobiT and ITIL provide a valuable combination for helping an organization manage IT from a business perspective, an approach known as Business Service Management (BSM). ITIL provides guidelines in best practice IT Service Management processes geared toward aligning IT with the business. CobiT helps the organization mold the ITIL processes to the business needs and goals of the organization. It helps the organization to establish a start and an end point; that is, determining where the organization is now and where the organization wants to be.

ITIL and CobiT will be mapped through its core components, corresponding each other in a high degree. There are minor issues about Incident Management that it's not actually covered with the same approach in CobiT, and some rewording for similar concepts in one framework and another. But still there are some very clearly defined relationships.

Study the relationships between ITIL and CobiT will require a complete paper by itself, so a briefly matching between both frameworks is described in the next table:

ITIL	CobiT
Service Desk	DS8 Assist and Advise costumers DS7 Educate and train users
Incident Management	DS10 Manage Problems and Incidents
Problem Management	DS10 Manage Problems and Incidents
Configuration Management	DS9 Manage Configuration
Change Management	AI6 Manage Changes AI3 Acquire and Maintain Technology
Release Management	AI6 Manage Changes DS9 Manage Configuration
Service Level Agreement	DS1 Define and Mange service levels M3 Obtain independent assurance
Financial Management	DS6 Identify and Allocate cost M2 Monitor the processes
Capacity Management	DS3 Manage Performance and Capacity
Continuity Management	DS4 Ensure continuous service AI6 Manage Changes
Availability Management	DS3 Manage performance and capacity AI2 Acquire and maintain Applications

Table 1. Mapping between ITIL and CobiT Frameworks

3. SDR GOVERNANCE

From the very first works produced by Guglielmo Marconi and Nikolai Tesla during the late of XIX century, the radio has evolved to change completely the concept itself. A new way to design has appeared, the Radio Software, which tries to bring the versatility of the software closer and closer to the antenna. This new vision of the radio has also produce some collateral problems, more associated to software development than to the radio itself. Although the hardware components used to build the radio has been evolved incredibly, the software lifecycle inherent to the whole radio development has been defined too many years ago, so an evolution is mandatory to successfully achieve the new challenges required to construct the radios of the future.

This chapter will define the guidelines of the model that will be presented to control the lifecycle and performance of the

SDR development. Furthermore it will present a way to control the impacts on the currently developed components (requirements, analysis documents, design models or processes) after a change in the business strategy. Or, otherwise, how a bad performance on those components could impact in the whole business strategy.

3.1. Facing the problems on SDR

Although, nowadays the latest technologies are used to construct the Software Radios, there is still a gap to fill in the SDR IT Governance. From the SDR development perspective there is an asset that has to be solved:

- During Software Defined Radio business definition (operational modes, physical restrictions, etc.) there are unrealistic expectations of Service Level.

The other way, the problems are worst from the business point of view:

- It's hard to have commitments on SDR Service Levels.
- How the SDR development handle on controlling its expenses.

Furthermore, there are no automatic mechanisms to provide a clear vision of how the business strategy will be affected by the change on a requirement of an operational mode, the change in a performance indicator, etc.

3.2. ITIL in a Radio environment

One of the most important problems that SDR development has to deal with is how to clearly specify the service level that the system will provide. ITIL defines SLA as Service Level Agreement, which will be a written agreement between the IT department and its customers describing the characteristics of the service to be delivered, that will be managed by the Service Strategy and Service Design. This services agreements could be signed also with internal departments, in that case it's named OLA (Operating level agreement) or if they are signed with third party contractors, UC (Underpinning contracts). Those SLA should express not a desire but a target service level, and furthermore a way to measure those levels of agreement has to be provided.

An important amount of time is day by day wasted in the SDR projects, trying to define those services that will have to be provided. The first step that has to be taken is a definition of a catalog of services that, as SDR provider, will be delivered to the client. This way, the client can choose from the catalog which services want to implement, and the overall time of implementing a Radio will be cut dramatically.

Define a catalog of SLA is not easy and has to be done carefully because they are actually contracts that will be

signed; implying penalties if the agreed level of the service is not reached.

An example of a service could be the definition of the interconnectivity of different kinds of networks and capabilities. Thus, the SLA will be redacted as follows:

“The radio will interconnect with different kind of networks (ISR, NIRIS, POS, MIP Database Instance), providing capability to interoperate with different kind of data (GMTI and imagery, air tracks, emitter detections and identifications, Blue Force data)”

Then, the ranges of operation should be provided and a way to measure if the threshold of the service level has been reached.

Although, the service strategy will define an after and before scenario in SDR development, implementing ITIL will also improve other stages of the lifecycle associated with the SDR development.

- **Service Transition.** Implementing Service Transition will improve how the services are started up. For example, defining the current releases of the desired waveform, managing the changes in the level of a service or managing the catalog of hardware and software components (FGPA, DSP, licenses, computers, radios, etc.) your organization has.
- **Service Operation.** Implementing Service Operation will improve the day by day of the already started up radios. This will include a definition of a service desk to gather the problems appeared in a radio or waveform, and the configuration of how those problems will be resolved.

3.3. Measuring how good the radios are defined

As it was presented, ITIL will define best practice processes for IT Service Management and more important how to get there. Unfortunately, those best practices do not define how to measure if the service level has been reached or not. In other words, how good are the processes performing?

