



Norwegian University of  
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# The use of Enterprise Architecture, IT Strategy and IT Governance at StatoilHydro

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# Problem Description

The master thesis will extend the students depth study. Through the master thesis the student shall study and evaluate how IT Governance, Enterprise Architecture and IT Strategy are related in StatoilHydro. The student shall also research StatoilHydro's awareness of the concepts. The student shall propose improvements and/or changes based on this evaluation.

Assignment given: 15. January 2009  
Supervisor: Harald Rønneberg, IDI



# Abstract

Enterprise Architecture, IT Strategy and IT Governance are buzzwords that can be hard to separate from each other. Most companies have different perceptions of what to include under each term. The terms are often used together, they might overlap, and there exists mixed usage of definitions regarding these concepts within most enterprises. This master thesis extends the paper [1] written by Christopher Ludt Parmo about the difference between IT Strategy, IT Governance and Enterprise Architecture.

This master thesis defines perceptions of Enterprise Architecture, IT Strategy and IT Governance based on study of literature and the perception defined in [1]. It describes how the concepts are implemented and separated within the Norwegian oil and gas company StatoilHydro. It also compares StatoilHydro's implementation of IT Strategy, IT Governance and Enterprise Architecture to the defined perceptions and researches the awareness of the concepts in StatoilHydro's organization. Finally, it discusses StatoilHydro's implementation, and suggests changes and improvements for StatoilHydro.

The general research approach for this master thesis is study of literature and documents. The literature is thoroughly reviewed and concluded with the defined perception of IT Strategy, Enterprise Architecture and IT Governance. Structuring StatoilHydro's use of these concepts was done through reviewing governing documents, strategies, governance systems and meeting key personnel. StatoilHydro's relation to these concepts is thoroughly researched and described before it is discussed and compared to the defined perceptions. A subtask of the problem definition was to "research awareness" of the concepts. This is done through literature study, informal conversations with StatoilHydro employees and 6 short interviews with key personnel in StatoilHydro.

The most extensive workload in this master thesis has been to research and classify StatoilHydro's implementations of these concepts, due to the size of StatoilHydro's organization and the lack of descriptive documents. My personal goal for this master thesis has been to make it a useful document to StatoilHydro by classifying and structuring their implementation and awareness of the concepts, and help improve future development and implementation of IT Strategies, Enterprise Architecture and/or IT Governance.



# Preface

This master thesis was written as a part of a Master program in Computer Science, at the Department of Computer and Information Science (IDI) at the Norwegian University of Science and Technology (NTNU).

The subject of this report was chosen by associate professor Harald Rønneberg in cooperation with StatoilHydro. Harald Rønneberg has been the supervisor at NTNU. Harald Wesenberg has been the supervisor at StatoilHydro.

I would like to thank Harald Rønneberg for giving me insightful and valuable feedback through private guidance. His contribution made the task interesting and challenging. He gave me valuable guidance on the structure of the report and how to approach the task at hand.

I would also like to thank Harald Wesenberg for extensive guidance throughout the whole semester. Harald Wesenberg has been very motivating and helpful, and he has taken extremely good care of me at StatoilHydro. I have learned a great deal from him in many ways, not only related to the master thesis scope.

I would also like to thank Gisle Stokke for guidance and feedback on structure and content of the master thesis, and I would like to thank Øivind Høiem for guidance on IT Governance within StatoilHydro.

I would also like to thank Geir Owe Wærsland, Frode Barstad, Kurt Ole Myren and Roald Kvamstad for taking the time to answer some questions regarding awareness of the concepts in StatoilHydro.

Last I want to thank some people for keeping me motivated; Jannikke Ludt and Magne Kristoffer Davidsen have both helped with English grammar, report structure and discussing subject with me during the whole semester.

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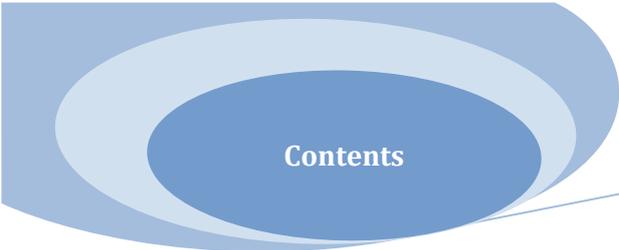
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Christopher Ludt Parmo



# Contents

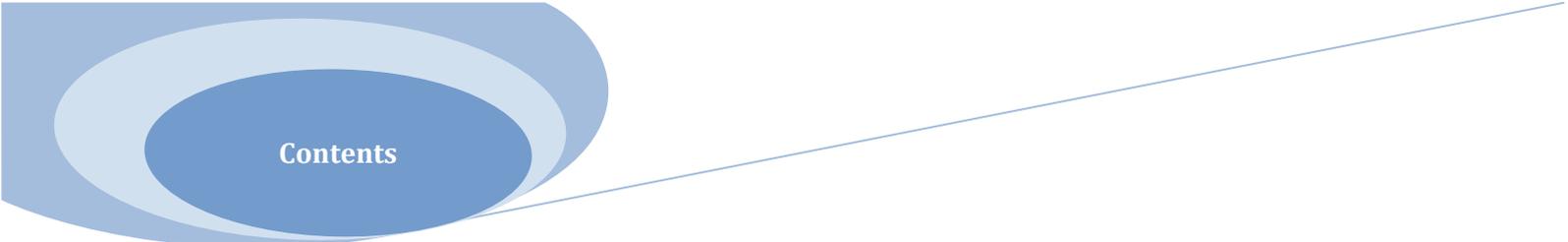
Abstract.....	3
Preface.....	5
Contents.....	7
List of Figures.....	11
List of Tables.....	13
1. Introduction.....	15
1.1 Motivation.....	15
1.2 Project Context.....	16
1.3 Problem Definition.....	17
1.4 Research method.....	18
1.5 Report outline.....	19
2. Perception of Concepts.....	21
2.1 Governance, risk management and compliance.....	22
2.2 IT Strategy.....	23
2.3 Enterprise Architecture.....	24
2.4 IT Governance.....	27
2.5 Comparison of Concepts.....	30
3. StatoilHydro.....	35
3.1 Regulations.....	36
3.2 The Management System.....	38
3.2.1 The StatoilHydro book.....	40
3.2.1.1 Governing bodies.....	41
3.2.1.2 StatoilHydro's values.....	42
3.2.1.3 People and leadership.....	43
3.2.1.4 Operating Model.....	44
3.2.1.5 Corporate policies.....	47
3.2.2 Tools of the Management System.....	49
3.2.2.1 Business Process Model.....	50
3.2.3 Performance Management and Strategy.....	55
3.3 IMT Corporate Governance.....	56
3.4 IMT Strategy.....	60
3.4.1 Business Strategy and IM/IT implications.....	61
3.4.2 Strategic direction.....	63



## Contents

3.4.3	Current- and future state of IM and IT.....	64
3.5	Enterprise Architecture.....	66
3.5.1	Development Process .....	68
3.5.2	Meta-model.....	70
3.5.3	Modelling.....	71
3.5.4	Organization .....	72
3.5.5	EA Governance.....	75
3.6	IMT Governance.....	76
3.6.1	Information Management Governance.....	78
3.6.2	Information Technology Governance .....	80
3.7	Connection of Concepts .....	82
3.8	Awareness of concepts.....	87
4.	Discussion .....	91
4.1	Frameworks .....	92
4.1.1	IT/IMT Strategy framework use .....	93
4.1.2	Enterprise Architecture framework use.....	94
4.1.3	IT/IMT Governance framework use.....	97
4.2	Awareness and connection of concepts.....	102
4.3	Suggested Improvements .....	104
	Conclusion .....	111
	Further work.....	115
	Abbreviations.....	117
	Bibliography .....	119
	Appendix A.....	121
	The Gartner Framework.....	121
	CRV .....	122
	Development and Strategy .....	124
	Viewpoints .....	126
	Appendix B.....	127
	The Zachman Framework.....	127
	Appendix C .....	129
	The TOGAF Framework.....	129
	ADM.....	130
	Continuum.....	132
	Appendix D.....	133
	The CobiT Framework .....	133

Appendix E .....	137
The ITIL Framework.....	137
Appendix F.....	141
Interview with Geir Owe Wærsland.....	142
Interview with Frode Barstad.....	143
Interview with Kurt Ole Myren .....	145
Interview with Roald Kvamstad.....	146
Interview with Knut Sebastian Tungland.....	148
Interview with Åge Haldorsen .....	149



# Contents

# List of Figures

Figure 1 - GRC cycle .....	22
Figure 2 - Connection of concepts .....	32
Figure 3 - Governance principles will guide the Strategy .....	33
Figure 4 - StatoilHydro Governance .....	35
Figure 5 – Regulations .....	36
Figure 6 - Corporate Governance.....	38
Figure 7 - The Management System.....	39
Figure 8 - Governing Bodies.....	41
Figure 9 - Ambition 2 Action.....	44
Figure 10 - Process map of StatoilHydro .....	50
Figure 11 - The StatoilHydro IT process .....	51
Figure 12 - The "Plan & Organize" process within the IT process .....	52
Figure 13 - The "Define a strategic ICT plan" process.....	52
Figure 14 - Available tools in the "Target setting and planning" process.....	53
Figure 15 – The Workflow diagram of the "Identify ICT opportunities" process .....	53
Figure 16 - Hierarchy of processes .....	54
Figure 17 - Long term vs. Short term strategy .....	55
Figure 18 - Important governance mechanisms, focus on IMT .....	56
Figure 19 - IT Arena process description, based on.....	58
Figure 20 - Hierarchies.....	59
Figure 21 - Process to develop the IMT Strategy.....	60
Figure 22 - Gap analysis of key components of IT .....	64
Figure 23 - Enterprise Architecture.....	66
Figure 24 - StatoilHydro's TOGAF .....	69
Figure 25 - Enterprise Architecture meta-model.....	70
Figure 26 - Viewpoints .....	73
Figure 27 - IMT Governance.....	76
Figure 28 - The Information Management Lifecycle.....	78
Figure 29 - CobiT IT process & StatoilHydro IT procesess .....	80
Figure 30 - Information Technology development.....	80
Figure 31 - Connection of concepts.....	84
Figure 32 - Development of EA within StatoilHydro .....	95

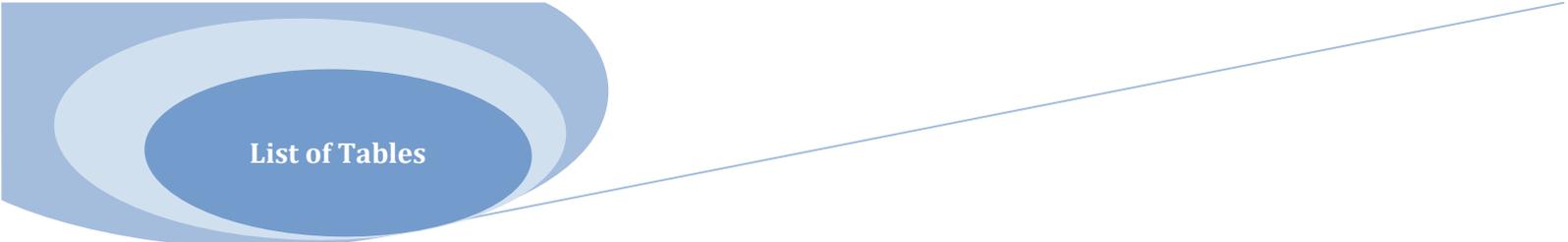


## List of Figures

Figure 33 - IT Governance processes in CobiT and StatoilHydro.....	97
Figure 34 - CobiT IT Governance .....	98
Figure 35 - StatoilHydro's IMT Governance .....	98
Figure 36 - StatoilHydro's Service Management processes.....	99
Figure 37 - Framework relations to concepts .....	100
Figure 38 - Suggested governance processes .....	109
Figure 39 - Enterprise Architecture Process model.....	121
Figure 40 - CRV source: Gartner.....	122
Figure 41 - Enterprise Architecture and IT planning synergies .....	124
Figure 42 - Architectural Viewpoints.....	126
Figure 43 - Example of Zachman Framework.....	128
Figure 44 - TOGAF ADM.....	130
Figure 45 - The CobiT processes .....	135
Figure 46 - ITIL framework.....	139

# List of Tables

Table 1 - Common Governance mechanisms .....	29
Table 2 - Gartner's separation of concepts .....	34
Table 3 - Clear connections .....	85
Table 4 - Abbreviations .....	117



## List of Tables

# 1. Introduction

This introductory chapter presents the motivation for writing this master thesis, the thesis context, the problem definition, the research method and the outline of the report.

## 1.1 Motivation

Most of StatoilHydro's IT Strategy, IT Governance and Enterprise Architecture are newly developed or under re-development. This calls for a need to investigate the implementations. Although StatoilHydro is an oil and gas enterprise they employ a large IT department, many pure IT projects and business projects with IT components.

Information Technology and systems are already critical to business success in StatoilHydro as technology evolves at an increasing pace. To be a successful organization in the modern business world StatoilHydro must support consistent decision-making and drive cultural change [2]. Today's business-world is fast-paced, internet enabled and changing. StatoilHydro needs to adapt to the changing environments.

This project is written in cooperation with StatoilHydro. My motivation for doing this project is to help StatoilHydro map their use of IT Strategy, IT Governance, Enterprise Architecture, and the connection between these concepts. IT Strategy and IT Governance as concepts have existed in StatoilHydro for some time, but have newly been re-developed. Enterprise Architecture is a fairly new concept in StatoilHydro. This hopefully makes this master thesis a useful analysis tool for StatoilHydro. I will compare StatoilHydro's perception and implementation of the concepts; **IT Strategy**, **Enterprise Architecture** and **IT Governance**, to perceptions and methodologies defined from literature.

StatoilHydro wanted this master thesis to analyze their implementation of IT Strategy, Enterprise Architecture and IT Governance, and define inconsistencies and/or flaws. There was a need to compare StatoilHydro's use of these concepts to relevant methodologies and definitions, and analyze the internal connection and awareness of IT Strategy, Enterprise Architecture and IT Governance.

## 1.2 Project Context

StatoilHydro is responsible for exploration, production, marketing and selling the Norwegian state's petroleum produced from the state's direct financial interest (SDFI), and for petroleum paid as royalty in kind [3].

StatoilHydro is a Norwegian oil- and gas company with about 29,500 employees and activities in 40 countries [3]. It is by far the largest Norwegian company and it has its own IT Department which, among other activities, works with development and maintenance of software systems used in the oil- and gas industry all around the world [4]. To be competitive in the oil- and gas market, StatoilHydro continuously explores and takes advantage of new technologies and updates strategies and governance policies.

In October 2007 StatoilHydro merged with the oil and gas division of Norsk Hydro. This made StatoilHydro the largest offshore oil- and gas company in the world [4]. When StatoilHydro was established there was a need to improve and renew the IT Strategy, IT Governance and Enterprise Architecture in accordance with the expansion. StatoilHydro expressed a need for mapping their own use of Enterprise Architecture, IT Strategy and IT Governance as concepts and to define inconsistencies and/or weaknesses in their implementation. This master thesis will hopefully help StatoilHydro in the development of future IT Strategy, IT Governance and Enterprise Architecture.

## 1.3 Problem Definition

The problem definition given by NTNU is as follows:

*The master thesis will extend the students depth study. Through the master thesis the student shall study and evaluate how IT Governance, Enterprise Architecture and IT Strategy are related in StatoilHydro. The student shall also research StatoilHydro's awareness of the concepts. The student shall propose improvements and/or changes based on this evaluation.*

In this thesis, I have tried to meet the challenges of the problem definition as good as possible. These concepts are interrelated within StatoilHydro, but I have tried to shed light upon the apparent definitions, differences and overall structure of the concepts.

My personal goals derived in cooperation with StatoilHydro for this master thesis is as follows:

1. Define perceptions of IT Strategy, Enterprise Architecture and IT Strategy, and the connection between them (this work is based on work done in [1]).
2. Define and structure StatoilHydro's implementation of IT Strategy, Enterprise Architecture, IT Governance and important relating concepts, governance mechanisms or infrastructures
3. Define the connection between the relevant concepts within StatoilHydro
4. Research awareness of the concepts in StatoilHydro
5. Discuss StatoilHydro's implementation of IT Strategy, Enterprise Architecture and IT Governance with focus on use of frameworks and interaction between the concepts
6. Discuss possible weaknesses and inconsistencies StatoilHydro's implementation of the relevant concepts might reflect, and suggest improvements

My personal goals are developed in collaboration with StatoilHydro from the problem definition. They have been derived from discussions to cover the needs of StatoilHydro.

I have defined my own perception of these concepts to have a clear starting point. My own perception of IT Strategy, IT Governance and Enterprise Architecture is based upon some methodologies and frameworks that are explained in [1]. StatoilHydro's perception and implementation of IT Strategy, IT Governance and Enterprise Architecture are described in chapter 3. The discussion (chapter 4) debates how StatoilHydro's perception differs, how it is inconsistent and what possible weaknesses it reflects. The conclusion summarizes the findings.

## 1.4 Research method

The research method used in this thesis is primarily study of literature and documents.

The research method for each of the goals defined in the previous subchapter contains:

1. Literature study and analysis: The work done to complete this goal builds on the work done in [1]. The research method includes study of literature on the concepts in general and on frameworks for implementing the concepts. The connection part is derived from my own analysis of the defined perception
2. Study of documents and Management System: The work done to complete this goal primarily includes studying StatoilHydro's implementation through governing documents, governance tools and informal conversations with different key personnel in StatoilHydro
3. Analysis: This goal involves comparing and analyzing the information gathered, discussed and described of StatoilHydro's implementation defined in the second goal
4. Informal interviews: To complete this goal, I have interviewed key personnel in StatoilHydro. The interview-answers are discussed and compared to my own impression of the awareness of these concepts. My own impression is based on informal conversations with StatoilHydro employees and analysis of governing documents. Summaries of the interviews are included in the appendix F
5. Analysis: This discussion is based on my own opinion and the work done to complete the three first goals
6. Analysis: This discussion is based on my own opinions and the work done to complete all the previous goals

As StatoilHydro is a large company with an extensive governance system and many governing and strategic documents most of the work done in this thesis has been to classify and analyze information. The information relevant to me was somewhat unordered and unstructured described in StatoilHydro's systems. Understanding the StatoilHydro governance system was vital to the success of this master thesis, and most of my time has been spent studying StatoilHydro's implementations. I hope that StatoilHydro can use my master thesis as a complementary encyclopedia for IT Strategy, Enterprise Architecture and IT Governance in their future work.

## 1.5 Report outline

This chapter gives a short introduction to all the chapters of this master thesis.

This master thesis is designed and formed with the purpose of being useful to StatoilHydro. It is structured to work as a complementary encyclopaedia by mapping governance mechanisms and connection of IT Strategy, Enterprise Architecture and IT Governance. I have chosen to shape the master thesis as if StatoilHydro are the readers.

### **Chapter 2, Perception of Concepts**

Chapter 2 defines perceptions of governance, risk management, compliance, IT Strategy, Enterprise Architecture and IT Governance. It also defines the connection between these concepts. The perceptions defined of IT Strategy, Enterprise Architecture and IT Governance is based on study of literature, study performed in [1] and study of frameworks. The connection between the concepts is defined from my own analysis.

### **Chapter 3, StatoilHydro**

Chapter 3 is the most extensive chapter of the master thesis. I have spent the majority of my time researching and mapping StatoilHydro's governance structure, Management System, IMT Strategy, Enterprise Architecture and IMT Governance. This chapter defines and describes all relevant information to understand StatoilHydro's organization. It explains StatoilHydro's Management System, IT organization and governance hierarchy and it maps StatoilHydro's use of IMT Strategy, Enterprise Architecture and IMT Governance and all relating concepts.

### **Chapter 4, Discussion**

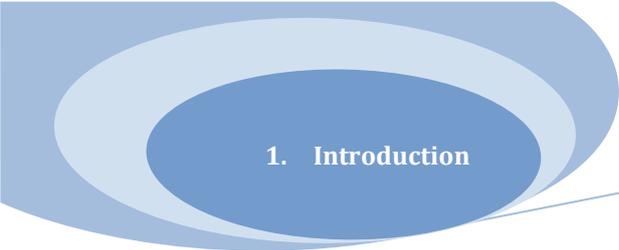
This chapter discusses StatoilHydro's use of frameworks and awareness of concepts. It compares StatoilHydro's IMT Strategy, Enterprise Architecture and IMT Governance to the defined perception and discusses potential flaws and improvements to StatoilHydro's organization.

### **Conclusion**

This chapter summarizes the goals and the findings of this master thesis and concludes the problem definition and the goals that are set.

### **Further work**

This chapter describes possible related future work. The further work contains 3 suggested extensions of this master thesis.



## 1. Introduction

### **Abbreviations**

This chapter defines acronyms and abbreviations used throughout this master thesis.

### **Appendices**

The appendices contain summaries of Enterprise Architecture and IT Governance frameworks. This includes the Gartner's EA framework, TOGAF, the Zachman framework, CobiT and ITIL. It is important to note that these summaries are written by me, and that they are high level introductions to the frameworks for unfamiliar readers. This means that the appendices might not be optional reading material to understand this thesis. I have chosen to put the framework summaries in the appendices, as most relevant StatoilHydro readers are familiar with the frameworks. Putting the summaries in the appendices creates a more natural flow of the thesis for StatoilHydro.

The appendices also contain summaries of interviews of StatoilHydro key personnel. These interviews are discussed in chapter 4.

## 2. Perception of Concepts

This chapter defines perceptions of IT Strategy, IT Governance and Enterprise Architecture based on study performed in [1]. It also defines a perception of a relating concept (GRC) which is used later in this master thesis to understand StatoilHydro's governance system. Finally, this chapter summarizes the relevant concepts and compares them.

The CobiT and ITIL frameworks for implementing IT Governance are described in appendices. The mentioned Gartner, Zachman and TOGAF frameworks for implementing Enterprise Architecture are also described in appendices.

## 2.1 Governance, risk management and compliance

Governance, risk management and compliance (GRC) is a term that reflects a way in which organizations can implement an integrated approach to these three areas.

**Governance** is defined as the way in which an organization is run and controlled [5]. Governance as concept relates to decisions that grant power, define expectations, or verify performance. It consists of a separate process or a specific part of management or leadership processes. In the case of an enterprise, governance relates to consistent management, cohesive policies, processes and decision-rights for a given area of responsibility (for example IT services).

**Risk management** include policies, procedures, and practices involved in identification, analysis, assessment, control, avoidance, minimization, or elimination of unacceptable risks [6]. An enterprise may use risk assumption, risk avoidance, risk retention, risk transfer, or any other strategy (or combination of strategies) in appropriate organization of future events.

**Compliance** is the state of being in accordance with the relevant Federal or regional authorities and their requirements [7]. Compliance contains the process that records and monitors the efforts needed to enable compliance with legislative or industry mandates as well as internal policies. Most large companies have compliance teams whose role is to take an independent stance in making sure that the company is following all the necessary rules and regulations.

It is important to realize that if **governance** is not in place, **risk management** and **compliance** probably cannot be meaningfully achieved. With the same logic, if risk management is not in place then achieving compliance becomes irrelevant and probably cannot be meaningfully achieved. This is the reason why the acronym is designed as GRC. Governance, risk management and compliance are highly related but distinct activities that solve different problems for different sets of constituents of an organization [8]. See Figure 1 below.



Figure 1 - GRC cycle, based on [8]

## 2.2 IT Strategy

**Strategy** can be defined as the direction an enterprise chooses to reach its goals. Goals are a description of a desired future condition, and strategy is intentions of actions to realize the goals [9]. A strategy might consist of a set of main beliefs or formulas that are used to satisfy a company's purpose [10]. These values are usually general directives for reaching some business goals.

Strategies can be associated with plans and planning [10]. They can be used to perform conscious actions or guidelines that handle given situations. Strategies should take into account competition, surroundings, market, advantages and disadvantages and so on.

**IT Strategy** is defined as:

- A plan consisting of different projects for deploying Information Technology within an enterprise [10]
- A long term view, mostly described as a high level framework on where a company wants to be IT wise in 3-5 years [11]
- An iterative process to align IT capability with long term business requirements [12]

These definitions differ in some aspects, but they contain mainly the same issues, such as the link to business strategy. The IT Strategy should consider or be defined from the business strategy. A successful IT Strategy will help a company achieve better system solutions, direct governance from the upper management, precise resource estimates on IT-investments, and estimate an adequate size of an IT-department [10].

Weill [13] defines strategy as a set of choices. Who are the targeted customers? What are the product and service offerings? What is the unique and valuable position targeted by the enterprise? What core processes embody the company's unique market position? Good IT Strategy choices should raise important questions regarding business goals, and help describe what needs to be done to reach these goals.

IT strategies should include plans consisting of different projects for use of IT that will contribute to achieving the overall company strategy [10]. An example IT Strategy covers the enterprise's direction and strategy (mission, vision, goals, knowledge strategy), persons (competence needs), organization (future organization and control of the IT function), and an IT platform (computers, networks, databases and applications).

## 2.3 Enterprise Architecture

**Architecture** can be the structure and design of a system or a product [14]. It can also be defined as the description of a set of components and the relationship between them [15]. Within Information Technology there are several branches of architecture: software, hardware, network, system and enterprise. Thus, architecture can have a range of meanings, goals and abstraction levels depending on the type of architecture.

**Enterprise Architecture** identifies all the main components of an organization; Its information systems, the ways in which the components work together to achieve defined business objectives, and the way in which the information systems support the business processes of the organization [16]. Enterprise architecting can be a set of processes, tools, and structures necessary to implement an enterprise-wide coherent and consistent IT architecture for supporting an enterprise's business operations. Enterprise Architecture is a complete expression of the enterprise; a master plan which "acts as a collaboration force" between aspects of business planning such as goals, visions, strategies and governance principles [17].

The purpose of an **Enterprise Architecture program** is to guide an enterprise's business processes and the associated information systems towards a common goal and to integrate business, data, information, and technology [18]. Enterprise Architecture involves the organizing logic for business processes and IT infrastructure reflecting the integration and standardization requirements of the company's operating model [19].

**Enterprise Architecture development** involves defining current state architecture, planning for future state architecture, evaluating different scenarios and develop orientation points, processes and principles for the architecture [20]. The Enterprise Architecture development and implementation must be managed and governed. The architecture management must focus its attention on the purpose of the system *as defined by the client* [21].

Enterprise Architecture was originally developed for organizing IT initiatives, but trends show that nowadays it is used on entire organizations [4]. The concept usually contains both a framework and a process. The Enterprise Architecture process is the process of developing and implementing the Enterprise Architecture. The process should be far-reaching in scope, and when done properly it touches on everything in the enterprise [22]. An Enterprise Architecture framework is a set of best practice descriptions on how to execute the EA process. There exist several different frameworks for implementing and defining Enterprise Architecture. Some of them are described in the appendices.

There are several reasons to organize an enterprise and implement Enterprise Architecture. Some important reasons include:

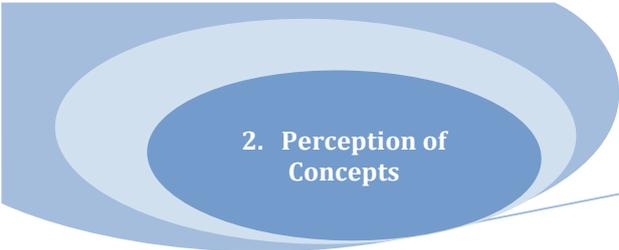
- Achieving alignment (how the enterprise is positioned and formed) [23]. Alignment between strategies, implementations and different sectors is crucial
- Integrating operations and sectors; is essential in the semantic structures of the enterprise, the connectivity of the enterprise, and in the means of the enterprise [23]
- Promoting agility; the architecture must be built to handle change in technology and business objectives [23]. Agility will also help reduce the time it takes to implement new solutions

**IT architecture** is *the organizing logic for data, applications, and IT infrastructure, captured in a set of policies, relationships, and technical choices to achieve desired business and technical standardization and integration* [13]. By providing a road map for infrastructure and applications, architecture decisions are pivotal to effective IT management and use. Process integration allows multiple business units to provide a single face to a customer or to move from one important function to another [13].

**Data** refers to a collection of organized information; usually the result of experience, intelligence, observation or other important information within the enterprise [4].

**Applications** refers to software programs designed to perform a specific task or a group of tasks, such as word processing, communication or database management [24].

**IT infrastructure** is the foundation of planned IT capability (both technical and human) available throughout the business as shared and reliable services and used by multiple applications [25]. Without a proper infrastructure an enterprise may have limited sharing of resources, information and expertise.



## 2. Perception of Concepts

The various elements of IT infrastructure may include:

- Technology components (computers, printers, database software packages, operating systems, scanners etc.)
- Telecommunication network services
- Management of large scale computing (servers, mainframes etc.)
- Management software (ERPs, customer relationship Management Systems etc)
- Management of shared customer databases
- Research and development expertise aimed at identifying the usefulness of emerging technologies to the business
- An enterprise-wide intranet

It is important to keep track of the company IT infrastructure in order to define possible extensions to meet the business process goals.

IT infrastructure, IT architecture, data and applications are important concepts within Enterprise Architecture, but it is important to separate and have clear definitions of them when developing the Enterprise Architecture (EA). It is also important to state that classifying these concepts is only a small part of Enterprise Architecture.

## 2.4 IT Governance

**Governance** is defined in the chapter about GRC (chapter 2.1).

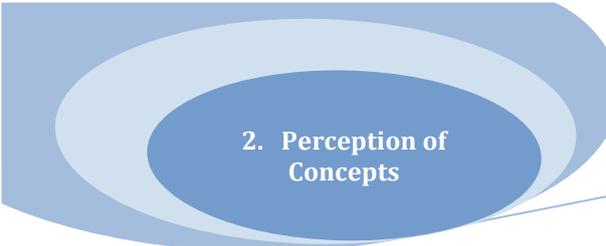
**Corporate Governance** consists of a set of processes, customs, policies, laws and institutions affecting the way people directly administer or control a corporation [13]. It also includes the relationships between the many players involved (the stakeholders) and the corporate goals. Corporate Governance contains essential legal directives to the direction and supervision of companies and defines international and national standards of good and responsible management. The board of directors develops the strategic alignment of the business and provides for its implementation. The board of directors is responsible for the appropriate risk management of the enterprise. Niemann [21] states that information is the key to the success of the Corporate Governance program, and therefore the use of IT and information systems is essential.