To achieve that, the Key Performance Indicators and Key Goals Indicators have to be defined over the SDR development lifecycle. Those KPI and KGI will be defined in three levels:

- **Business Level:** Both indicators will be related to the strategy required by the company to develop its services. Following the example proposed in the previous chapter, an example of those indicators may be: “Achieve successful interconnectivity within all the networks” for the goal indicator, and “Number of

failures the radio has trying to connect to a different network” for the performance indicator.

- **IT / Tactic Level:** Both indicators will be related to required IT mechanisms to implement the strategy defined previously. Following the same example:
“Use SOA to achieve the interconnectivity among all the networks” for the Goal Indicator, and “Delay in seconds measured from the transmission of a message and the reception of it” for the performance indicator.
- **SDR Development Level:** Both indicators will be related to required SDR implementation decisions that was taken to successfully achieve the goals defined in the Strategy Level. Following the same example than in the previous entries:
“Use XML as a language for exchanging data through the different networks” for the Goal Indicator, and “Number of times the networks is collapsed due to overhead prompted by the use of XML” for the Performance Indicator.

These three levels will be used in the next chapter to link the performance of the SDR development processes with the strategy defined in the business level.

3.4. Mixing everything to create an aligned cocktail

As it was presented previously, the perfect scenario is a combination of ITIL and CobiT for the implementation of best practices and SDR and business governance.

This implementation will have to be done in four phases, described as follows:

- **Plan** – Determine the governance focus. The focus of the governance should be wider than SCA, furthermore, wider than SDR. It has to cover the whole process of deliver SDR to business and how business needs are transferred to SDR.
- **Define** – Define the IT governance model. How the ITIL model will be implanted in the organizations developing SDR? How to define communications channels between organizations in order to understand how the changes affect each other?
- **Enable** – Implement the IT governance model. How the people in the organizations will be involved in the change?
- **Measure** – Refine the IT governance model. From the very beginning metrics should be introduced to show how far or close are from the points defined in the first and second stages of the plan, to provide feedback to make modifications to the plan.

The success of this plan will be defined by the success in managing three core elements:

- **Business Engagement:** IT and the organization share a common vision and strategy. Are the new IP based radios an improvement pushed from business needs to accomplish a wider project, NATO Network enabled capability (NNEC) or just a technologic upgrade that will be transparent to the business layer?
- **Delivering Value:** IT has been able to achieve a dialogue and agreement of the business value that IT delivers. Offer XML radio transmission is something useful standalone, or could be used to integrate the radio software in other systems. So is the cost of this improvement worthy or not? Is mandatory to put the value of the service integration in a business context.
- **Managing Change:** IT and the business are jointly being responsible for aligning people and for delivering services which work and reliably help people do their jobs better.

A model is presented to successfully achieve the implementation of both ITIL and Cobit in the SDR development environment. This model will link the goals defined in the business strategy with the performance indicators that will be used in the development level. This cascade approach will be useful to easily know how far from the service level agreements are in a certain moment. Furthermore, it will provide an automatic way to present the value of the IT decisions taken in a development phase to the business board, so both, the tactic / IT, and business strategies can be refined.

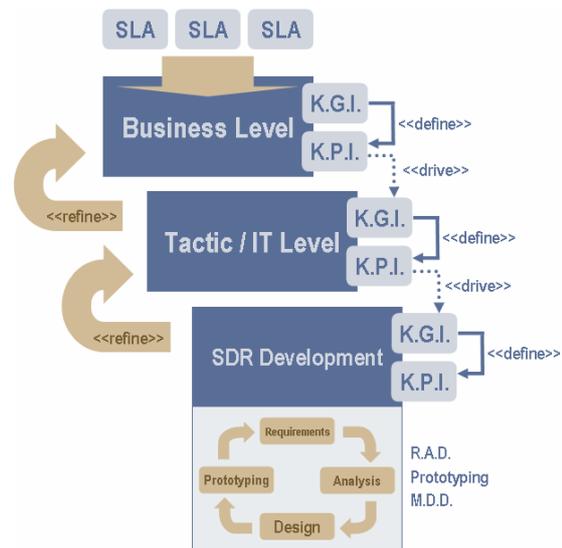


Figure 3. Refining strategy goals through SDR development performance indicators

4. CONCLUSIONS

Nowadays, there are still too few companies that have been successfully implemented, in their management models, best practices and govern in IT & Business Levels. The good news comes from the number of companies that, or have been realized that the implementation of this kind of practices are needed, or are in the process of implementation.

The paper has presented a cascade approach to IT & Business governance, in which there is a way to link the performance in the IT processes with the decisions that have been taken in a Business Strategy Level. Those implementation processes could be requirements, analysis documents, design models, or applications already implemented.

Thus, there is a way to know how the impact will be if the business strategy is changed in the current implementation state, and is possible to elaborate a plan to minimize the impact in the IT.

The paper has also presented how the IT lifecycles has to be changed. The upcoming radios are using the latest technologies in FPGA, DSP, Antennas, power supply units, etc. Some components of software are also state-of-the-art, like, for example, the implementation of CORBA for FPGA and DSP or the high level languages to develop over systems on a chip. In the same way, some develop methodologies has been upgraded to meet the current necessities, like RAD (Rapid Application Development) or MDD (Model Driven Development). But there is still a lot of work to do in the governance models used in the control of lifecycle of the SDR applications development.

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