**IT Governance** has multiple definitions:

- The organizational capacity to control the formulation and implementation of IT Strategy and guide to proper direction for the purpose of achieving competitive advantages for the corporation [26]
- IT Governance 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 [27]
- IT Governance is the organizational capacity exercised by the board, executive management and IT management to control the formulation and implementation of IT Strategy and in this way ensure the fusion of business IT [28]

These definitions differ in some aspects, but they contain mainly the same issues, such as the link between business and IT.

IT Governance does not only focus on who has the decision rights within a company. IT Governance should also define structures, processes and relational mechanisms [28]. Enterprise's implement their governance arrangements through these mechanisms. They should be well-designed, well-understood, and transparent so that they promote desirable IT behavior.



## 2. Perception of Concepts

IT Governance should thus consist of the following three different types of mechanisms [13]:

- *Decision-making structures*: The most visible IT Governance mechanisms are the executive structures that locate decision-making responsibilities according to intended archetypes. Decision-making structures are the normal approach to generating commitment and obligation. Organizational units and roles responsible for making IT decisions may include committees, executive teams, and business/IT relationship managers.
- *Alignment processes*: Alignment processes are IT management techniques for securing extensive involvement in the management and use of IT. It consists of formal processes for ensuring that daily behavior is consistent with IT policies and provides input back to decision-makers. Alignment processes may include IT investment proposal and evaluation processes, architecture exception processes, service-level agreements, chargeback, and metrics.
- *Communication approaches*: Communication mechanisms are intended to help “spread the word” about IT Governance decisions and processes. Enterprises communicate their mechanisms in a variety of ways. Communication mechanisms may consist of announcements, advocates, channels and education efforts that disseminate IT Governance principles and policies and outcomes of IT decision-making processes.

Examples of these IT Governance mechanisms are included on the next page.

See Table 1 below for examples of the three different types of mechanisms defined by [13].

<b>Decision-making Structures</b>
Executive or senior management committee IT leadership committee comprising IT executives Process teams with IT members Business/IT relationship managers IT council comprising business and IT executives Architecture committee Capital approval committee
<b>Alignment Processes</b>
Tracking of IT projects and resources consumed Service-level agreements Formally tracking business value of IT Chargeback arrangements
<b>Communication Approaches</b>
Senior management announcements Office of Chief Information Officer (CIO) or office of IT Governance Web-based portals and intranets for IT

**Table 1 - Common Governance mechanisms**

## 2.5 Comparison of Concepts

**IT Strategy** is the process of determining an organization's long-term IT goals and then identifying the best approach for achieving those goals. IT strategies should include plans consisting of different projects for use of IT that will contribute to achieving the company strategies [10].

**IT Governance** is the responsibility of the board of directors and the 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 supports the organization's strategies and objectives [21]. Ideal IT Governance ensures:

- Fulfillment of the expectations of IT
- Continuous planning, control and optimization of IT resources deployment
- Measurability of IT performance
- Risk minimization

The term **Enterprise Architecture** refers to a structured, harmonized and dynamic collection of plans for the development of an enterprise's IT landscape [21]. Enterprise Architecture's various levels of detail and views enable the enterprise architect to represent a range of aspects of information systems and their alignment with the business to various stakeholders in the form of past, present and future scenarios.

Enterprise Architecture:

- Is arranged in various levels of details and views
- Is specifically designed for certain stakeholders (e.g. managers, planners, owners and designers)
- Illustrates different aspects of IT systems (e.g. data functions, interfaces, platforms, networks) and their alignment with the business (e.g. objectives, strategies, business processes) in past, present and future scenarios

IT Strategy is derived from the business strategy. Future state Enterprise Architecture should be derived from the IT Strategy, or directly from the business strategy (depending on the enterprise). It is important to clarify what strategic impact and importance IT is expected to have in a company. This is an integral part of the IT Strategy and it will act as a guideline for the Enterprise Architecture.

The IT Strategy should reflect the entire business strategy, which includes subjects like **competition, surroundings, market, hiring-policies** etc, but this is often not a part of the Enterprise Architecture. The IT Strategy or the business strategy should *set goals* for Enterprise Architecture, depending on the enterprise.

Enterprise Architecture is about *optimizing* the business' IT architecture and infrastructure. One reason for developing Enterprise Architecture is to support the business by providing the fundamental technology and process structure for an IT Strategy. This in turn makes IT a responsive asset for successful modern business strategy.

Enterprise Architecture (EA) includes governance processes for closing the gap between current state EA and future state EA. These processes (IT principles regarding operation, data, architecture, infrastructure etc.) are somewhat similar to the processes of IT Governance. Both IT Governance and EA Governance provide policies, standards, guidelines and procedures to follow. However:

- EA Governance governs the development and implementation of EA throughout the company
- IT Governance governs the everyday IT operations within the company.
- EA Governance might cover decision-making beyond the scope of IT
- IT Governance only apply to the IT environment [29].
- EA Governance is primarily strategic and focused on directing the evolution of the IT and business environment towards a desired design of a future state that will enable a new competitive competence [29]
- IT Governance is primarily operational and secondary strategic with the focus on directing how IT services enable business operations

TOGAF (described in appendix C) specifies the CobiT framework (described in appendix D) as a good tool for implementing IT Governance. TOGAF defines how to develop EA Governance, but it states that IT Governance is a much broader topic and beyond the scope of most Enterprise Architecture frameworks [30].



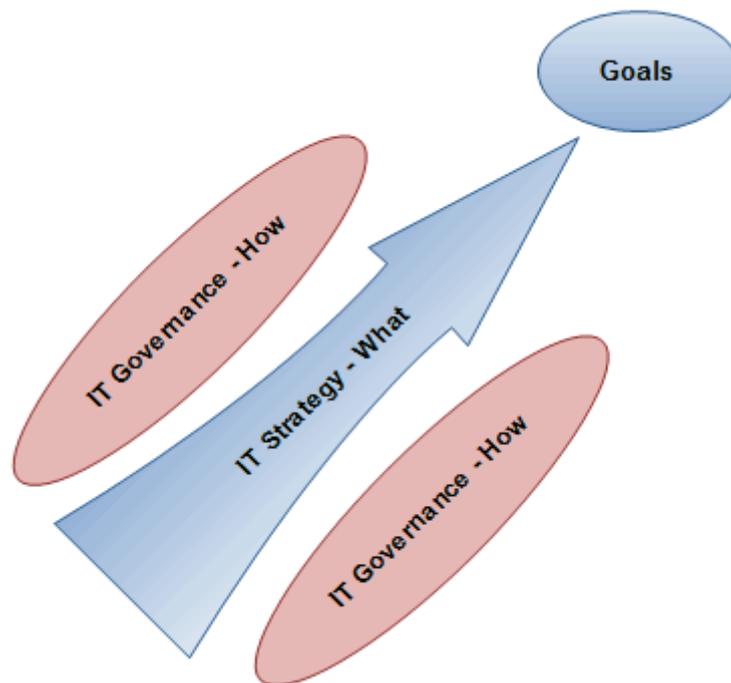


Figure 3 - Governance principles will guide the Strategy

IT Strategy describes which possibilities and limits that surround an enterprise. The possibilities comprise available resources and how to implement and maintain information systems and information technology. IT Strategy describes how possibilities are rated to the enterprise, how time-limits on tasks are set within an enterprise and when the enterprise should pull out of yesterday's possibilities. IT Strategy is all about defining where the enterprise wants to go IT-wise in the long term. This involves IT architecture and infrastructure (EA concepts), but also enterprise direction, market strategy, competition, environment, knowledge-strategy, and alliance strategy. IT Governance is mainly a set of principles. These principles may deal with some of the same issues as the IT Strategy. However, primarily the IT Strategy should set the goals while the IT Governance should set the rules on how to operate. IT Governance is by definition [30] a provider of the framework and structure that links IT resources and information to goals and strategies.

IT Strategy focuses on business competition and long term and short term IT trends. IT Governance and Enterprise Architecture frameworks do not necessarily take these aspects into consideration. IT Strategies can be developed to help outmaneuver competition. In addition, strategic priorities can shift as companies attempt to respond to competitor initiatives or to seize new opportunities. IT Strategy may also encompass hiring strategies. For example, an IT Strategy might describe minimum education IT employees should possess when hired. This is not a part of either Enterprise Architecture or IT Governance. Enterprise Architecture can be considered *the bridge between strategy and implementation* [31]. Enterprise

## 2. Perception of Concepts

Architecture is a process that ensures alignment, integration and agility for an enterprise.

Gartner separates the concepts on the following basis [32]:

<b>IT Strategy</b>
Sets long term goals for the IT organization Establishes directions and constraints Identifies assets and capabilities necessary Contains sourcing options (buy off-the-shelf, outsource or develop in-house) Contains service delivery plans and Service-level agreements (SLAs) Contains IT training, mentoring and recruitment programs
<b>Enterprise Architecture</b>
Contains both a process and a framework The process of translating business vision and strategy into effective enterprise change Is about creating, communicating and improving the key requirements, principles and models that describe the enterprise's future state Enables evolution Scope includes: people, processes, information, technology and the relationship between them
<b>IT Governance</b>
The processes that ensure effective and efficient use of IT in enabling an organization to achieve its goals Processes composed of inputs, outputs, roles and responsibilities

Table 2 - Gartner's separation of concepts [22, 32]

Gartner states that Enterprise Architecture and IT Strategy are complementary efforts that must be coordinated and integrated, but they are not the same [32].

# 3. StatoilHydro

This chapter explains StatoilHydro's overall organization and governance. It starts off by describing the Management System in StatoilHydro, including the StatoilHydro Book, the Business Process Model and internal Performance Management. The chapter goes on to discuss the Corporate Governance with focus on IMT, long term and short term IMT Strategy, how Enterprise Architecture is ordered at StatoilHydro, and finally IT related Governance.

Figure 4 shows the hierarchy of governance within StatoilHydro. This figure will be used and described throughout this chapter as each governance level is explained.

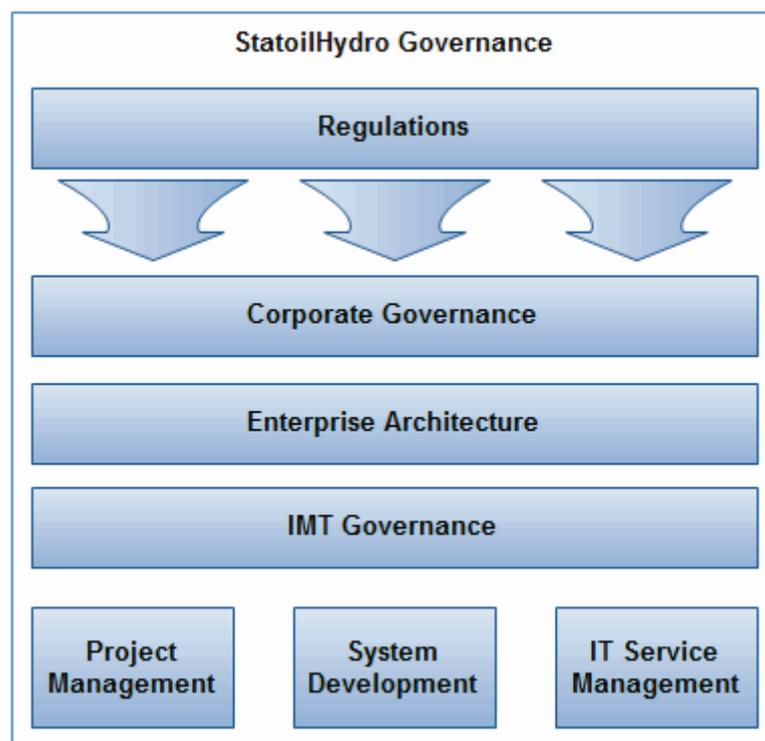


Figure 4 - StatoilHydro Governance, based on information from [33]

## 3.1 Regulations

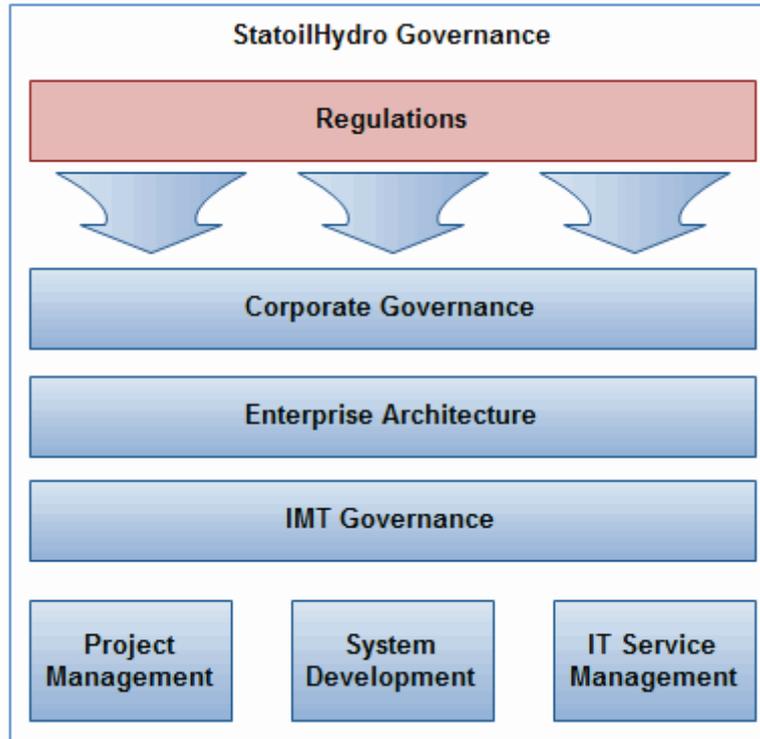


Figure 5 - Regulations, based on information from [33]

Regulation is about controlling the company behavior based on **external** rules and restrictions [34]. Regulation can take many forms; legal restriction promulgated by a government authority, self-regulation (norms and morals), co-regulation and market regulation.

As an oil and gas company, StatoilHydro is affected by many government regulations. The Norwegian law affects StatoilHydro, but they are also affected by the law of all other countries that they operate in. For example: the Norwegian Petroleum Directorate have regulations that StatoilHydro has to follow on how to operate concerning oil and gas within Norway, and the Norwegian Labor Inspection Authority has regulations on how to treat employees.

The regulations differs from country to country, and as StatoilHydro has oil and gas operations in Norway, USA, Brazil and Canada and some minor operations in other countries, there are a lot of different regulations to consider.

The StatoilHydro work processes (exemplified in chapter 3.2.2.1) are designed in accordance with best practice and the regulations that affect the operation. A central aspect of StatoilHydro's Business Process model (described in chapter 3.2.2.1) is to be able to use the best practice work process in each and every case, and at the same time be able to change the affecting requirements and regulations. Each work process may be altered from country to country as the affecting regulations differ, but the main policy is to keep the best practice work process as unchanged as possible and rather change exceptions and affecting requirements [35]. This is some of the essence of StatoilHydro's Business Process Model (described in chapter 3.2.2.1). All the different requirements and regulations affecting the daily operation of StatoilHydro are collected and carried out in the Business Process Model.

## 3.2 The Management System

The StatoilHydro Management System has three main objectives [36]:

- To incorporate values, people principles and leadership principles in everything StatoilHydro does
- To ensure fulfillment of formal external and internal requirements
- To drive business performance through high quality decision-making, fast and precise execution and continuous learning

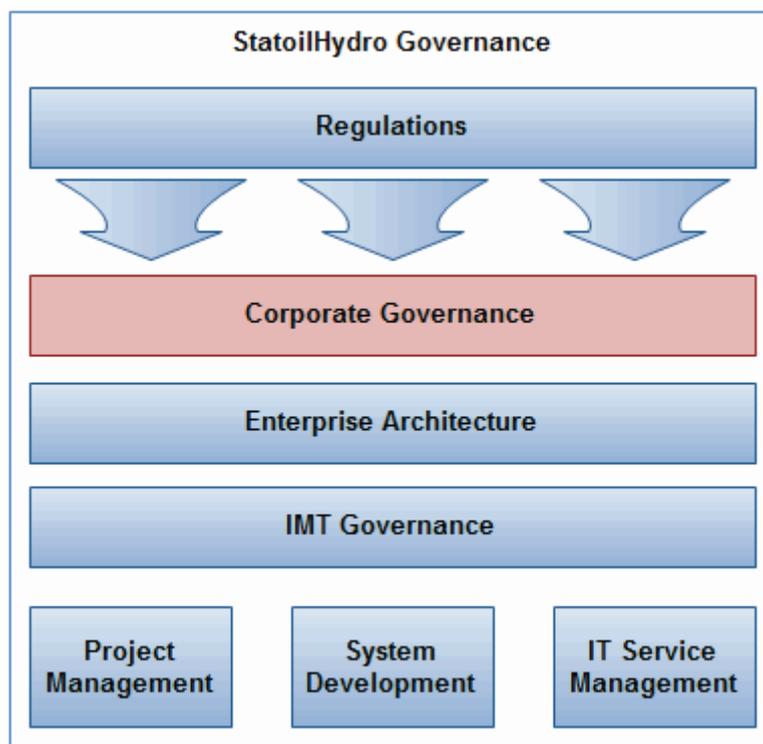


Figure 6 - Corporate Governance, based on information from [33]

The Management System is reflected in the Corporate Governance, and Corporate Governance is considered a vital part of the Management System. Corporate Governance within StatoilHydro is very much affected by the laws and regulations described in the previous chapter. Corporate Governance is further explained in chapter 3.3.

The Management System contains the **StatoilHydro Book**, **corporate function requirements** and **business area requirements** as shown in Figure 7.

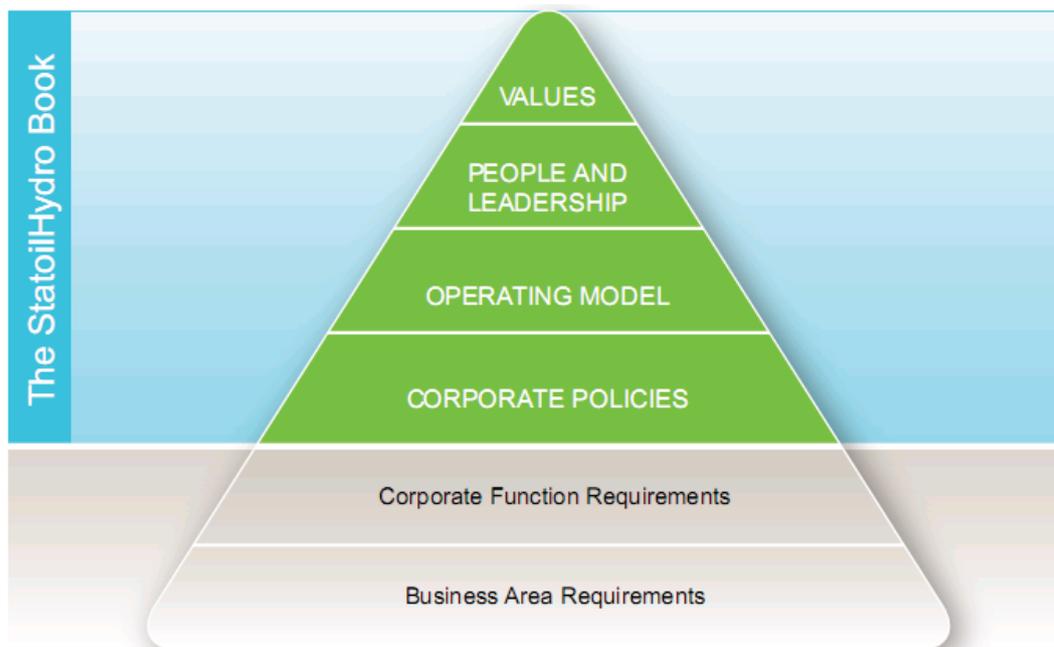


Figure 7 - The Management System [36]

The **StatoilHydro Book** (This will probably be renamed the “StatoilHydro book”, as StatoilHydro is no longer called StatoilHydro. I will call it the StatoilHydro book throughout this thesis) contains the company values (guiding day-to-day behavior), people and leadership (describing what StatoilHydro expects from company, people and leaders), an operating model (describing organizational principles, work description and management description to improve performance) and corporate policies (regulating actions and decisions in important areas).

**Corporate function requirements** describe function requirements (FRs) and work process requirements for the common work processes across StatoilHydro.

**Business area requirements** control the organization, the Management System and activities for business areas and other organizational units. It also describes technical, operational and administrative requirements for individual business areas and other units.

These parts together complete StatoilHydro’s Management System. The Management System encompasses the Governance, Strategy and Enterprise Architecture of StatoilHydro.

The next subsections will describe each part of StatoilHydro’s Management System in more detail.

### 3.2.1 The StatoilHydro book

The StatoilHydro book covers domains such as governing bodies, Management System, company values, people- and leadership-principles, operating model and corporate policies.

Helge Lund (CEO of StatoilHydro) states in the StatoilHydro book preface that the company ambition is to be a globally competitive company. He encourages high performance and opportunities for personal development. He states that an ultimate goal is to have a strong and value-based performance culture, clear leadership principles and an effective Management System [36].

Helge Lund states that the StatoilHydro book defines a common platform for how StatoilHydro manages business; it sets the standards for behavior, performance and leadership.

### 3.2.1.1 Governing bodies

The Corporate Governance is a precondition for a sound and sustainable company [36]. StatoilHydro's governing bodies are supposed to help ensure that StatoilHydro runs their business in a justifiable and profitable manner, and that it benefits employees, shareholders, partners, customers and society. The governance structure of StatoilHydro is based on the Norwegian law as exemplified in chapter 3.1 about regulations.

Governing bodies in StatoilHydro includes **the board of directors, the general meeting** and **the corporate assembly**. **The board of directors** is responsible for the overall management of the StatoilHydro group, and for supervising the group's activities in general. They handle matters of major importance, and they appoint the president and chief executive officer (CEO). They also establish the working instructions, power of attorney, and terms and conditions of employment for the president and CEO.

**The general meeting's** tasks include approving the company's accounts and the allocation of net income, electing the members of the corporate assembly, and electing the members of the election committee. **The corporate assembly** has a duty to supervise the board of directors and the president and CEO in managing StatoilHydro. See Figure 8 below for an overview of the governing bodies and the connection between them. Not all of the governing bodies are relevant for this master thesis and will therefore not be described.

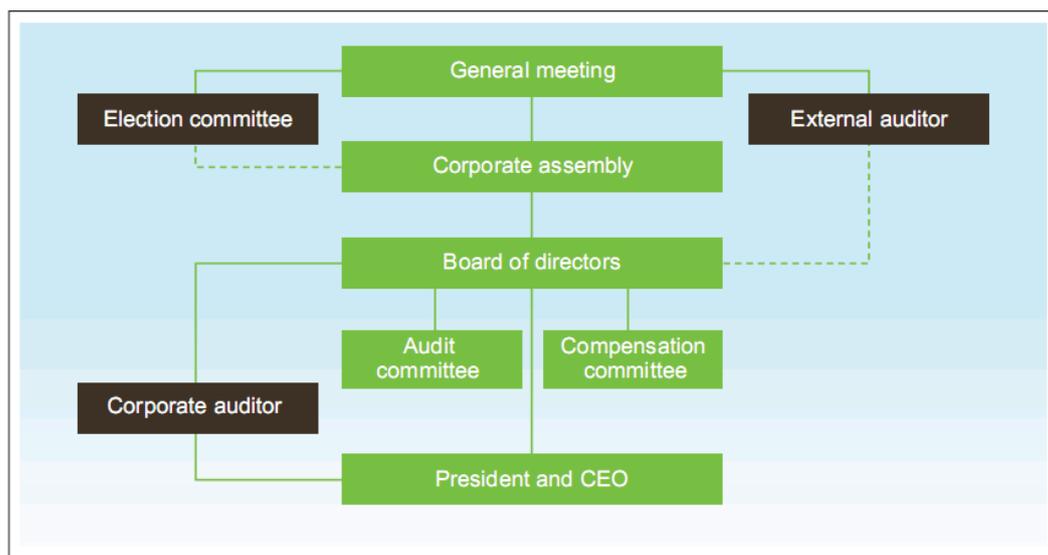


Figure 8 - Governing Bodies [36]

### 3.2.1.2 StatoilHydro's values

StatoilHydro's values are at the core of the Management System and they are supposed to lead way in decision-making. The values include [36]:

- **Courageous:** Be ambitious, identify opportunities and challenges, make demands and manage risk
- **Open:** Be trustful, curious, promote value diversity, communicate well, be ethical
- **Hands-on:** Deliver on promises, develop expertise, strive for simplification and clarity, act loyal to decisions and show dedication and endurance
- **Caring:** Cause zero harm to people and prevent accidents, save the environment, act within law, demonstrate social responsibility and respect the individual

These values complete StatoilHydro's overall ambition on how to act as a company and as individuals. Every StatoilHydro employee should be aware of the company values, and act accordingly.

### 3.2.1.3 People and leadership

The StatoilHydro book describes what is expected from the employees and leaders of StatoilHydro. It defines a *people partnership* which identifies what employees should expect from StatoilHydro, and what StatoilHydro expects from its employees. Examples of the people partnership guidelines include:

- StatoilHydro promotes a stimulating work environment guided by their values and a commitment to the employees personal and professional development
- The employee upholds and lives StatoilHydro's values in all aspects of their work
- StatoilHydro values diversity and provides equal opportunities
- The employee takes initiative and continuously looks for ways to improve performance

It includes a more detailed list of what StatoilHydro expect from its leaders regarding:

- Personal qualities (commitment, integrity and self-insight)
- Performance standards (deliver results, drive change, develop and energize people and demonstrate passion for the values)
- Leadership building (responsibilities, teach and learn and "bred from own ranks").

All requirements are described as both high level and low level principles that are meant to guide all employees and leaders of StatoilHydro through everyday work. This cannot be considered a governance mechanism; it is merely considered as rules and guidelines for StatoilHydro employees and leaders.

This thesis will not go further into detail of the *people partnership* as this is both sensitive and irrelevant information.

### 3.2.1.4 Operating Model

StatoilHydro’s operating model is about how to manage performance. It sets priorities based on the values and *drives performance through execution with precision, quality, speed and continuous improvement of results* [36]. The operating model consists of organizational principles and the “Ambition to Action” (A2A) process.

The organizational principles define how StatoilHydro is structured and managed. There are 5 principles, each with a different purpose. The principles define [36]:

- How value is created and performance is driven within the organization
- Responsibilities and roles of the organizational units
- Establishment of authorities through assignments of tasks
- That all individuals are accountable for actions and measurable deliveries
- Primacy if conflicts occur

These principles will not be described in detail.

“Ambition to Action” (A2A) is StatoilHydro’s internal way of setting targets and goals, plan and execute, and evaluate employees. The main purpose of A2A is to identify and implement actions necessary to deliver on long-term ambitions and goals. A2A will be described both here, and in chapter 3.2.3. This chapter will explain A2A, and chapter 3.2.3 will put A2A in perspective relative to other strategies.

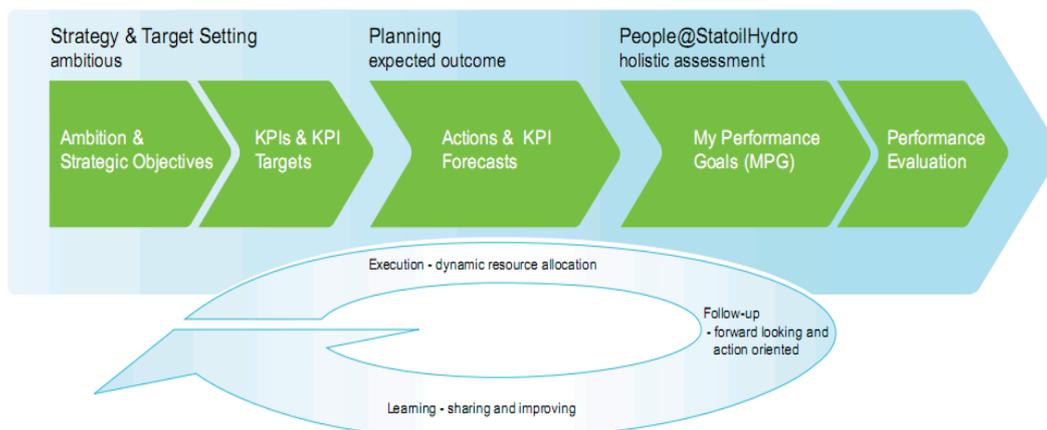


Figure 9 - Ambition 2 Action [36]

A2A guides the cycle in Figure 9 from ambition and target setting, through execution, to individual performance evaluation. It is a continuous, dynamic, forward-looking and action oriented process.

In A2A StatoilHydro's long-term ambitions are translated into shorter-term strategic objectives, key performance indicator (KPI) targets and required actions across five delivery areas. The five delivery areas are:

- People and organization
- Health, safety and environment
- Operation
- Market
- Finance

**Strategy & Target setting** from Figure 9 above is about developing a long-term strategy and goals and ambitions that one wishes to realize. This can be translated into KPIs that will measure the delivery.

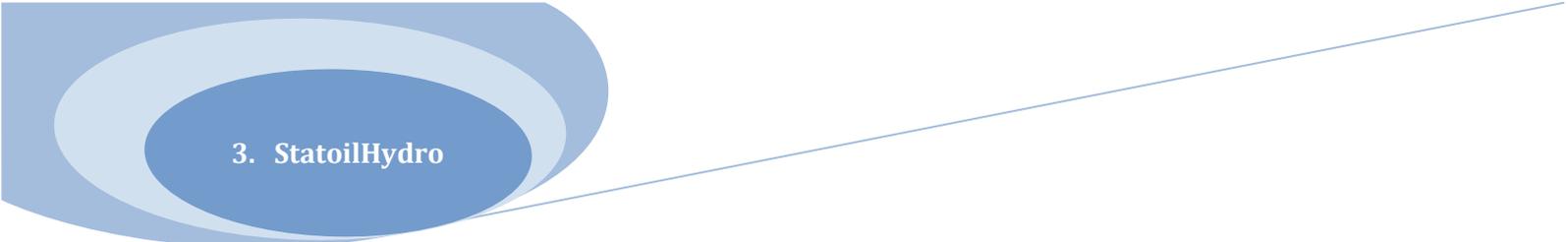
**Planning** from Figure 9 focuses on actions necessary to deliver on objectives and targets, and includes [36]:

- Initiatives required to meet the strategic objectives and KPI targets
- Unbiased forecasts of the expected consequences of these actions on relevant KPIs and other financial/operational developments
- The most important risks and actions to manage these.

Forecasts provide an early warning of possible gaps against targets. Planning includes employees and organization actions for all relevant levels of the organization, to manage the people and capability base in alignment with business priorities.

**People @ StatoilHydro** from Figure 9 ensures alignment between business targets and individual targets. The individual targets are tested against the KPIs and strategies set on higher levels. Employees are also tested through behavior targets based on formal feedback from dialogue. This means that each employee of StatoilHydro is measured against the goals that are set for him/her and general behavior. The objective of this evaluation is to support the development of employees and give a clear picture of individual performance and potential.

Summarized, A2A starts off with the business executives deciding on strategy, goals and target state for StatoilHydro. These goals are translated into more specific goals as they seek fulfillment and completion down the company hierarchy. This can for example be IT goals for the IT department to help complete the business strategy. Each hierarchy level and function of StatoilHydro has A2A goals. On the lowest



### 3. StatoilHydro

At the hierarchy level the goals are translated into personal goals for each and every employee of the StatoilHydro organization. Fulfillment of all individual goals will achieve the business strategy, goals and target state set by the StatoilHydro executives.

### 3.2.1.5 Corporate policies

StatoilHydro has nine corporate policies. These policies guide behavior, actions and decisions. They cover the following areas:

- Health, safety and environment (HSE)
- Ethics
- Social responsibility
- People
- Communication
- Risk management
- Finance and control
- Procurement and logistics
- Information management

**Health, safety and environment (HSE)** ensure safe operations that protect people, the environment, communities and assets. StatoilHydro's aim is to use natural resources efficiently and provide energy that supports sustainable development. HSE encompasses several principles for what StatoilHydro is committed to, and how they work in order to secure and protect. This corporate policy can be associated with and connected to StatoilHydro's corporate value "Caring" (see chapter 3.2.1.2).

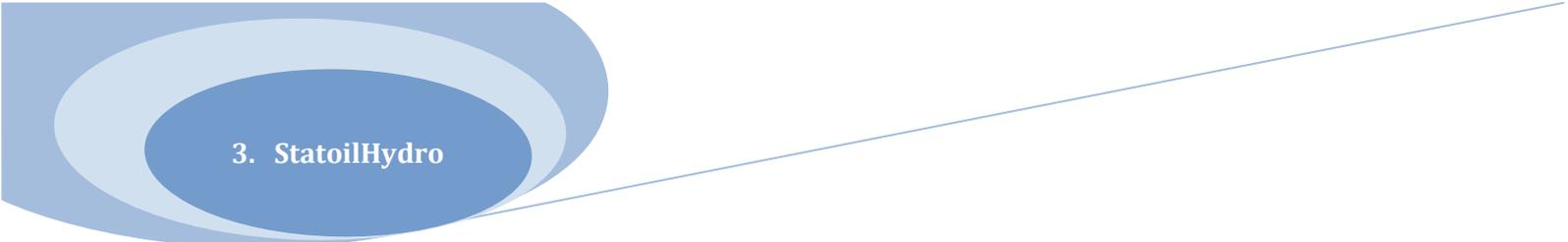
StatoilHydro believes that an **ethical** conduct is a necessary condition for a sustainable business. The corporate policies have principles for how StatoilHydro is committed to have ethical standards and principles for how to work to follow these standards.

StatoilHydro has a **social responsibility** to contribute to development based on their activities in all countries they are involved in. Specially designed principles explain what StatoilHydro is committed to, and how they have to work to achieve this.

StatoilHydro has a set of high-level principles for how to ensure quality in selection and development of employees (**people**).

**Communication** is about having an open and clear dialogue in all parts of StatoilHydro's operation. Principles are included to ensure precise and honest communication.

StatoilHydro identify, evaluate and manage **risk** in all activities. Risk is managed to secure safe operations and to reach corporate goals. The principles regarding **risk management** is supposed to help administer and coordinate risk at all levels. See the definition of **risk management** in chapter 2.1 about GRC.



### 3. StatoilHydro

A2A (see chapter 3.2.1.4 and chapter 3.2.3) is essential for StatoilHydro to accomplish high quality **finance and control**. The StatoilHydro Book includes high level principles for what StatoilHydro employees are committed to, and how they should work to accomplish this.

StatoilHydro believes that maintaining a strong relationship with high-quality suppliers will contribute to a sustainable edge. **Procurement and logistics** as corporate policy contributes to this by including principles for what StatoilHydro is committed to, and how they should work to achieve this.

Finally, **information management** as corporate policy helps StatoilHydro manage information so that it is accurate, appropriate, handled according to sensitivity, and readily available. This will be discussed further in chapter 3.6, as it is a part of StatoilHydro's IMT Governance.

## 3.2.2 Tools of the Management System

The StatoilHydro Corporate Governance system has some tools intended to help “spread the word” about governance decisions and processes. These tools include a Business Process Model (BPM), Docmap and APOS. The Business Process Model is described in subchapter 3.2.2.1.

**Docmap** contains all governing documents. The governing documents contained in Docmap are required to [37]:

- Be developed in a language understood by the target group
- Take into account specific regulatory requirements (of for example the country in which they are valid)
- Have a clear validity area
- Be well coordinated across functions and work processes

The governing documents contained in Docmap include responsibilities: How to approve a new governing document, responsibilities of the Management System, ethics and values in governance, operating models, process network, evaluation of control design, process owner responsibilities and verifying of information.

**APOS** (Arbeids Proses Orientert Styring. Translated: Work process oriented governance) contains work process requirements [37]. A work process describes activities that have to be done in a certain order to complete a planned delivery, a product or another result. Work processes are connected to requirements and best practices in APOS.

The requirements explain what has to be done and the best practices describe how it should be done. Requirements can be from government regulations or important governing elements inflicted by StatoilHydro itself. A best practice is the updated best known method or procedure of completing a work operation.

### 3.2.2.1 Business Process Model

StatoilHydro is in a transition from a document-oriented governed company to a process-oriented governed company [35]. Being a document-oriented company implies that all governance, employee instructions, process descriptions, regulations and exceptions are described in documents. Being process-oriented implies that all company activities are defined in processes.

StatoilHydro’s newly developed processes contain information about all activities. All of regulations, governance, etc. are included in the process descriptions as exceptions or tasks. Each process has a process owner which is responsible for the management of that certain process. This includes both the high-level processes and the lower-level processes. The process owner is responsible for ensuring that the process description ensures best practice and that it uses the correct information, technology and applications. A more concrete description of the process owner’s role is included in chapter 3.3

StatoilHydro’s Business Process Model (BPM) consists of a set of core processes, and a set of support processes (see Figure 10). The **core processes** include all processes regarding StatoilHydro’s oil and gas. This chain embodies all processes regarding exploration, drilling, plant operation, marketing and supply of oil, including relating project management technology processes. It follows the oil from the ground to the gas stations.

The **support processes** include all other functionalities of StatoilHydro that help support and maintain the daily operation. This can for example be the Information Technology process which contains business processes for how to operate IT within StatoilHydro or the Legal process which deals with all legal sub-processes.

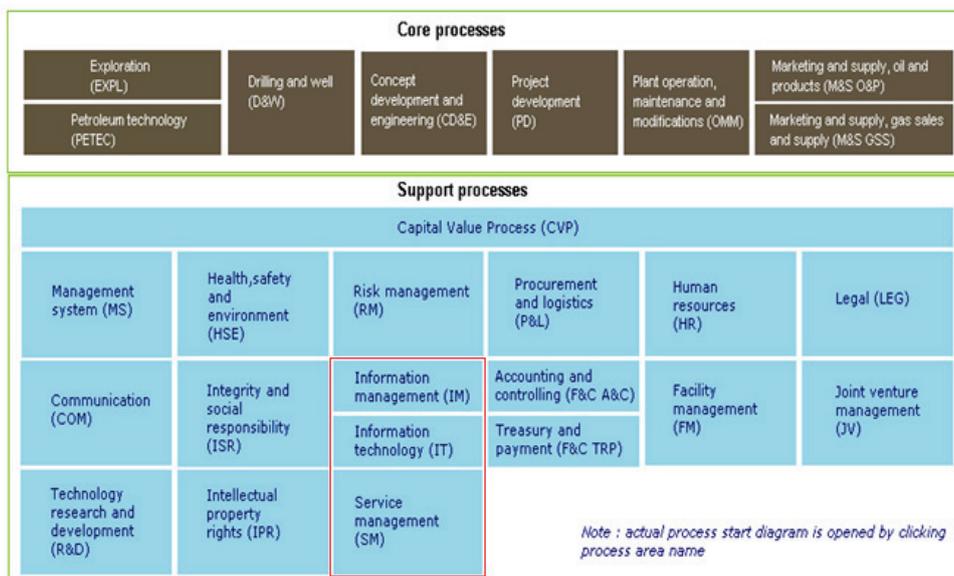
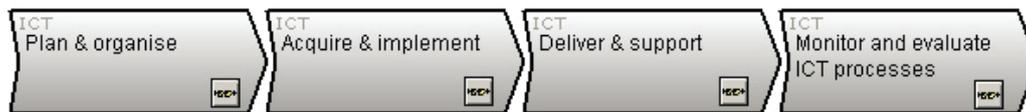


Figure 10 - Process map of StatoilHydro [38]

Each process is divided into a map of lower-level processes. In this thesis I will exemplify with the Information Technology process, as this is the most relevant. However, each of the individual core processes and the support processes contains a different map of lower-level processes.

Figure 11 displays the lower level processes of the Information Technology support process displayed in Figure 10. The IT process consists of the four elements of CobiT (described in chapter 4.1.3 and appendix D), and the IT process is discussed in chapter 3.6 (IMT Governance).



**Figure 11 - The StatoilHydro IT process [38]**

The “Plan & Organize” process covers strategy and tactics, and concerns the identification of the way IT can best contribute to the achievement of the business objectives [38]. Furthermore, the realisation 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.

To realise the Information Management and Technology (IMT) Strategy, IT solutions need to be identified, developed or acquired, as well as implemented and integrated into the business process [38]. This is done in the “Acquire & Implement” process. In addition, changes in and maintenance of existing systems are covered by this process to make sure that the life cycle is continued for the systems.

The “Deliver & Support” process is concerned with the actual delivery of required services, which range from traditional operations over security and continuity aspects to training [38]. The process includes the actual processing of data by application systems, often classified under application controls. The process is implemented through StatoilHydro's CobiT and IT service management (ITIL) processes (described in chapter 4.1.3).

All IT processes need to be regularly assessed over time for their quality and compliance with control requirements. The “Monitor & Evaluate ICT processes” 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 [38]. It does also cover periodic corrections and changes to the IT processes to keep them in line with the business needs.

### 3. StatoilHydro

The Business Process Model is a hierarchy of processes. Figure 12 below displays the subprocesses contained in the “Plan & Organize” process. These processes are originally defined in the CobiT framework (described in appendix D). The “sequence below is a sub-process of the IT process. I will not describe the content of these processes in detail; they are merely shown to exemplify the hierarchy of processes within the BPM.



Figure 12 - The “Plan & Organize” process within the IT process [38]

Figure 13 below displays the processes contained in the “Define a strategic ICT plan” process from Figure 12 (over).



Figure 13 - The “Define a strategic ICT plan” process [38]

Figure 14 displays the IT tools that are necessary for the “target setting and planning” process contained in the “define a strategic ICT plan” process.

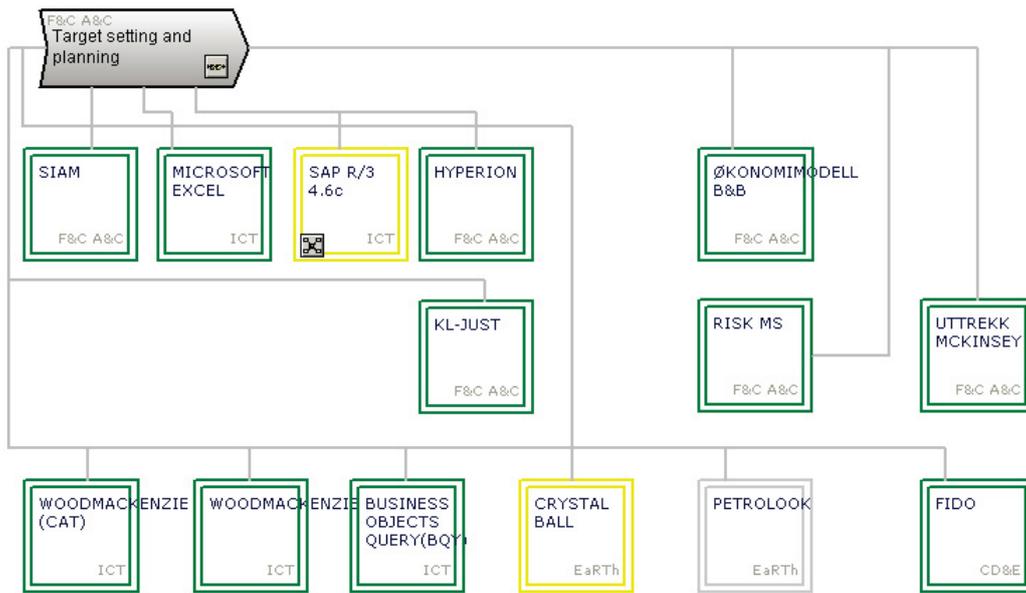


Figure 14 - Available tools in the "Target setting and planning" process [38]

The colors in Figure 14 indicate whether or not the application is in use (green), is about to be phased out (yellow), or phased out (gray). The text in the bottom right corner of each application indicates the process owner. For example; *Microsoft Excel* is owned by the ICT process owner.

Figure 15 below displays the Business Process Modeling Notation (BPMN) model of the "Identify ICT opportunities" process contained in the "define a strategic ICT plan" process. BPMN notation is discussed in [39] and it is the lowest level of the process hierarchy. It reflects a specific order of work tasks for identifying ICT opportunities in StatoilHydro.

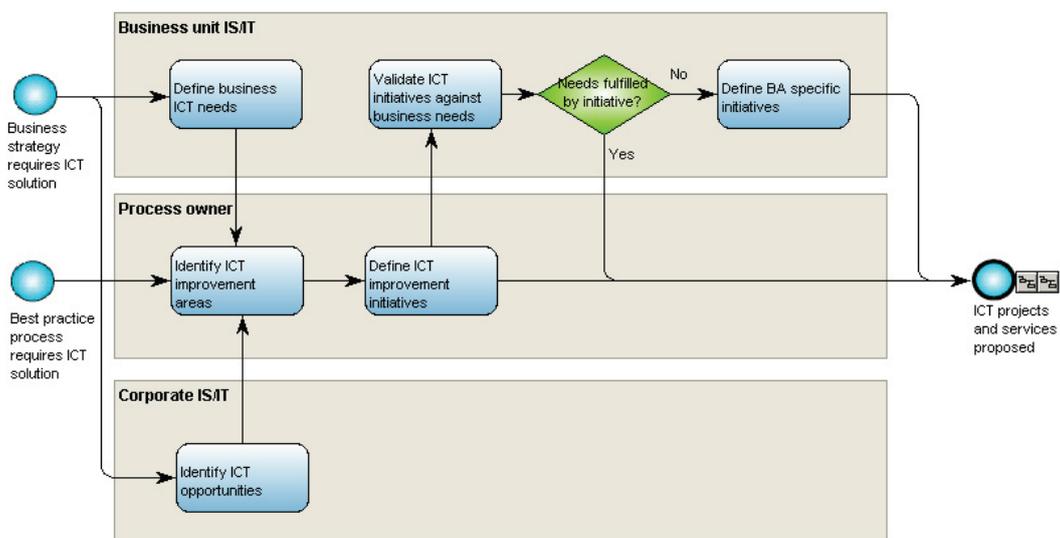


Figure 15 - The Workflow diagram of the "Identify ICT opportunities" process [38]

### 3. StatoilHydro

Figure 16 below shows an overview of the process hierarchy-path followed in the explained example.

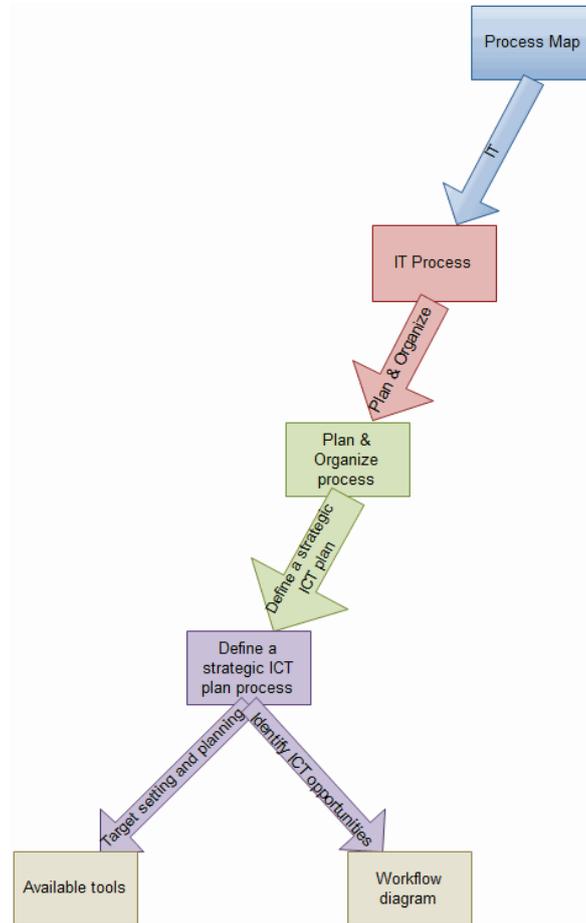


Figure 16 - Hierarchy of processes

The blue box indicates the process map of the core processes and the support processes. The red box indicates the IT process. The green box is accessed when “Plan & Organize” is chosen from the 4 IT processes. “Define a strategic ICT plan” is chosen as one of the 12 “Plan & Organize” processes. Finally, the gray boxes indicate the available tools and workflow diagrams of the “Define a strategic ICT plan process”. Different colors indicate the different hierarchy levels and the gray boxes are the lowest level of the process hierarchy.

### 3.2.3 Performance Management and Strategy

Ambition 2 Action is a way of managing the performance of individual employees in StatoilHydro. It is briefly explained in chapter 3.2.1.4, but this chapter will connect it to strategy.

A2A starts out as the ambitions of StatoilHydro formulated by the executives. This reflects a short term strategy for how to improve company performance the coming year. It is important to separate short term strategy from long term strategy. The short term strategy is supposed to help complete the long term and higher level strategy. The long term business strategy often reflects where a company wants to be in 5 years, while the short term strategy defines where a company wants to be in a year.

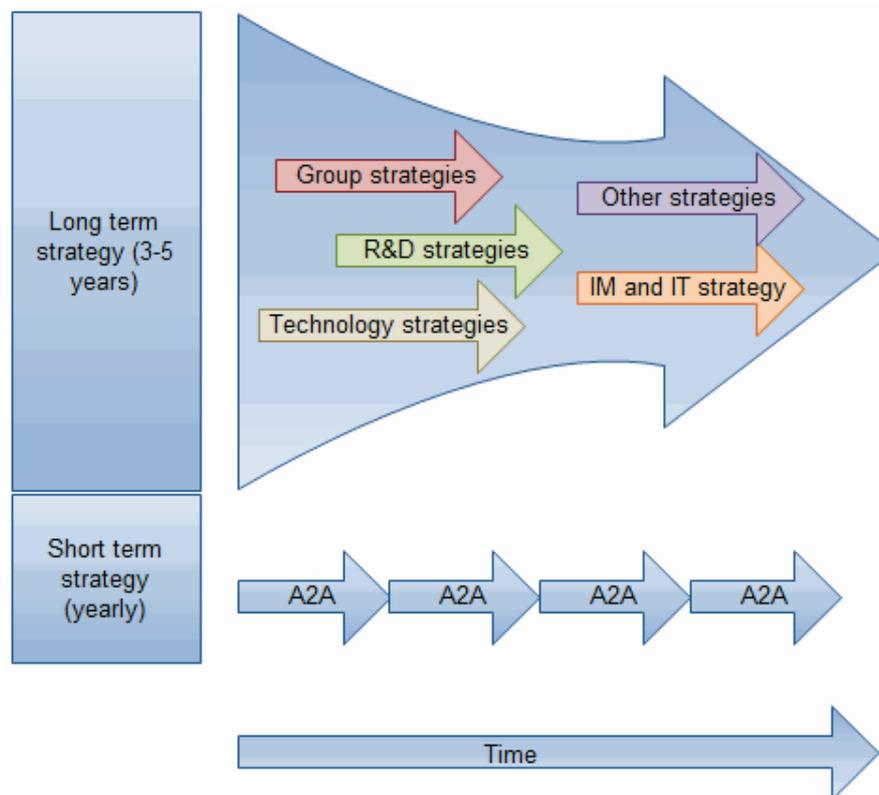


Figure 17 - Long term vs. Short term strategy

With the short term strategy, high level goals are translated into lower level goals and ambition for each unit of StatoilHydro. This includes all sections regarding Information Technology and Information Management. This means that the A2A goals must help complete the long term IM and IT Strategy [40]. The long term IM and IT Strategy is discussed in chapter 3.4. The short term IM and IT strategy is included in the A2A goals for the different sections.

### 3.3 IMT Corporate Governance

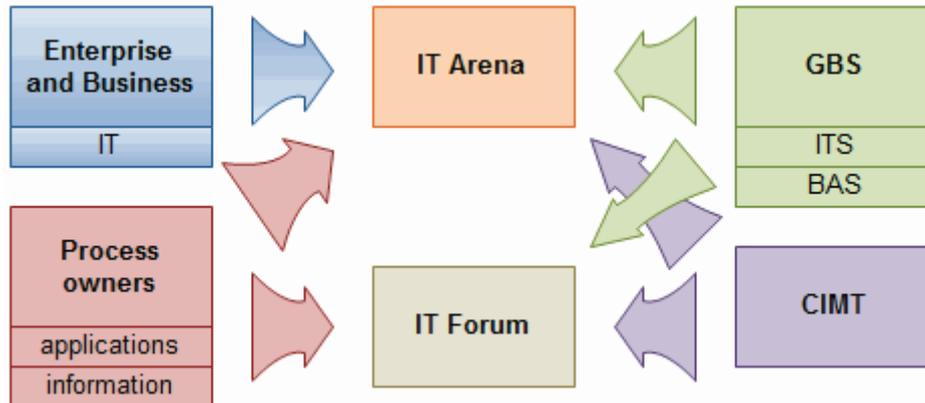


Figure 18 - Important governance mechanisms, focus on IMT

This chapter describes the roles of the process owners, the IT Arena, the IT Forum, Global Business Services (GBS) and Corporate Information Management and Technology (CIMT). This can be considered the inner Corporate Governance regarding IT.

**The StatoilHydro enterprise** (represented by the color blue in Figure 18) has an IT department responsible for day to day IT services and maintenance. The StatoilHydro enterprise includes all relevant business areas.

**Global Business Services** (GBS, represented by green in Figure 18) is the internal vendor of business support services in the StatoilHydro group. All services are produced and delivered according to principles and requirements set by corporate staff and process owners. GBS consists of IT Services (ITS) and Business Application Services (BAS). ITS provide infrastructure applications (applications such as portals that “everyone” uses), while BAS provides specific applications.

**Corporate Information Management and Technology** (CIMT, represented by purple in Figure 18) is the corporate staff for IM and IT. The head of the CIMT is the CIO, which is the process owner for the IM and IT processes and responsible for the IT Arena. CIMT is created to ensure that all IM and IT requirements and standards support StatoilHydro actively worldwide. CIMT is responsible for Information Security, Application Portfolio Management, Information Management and Collaboration, Governing documents and compliance monitoring, infrastructure and IT Governance.

Each process in the BPM (described in chapter 3.2.2.1) has a **process owner** (this is represented by the color red in Figure 18). Process owners include the specifically designated process owners and leaders in the corporate centre with responsibility for common work processes. The role of a process owner in StatoilHydro is to deploy best practice, capture lessons learned, follow up compliance and ensure improvement of the work processes.

The most important responsibilities of the process owners include:

- Establish and document own work processes
- Ensure that authorities and corporate requirements are included in the work processes
- Verify that the work processes are followed correctly
- Establish A2A for their own function
- Ensure that the process uses the correct tools
- Ensure that the correct information is enabled in the process

The process owner is responsible for defining work processes in his/her own area of field, define applications to be used in the process, define important information used in the process and define other relevant technology to the process. This covers all the architectural viewpoints (Business architecture, Information architecture, Technology architecture and Solution architecture) described in chapter 3.5 about Enterprise Architecture.

StatoilHydro has four arenas: IT, technology, exploration and projects. This thesis will only describe the IT Arena, as this is the most relevant for the scope of this thesis (but the same concepts generally apply for all arenas). The purpose of the arenas is to provide quality and consistency across the organization before important decisions are made. The arenas are meant to help ensure that decision makers in StatoilHydro understand expectations regarding the end result, that risk exposure is realistic and that decision making meets StatoilHydro's requirements.

The **IT Arena** (represented by orange in Figure 18) has the mandate to establish, prioritize and recommend the portfolio of major IT initiatives. This means that the main functionality of the IT Arena is to select a portfolio of projects that will help complete the business strategy. The IT Arena ensures that the portfolio is clear, well rooted in the business strategy, supported by the management and understood across the group [36]. The participants of the IT Arena includes: GBS representatives, CIMT, business area representatives and relevant process owners. The IT Arena is considered a part of the planning phase of the A2A process described in chapter 3.2.1.4 and chapter 3.2.3.

### 3. StatoilHydro

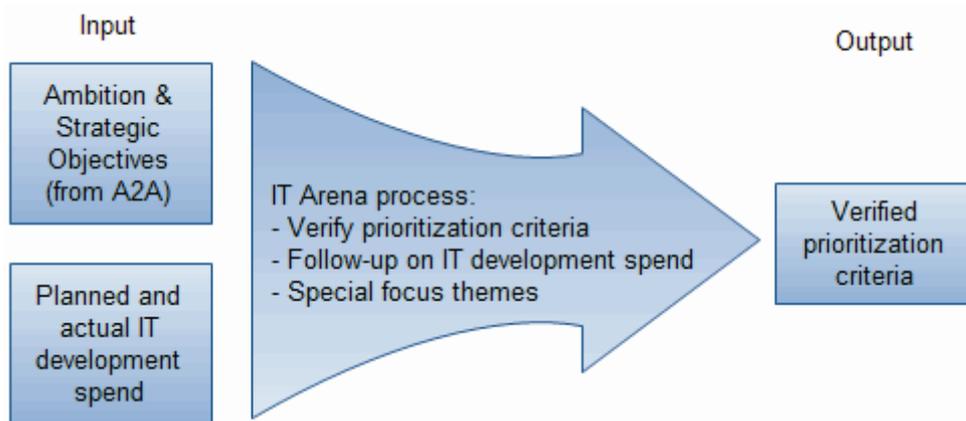


Figure 19 - IT Arena process description, based on [36]

Verifying the prioritization criteria (Figure 19) is about ensuring that the defined prioritization criteria reflect the current priorities of StatoilHydro. Follow-up on the IT development spends is about checking that the spending is as reported by the business areas and special focus themes. The special focus theme during the IT Arena process is different for each quarter (of a year). The first quarter enhances a special focus on the current portfolio and IT development spending. The second quarter enhances a special focus on the strategy from the A2A process and its IT implications. The third quarter enhances a focus on the most important new projects. The fourth quarter enhances a focus on verifying the prioritization criteria and revising the portfolio targets. The **IT Arena** participants include all relevant IT and IM process owners, representatives from business areas, CIMT and GBS representatives.

#### The **IT Forum**:

- Serves as a monthly IT process owners advisory panel, where ideas are discussed and proposals from the business units are put forward
- Makes no formal decisions
- Includes informal meetings for updating, briefing discussion of IT related matters between IT leaders
- Participants include: IT representatives from business areas, CIMT representatives and GBS representatives

The IT Forum defines and discusses IM and IT opportunities and challenges.

**Line role** is a distinct and different role in the StatoilHydro organization. The Line role is the actual executives and responsible personnel on locations. This is usually the employees executing the defined work processes. This can for example be the executive or worker of an oil plant or an oil platform. The Process owners define the process standards and processes while the Line role executes them and generates the funds.

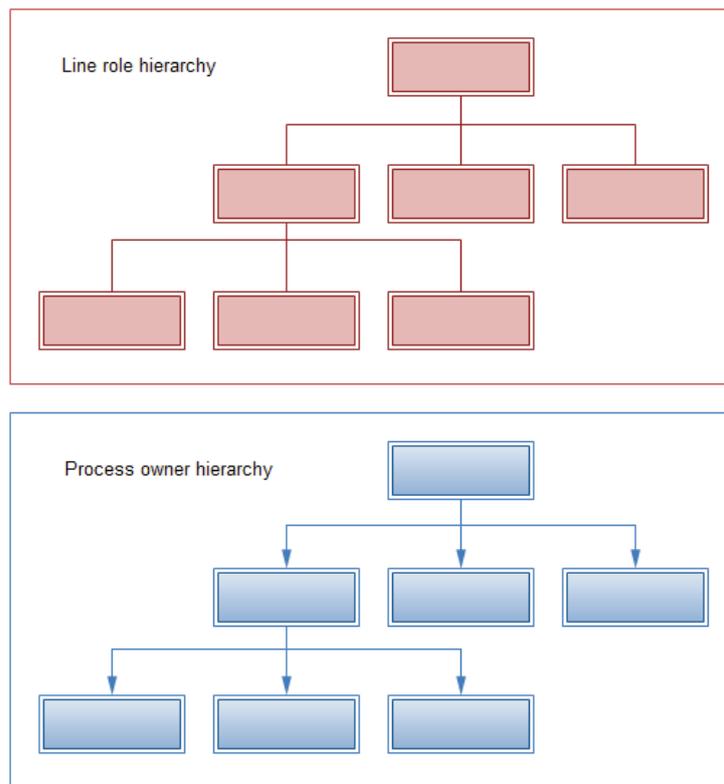


Figure 20 - Hierarchies

Figure 20 indicates that both the line roles and the process owners are hierarchies. Each process in the process hierarchy has a process owner (which makes the process owner hierarchy). The line roles are the personnel on locations, for example an oil platform. The line roles execute the processes. The process owners designs and updates the processes.

### 3.4 IMT Strategy

The long term Information Management (IM) and Information Technology (IT) strategy is part of the overall business strategy in StatoilHydro. This chapter describes StatoilHydro’s IMT Strategy while chapter 4 will discuss the IMT Strategy.

Business area representatives and process owners are involved in the IMT Strategy through the process displayed in Figure 21 below. The figure describes how an IMT Strategy is developed in StatoilHydro. This is done through three steps. First, the developers of the IMT Strategy gains insight in the group business strategic objectives (representatives from corporate strategy), the business area objectives (representatives from each section of StatoilHydro), process strategic objectives (representatives from process owners) and the business technology trends. The next step is to understand implications and discover the opportunities. The final step is to prioritize projects and implement the strategy.

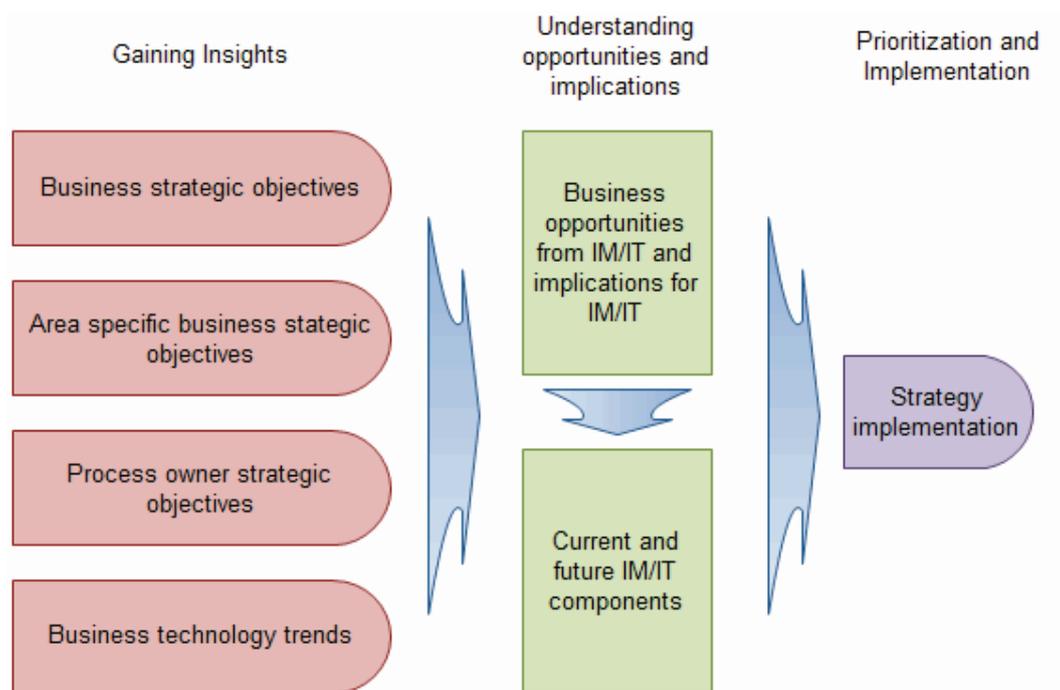


Figure 21 - Process to develop the IMT Strategy, based on [41]

### 3.4.1 Business Strategy and IM/IT implications

An important part of developing the IMT Strategy is understanding the impact of the industry trends, IT trends and business strategy for StatoilHydro. Analyzing these three aspects results in the defined opportunities and implications of the IMT Strategy.

StatoilHydro has defined five key themes that are crucial to energy companies around the world. The key **long term trends** within the oil and gas industry include:

- Global energy demand are set to grow: New sources of energy must be acquired
- Capital expenditure is set to increase: Operational excellence and modernized assets are essential
- There will be a future engineer shortage: Developing the workforce of the future can be harder
- Possibly a future marked liquidity and volatile prices: Increases the need to leverage information to create and optimize value
- Possible future environmental regulations and climate change: Increases the need to increase environmental stewardship

The energy **short term** trends most importantly include the current financial crisis of 2008/2009, lower market capitalizations and falling oil price. This affects StatoilHydro by driving the investment levels down, enforcing stronger cost focus, and business strategies and goals needs to be revised and therefore also short term strategy through A2A (described in chapter 3.2.1.4 and chapter 3.2.3).

Several **IT trends** open up value creation opportunities for the energy industry in general and therefore also StatoilHydro. StatoilHydro states that in 5 to 10 years:

- They will consume IT
- Available information is the asset
- Information is stored anywhere
- IT is an integral part of all disciplines
- The IT discipline is highly specialized
- Larger degree of automatization

StatoilHydro has identified a range of technological approaches, solution approaches and domain specific approaches that might become important within Information Technology and influence their business strategy, technology strategy and global collaboration. I will not go into detail of specifically what they have identified.

### 3. StatoilHydro

The most significant IM and IT goal for StatoilHydro is to support the business strategy and the four key focus areas (maximizing long-term value creation, building profitable international growth, developing profitable midstream and downstream position and creating a new platform for new energy). Based on the industry and IT trends, four main categories were defined for the IMT Strategy:

- Improved core business solutions: Identified need for improved capabilities to support core business processes. Focused on areas StatoilHydro has technology leadership ambitions.
- Improve collaboration solutions: Identified need for improved solutions for collaboration and information sharing. Special emphasis on meeting the needs of a global organization.
- Differentiate solutions: Identified need for higher degree of differentiated solutions caused by higher degree of variation in business needs. Differentiation is for the most part a topic in connection with international operations.
- Improve utilization of current standards: Potential for improved utilization of existing standards. Further roll-out of standardized processes and tools

StatoilHydro's IMT Strategy describes how important these categories are to each company sector. The IMT Strategy defines high-level requirements for how each of the categories will fulfill the need of the sector. The IMT Strategy lists all of the most important technical and non-technical actions for implementing the four main categories. This thesis will not describe the sector requirements and the actions, as this information is sensitive and not relevant.

## 3.4.2 Strategic direction

An important requirement for StatoilHydro is that all IM and IT initiatives shall be driven by the business goals. IMT Governance and prioritisation within StatoilHydro shall be holistic and aligned with the A2A process (described in chapter 3.2.1.4 and chapter 3.2.3).

StatoilHydro's most important IM and IT goals include:

- StatoilHydro gains competitive advantage by the way they
  - Apply unique IT in a few selected areas
  - Use own personnel in areas where business knowledge can add value
- StatoilHydro promote collaboration by
  - Being globally enabled by fostering collaboration and harvesting competence across both geography and people
  - Providing IT that works globally, internally and externally
  - Providing information that is readily available
  - Enforcing risk-based and efficient information security
- StatoilHydro reduce business cost and complexity by
  - Capitalizing on commoditisation of IT by using off the shelf processes and solutions
  - Not building specific processes or solutions unless it gives competitive advantage
  - Having a strictly governed portfolio of solutions
  - Having lean work processes and regulatory compliance
  - Applying a transparent charging model based on paying for what is used
- StatoilHydro show environmental responsibility by
  - Providing sustainable IT solutions in line with StatoilHydro's environmental objectives

### 3.4.3 Current- and future state of IM and IT

StatoilHydro's IMT Strategy defines the current state, future state and gap analysis of the five major components of IT. These components are displayed in Figure 22 below. The specifics of the gap analysis will not be discussed in this thesis due to sensitivity of information.

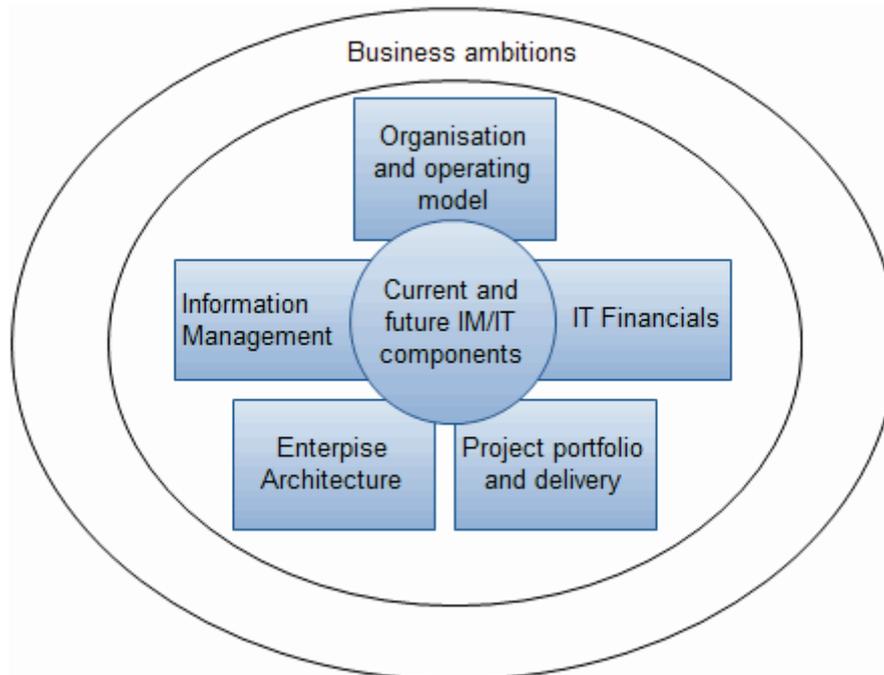


Figure 22 - Gap analysis of key components of IT, based on [41]

**Business ambitions** involve StatoilHydro's business ambitions as defined by corporate and business area strategies. These must set requirements on all dimensions of IT.

The **Organisation and operating model** must enhance aligned roles, clear responsibility and execution capability. The IT capabilities of StatoilHydro are required to be well managed and have functional integrity in order to meet the business needs.

The **IT financials** of StatoilHydro must significantly drive down operating costs of IT and make new supporting business requirements.

The **project portfolio & delivery** involve clear prioritisation mechanisms and balance.

The **Enterprise Architecture** will enable StatoilHydro to view the business from different perspectives and lift common understanding. The Enterprise Architecture of StatoilHydro is discussed in chapter 3.5.

Enterprise Architecture in StatoilHydro is defined as “the processes and methodologies used to align IT initiative with business goals” [35]. The current EA implementation and tools consists of all models in the Business Process Model, the documents of Docmap and the APOS models. There is a stronger focus on Enterprise Architecture in the current IMT Strategy than previously used IMT Strategies which indicates that StatoilHydro’s awareness of EA as a concept is increased.

The most important gap analysis of **Information Management** involves actions to fulfil the information to be accurate, appropriate, handled according to sensitivity, and readily available.

The IMT Strategy includes more specific analysis of the current state, future state, and actions needed to close the gap between the two states. This will however not be discussed in this thesis as it is classified material and not relevant to the context of this thesis.

## 3.5 Enterprise Architecture

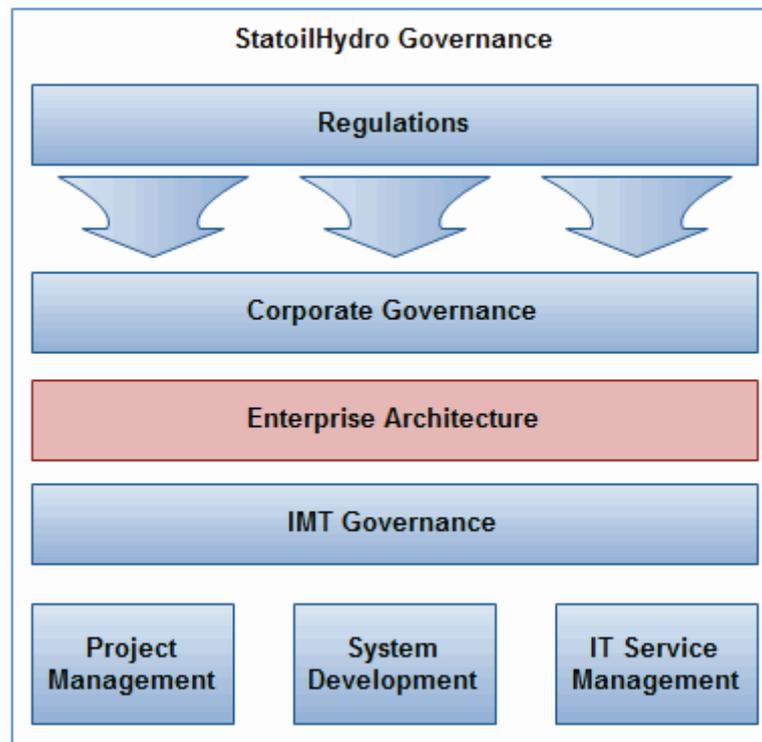


Figure 23 - Enterprise Architecture, based on information from [33]

StatoilHydro does not have a specific Enterprise Architecture group. Enterprise Architecture development is not one single unit's responsibility within StatoilHydro, but it is implemented through the Management System and it is the responsibility of several different units. In other words, StatoilHydro has a *federated* Enterprise Architecture, as opposed to a *unified* Enterprise Architecture. In a *federated* Enterprise Architecture the EA implementation is distributed across the organization. In a *unified* Enterprise Architecture there is a single group that handles EA implementation, EA development and EA Governance.

The closest comparison to an Enterprise Architecture group in StatoilHydro are the leading advisors [35]. The leading advisors have duties regarding the development of StatoilHydro's Enterprise Architecture. The leading advisor role and its connection to EA development is described in chapter 3.5.4.

Enterprise Architecture in StatoilHydro is not just about Information Technology. Some EA frameworks are designed for implementing Enterprise Architecture through Information Technology, but StatoilHydro has a different approach. Enterprise Architecture in StatoilHydro contains all activities and sections within the organization, and not just activities related to Information Technology.

StatoilHydro does not buy frameworks for implementing Enterprise Architecture. Enterprise Architecture is developed through access to Gartner papers and open source frameworks like TOGAF and Zachman.

This section of the thesis will explore StatoilHydro's approach on Enterprise Architecture.

## 3.5.1 Development Process

The primary sources on methodology for StatoilHydro when developing the Enterprise Architecture have been the Gartner framework (described in appendix A) and TOGAF (described in appendix C). It is important to state that the Enterprise Architecture within StatoilHydro includes StatoilHydro's entire organization; it is not limited to Information Technology.

The most important part used from the Gartner framework is the CRV model (discussed in appendix A) and the Gartner EA development process (Figure 39 page 118). Figure 39 shows that environmental trends and business strategy must be considered when developing the CRV and future state Enterprise Architecture. When both the future state architecture and the current state architecture are documented, it is important to govern and manage the process of closing the gap between the two. StatoilHydro has used the CRV primarily for identification and analysis of trends, business strategies and strategic requirements.

StatoilHydro has used TOGAF process and deliverable step in their Enterprise Architecture effort. The TOGAF ADM (described in appendix C) is used by StatoilHydro as development cycle. The next paragraphs will describe StatoilHydro's specified use of the different phases of the TOGAF ADM.

The **framework and principles** phase is about defining the organization, appoint the team and define the roles of the team members. The team should describe the purpose and scope of the architecture work, identify stakeholders, create a process description, decide on a meta-model (described in chapter 3.5.2) and create an Enterprise Architecture presentation.

**Phase A: Architecture vision** is about creating the previously discussed CRV through studying business strategies and interviews and workshops with stakeholders. This phase is also about defining a scope for the architecture effort (width, level of details, architecture domains, time and horizon), and define constraints.

**Phase B: Business Architecture** covers the two highest levels of the Zachman framework (conceptual and contextual - described in appendix B). This is the only related use of the Zachman framework that StatoilHydro has employed. It covers both process and information analysis. This phase is about developing a baseline design of the existing business architecture, selecting tools and viewpoints based on business drivers and stakeholder's concerns, and develop information requirements.

**Phase C: Information system architecture** is about creating models for data architecture and solution architecture. Data architecture describes the current data structures used by a business and/or its applications. This can be descriptions of data stores, data groups and data items, and mappings of data artifacts to data qualities, applications, locations and so on. Solution architecture is the architecture of applications within StatoilHydro.

**Phase D: Technology architecture** is about describing the current technology architecture (software patterns, infrastructure elements and tools, and physical/geographical location of the infrastructure elements).

**Phase E: Opportunities and solutions** is about reviewing the CRV and getting additional input on key business drivers of relevance to setting priority and sequence of implementation for migration actions. One should analyze gaps and identify development tasks from solution and technical architecture building blocks and add tasks for analysis.

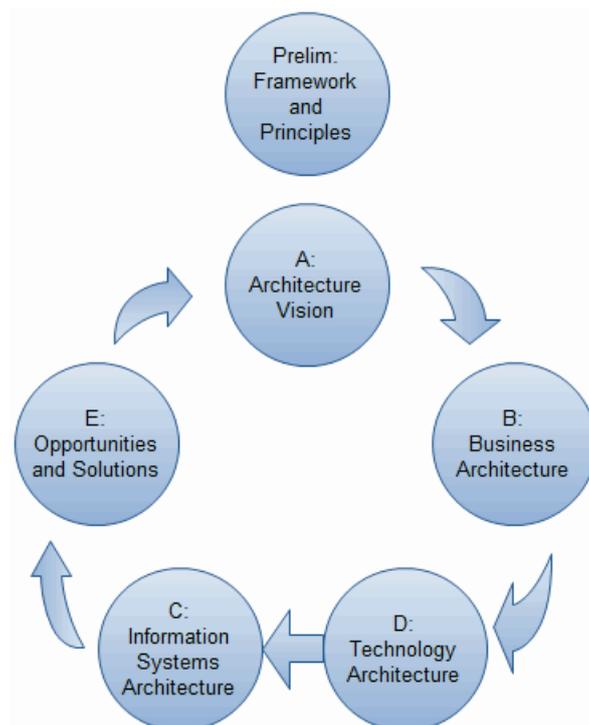


Figure 24 - StatoilHydro's TOGAF [42]

If we compare StatoilHydro's use of TOGAF phases to the TOGAF ADM described in appendix C, we see that StatoilHydro has used some phases and left some phases out. StatoilHydro's development method for Enterprise Architecture is loosely based on the TOGAF ADM. The last 2 phases of the TOGAF ADM are left out because of overlap with the governance system.

## 3.5.2 Meta-model

The Enterprise Architecture of StatoilHydro is expressed in terms of five architecture models: Business architecture, Solution architecture, Information architecture, Data architecture and Technical architecture. The development of these architectures follows the scheme described in the previous chapter.

The meta-model of the architecture models show how they are connected and related. The meta-model is displayed in Figure 25 below.

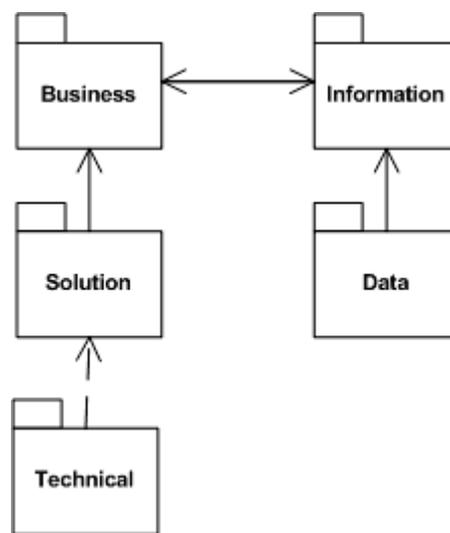


Figure 25 - Enterprise Architecture meta-model [42]

The Unified Modeling Language (UML) syntax used in this meta-model is explained in [42].

The five architecture models in this meta-model is inspired by Gartner's views (Information architecture, Business architecture, Technical architecture and Solution architecture) described in appendix A.

Business architecture contains all business processes, Information and Data architecture covers management of information, Solution architecture includes all applications, and Technology architecture maps all the technology of StatoilHydro.

Business architecture syntax is BPMN [42], Information architecture syntax is a language developed by StatoilHydro, and Technical, Solution and Data architecture are developed in UML [42].

### 3.5.3 Modelling

The general purpose of enterprise modeling in StatoilHydro is to visually describe different perspectives such as business processes, external and internal requirements, information usage, information systems and information technologies [39]. StatoilHydro has used enterprise modeling to model business processes, as well as workflow diagrams with corresponding requirements, roles and responsibilities.

The main purpose areas for StatoilHydro's enterprise models are:

- Compliance: What is the obligatory way to execute a task, and who are involved in this task?
- Portfolio management: Includes StatoilHydro's current and future portfolio of business processes, information systems and technologies. Also includes a roadmap for how to close the gap between current and future state.
- Analysis and decision-making: Includes the relationship between different objects in StatoilHydro's models.
- Standardization: Standardizing work procedures.
- Optimization: Optimizing the best practice work processes.

StatoilHydro uses the Business Process Modeling (BPMN) standard as basis for the process models. BPMN is described in [39].

A process model includes best practice work process descriptions (as described in chapter 3.2.2.1 about the Business Process Model), application use and information use.

A business process model of StatoilHydro is required to have **high cohesion** and **low coupling** with regards to other business processes [39]. High cohesion means that the activities within the business process have strong internal relations to each other and they work together to achieve the same goals. Low coupling means that the activities within a business process has few direct dependencies towards activities in other business processes, and are therefore not influenced by changes in those processes.

## 3.5.4 Organization

StatoilHydro is a process oriented organization. This implies that all work processes are modeled in a Business Process Model (BPM). The BPM of StatoilHydro is described in chapter 3.2.2.1. All requirements, exceptions and regulations are included in the BPM.

Goals and ambition-level for future state Enterprise Architecture are defined in StatoilHydro's IMT Strategy. The primary goals include [41]:

- Being open, collaborating and innovating with peers and partners
- Having solutions that support an agile and flexible business model driven by business needs
- Being globally enabled, harvesting competence and fostering collaboration across geography and people
- Being able to better understand IT implications from business change and spot opportunities across processes

These goals are very high-level and they will be discussed in chapter 4.1.2.

StatoilHydro defines Enterprise Architecture as “the processes and methodologies used to align IT initiatives with business goals” [35]. However, EA in StatoilHydro does not only contain IT operations. The Enterprise Architecture contains all architecture efforts seen through a business viewpoint, a technology viewpoint, an information viewpoint and a solution viewpoint. These viewpoints are developed from Gartner's methodology described in appendix A.

The **current state** Enterprise Architecture implementation in StatoilHydro was included in all governing and architectural documents in the Docmap tool. However, the last couple of years StatoilHydro has been going through a transition towards a future state Enterprise Architecture. The thought behind this transition is to develop StatoilHydro from a document-oriented company to a process-oriented company.

In the **future state** Enterprise Architecture implementation, all of StatoilHydro's operations will be included in the Business Process Model. This transition is almost completed. The ultimate goal is to have all governance, requirements, work processes, exceptions, regulations, risk management, use of tools use and use of information enclosed in the Business Process Model.

A complete Business Process Model is regarded as part of the future state Enterprise Architecture implementation of StatoilHydro [35] as the Business Process Model will contain:

- Processes: Work processes are regarded as the business view
- Information description: Each process will have information and information systems connected to it. This is the information view
- Tools and applications: each process will be linked to the solutions needed to perform the process. This is the solution view
- Technical aspects: Each process is connected to relevant technology. This is the technology view

Each of the previously described viewpoints has a process owner. These process owners are responsible for maintaining the architectural viewpoints and goals through StatoilHydro. They manage and direct the **leading advisors**, described in the next paragraph, to uphold the Enterprise Architecture initiative. The StatoilHydro's viewpoints are based on Gartner's methodology. Figure 26 below displays the connection of the viewpoints.

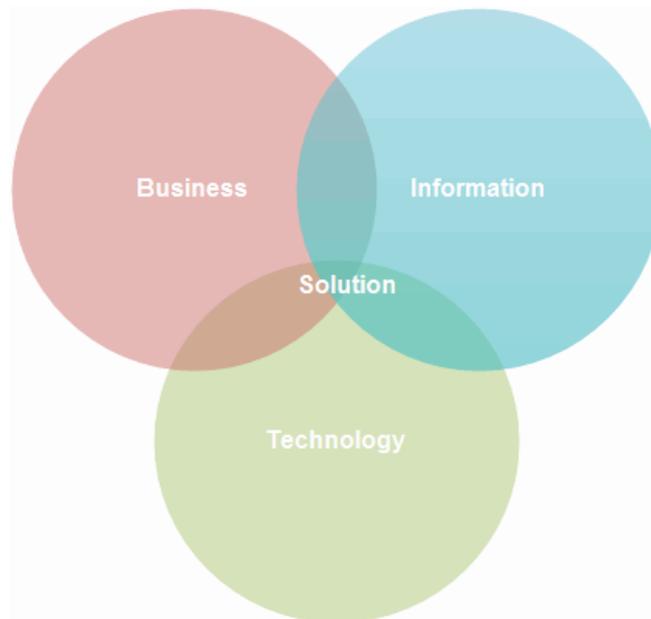


Figure 26 - Viewpoints

Today, StatoilHydro does not have a defined unit for implementing/updating Enterprise Architecture. The employees working directly with Enterprise Architecture in StatoilHydro are the **leading advisors**. The role of a leading advisor is to be active in the development of his/her assigned area of expertise. The leading advisor of each field shall provide counseling, assistance and quality assurance [43].

### 3. StatoilHydro

A leading advisor will typically spend 20% of his/her time developing the enterprise directly, collaborating with upper management, process owners for the architectural viewpoints or other leading advisors. The leading advisors meet once a month to discuss and determine StatoilHydro's architectural direction. Much of the enterprise architectural planning and some of the enterprise architectural work are done through this 20% workload.

The remaining 80% are spent as architects in important StatoilHydro projects [35]. This is considered the important enterprise architecture work. Through these architectural tasks, the leading advisors direct StatoilHydro towards the EA goals. The architecture work helps maintain the Enterprise Architecture initiative.

The **future state** Enterprise Architecture will be maintained by an Enterprise Architecture group consisting of only 5 key members. This group includes essential IT process owners and the leading advisor on Enterprise Architecture [35]. This is called the architecture board and it will basically have the same function as the leading advisors have today, but it will be more structured, goal-driven and methodical in the Enterprise Architecture work.

### 3.5.5 EA Governance

The Enterprise Architecture is governed through the Business Process Model and documents published in Docmap. The Business Process Model sets the requirements and constraints on all work processes, and the governing documents published in Docmap define important governing elements and restrictions.

Enterprise Architecture implementation is usually governed through placing leading advisors in strategically important projects. The leading advisors are governed by the StatoilHydro Corporate Governance as employees. The leading advisors will work as architects in the projects and they will direct the project towards the future state Enterprise Architecture goals. The goal is to help ensure alignment and integrity with all parts of StatoilHydro. The architecture work from the leading advisors in these projects is a significant part of maintaining the Enterprise Architecture.

As of today, there is no defined Enterprise Architecture governance in StatoilHydro. The governance mechanisms mentioned above are merely a part of the Corporate Governance. This is further discussed in chapter 4.3.

## 3.6 IMT Governance

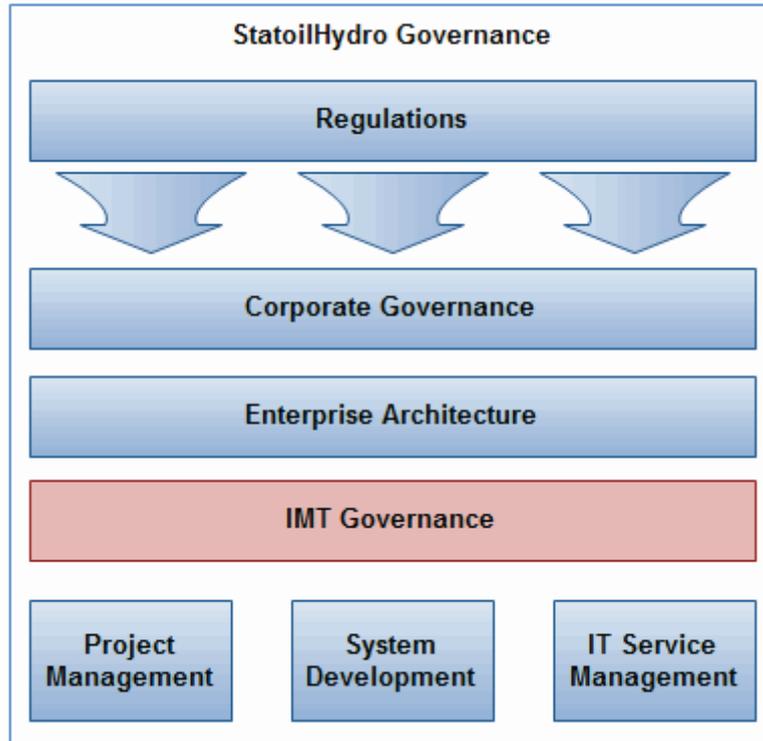


Figure 27 - IMT Governance, based on information from [33]

In addition to Governance through the Management System, StatoilHydro has documents governing Information Management and Technology. These documents state that the objective of StatoilHydro's IMT Governance is to describe requirements for Information Management (IM) and Information Technology (IT). StatoilHydro's IM and IT shall:

- Draw up, communicate and implement the group's policies, strategies and requirements within IM and IT
- Identify best practices and communicate them across the group
- Identify opportunities and challenges within the three sub-functions IM, IS and IT
- Holistically evaluate and align the IM and IT initiatives throughout the corporation
- Produce and deliver IM and IT services

StatoilHydro has a set of functional requirements that reflect these goals. The functional requirements consist of general requirements, Information Management and Information Technology.

The **functional requirements** states that IM and IT managers, process owners and corporate staff shall actively identify, propose and promote use of IM and IT to achieve business strategic objectives, fulfillment of regulatory requirements, and to improve business processes. The functional requirements defines that all information systems must comply with internal and external regulations, and that work processes and IT infrastructure must enable correct and secure creation, transmission and storage of information within StatoilHydro.

This chapter describes the IM Governance and IT Governance of StatoilHydro. Both IM and IT Governance are included in the term IMT Governance.

### 3.6.1 Information Management Governance

**Information Management** governance consists of *responsibility, management information, information security, classification and control of IT assets, availability of information, integrity of information, confidentiality of information and access control* [40]. These subjects are described below.

**Information Management responsibility** states that all information and information systems shall have designated owners [40]. This section defines responsibility areas for process owners, line role, business architects, IT service providers and all other employees regarding information.

**Management of information** is about *the creation and management of authentic, reliable and useable information, capable of supporting and documenting business functions and activities for as long as they are required* [40]. The Information Management lifecycle (see Figure 28) within StatoilHydro consists of five steps:

- **Creation and receipt:** Deals with information from the origin-point. The process includes capture, quality control, classification and registration.
- **Distribution:** Manages the information once it has been created or received. This includes both internal and external distribution.
- **Use:** Takes place after information is distributed, and can generate business decisions, document further actions, or serve other purposes.
- **Maintenance:** Is about administration of information. This includes processes such as filing, transfer and reclassification.
- **Disposition:** This is the practice of handling information that is less frequently accessed or has met its assigned retention periods.

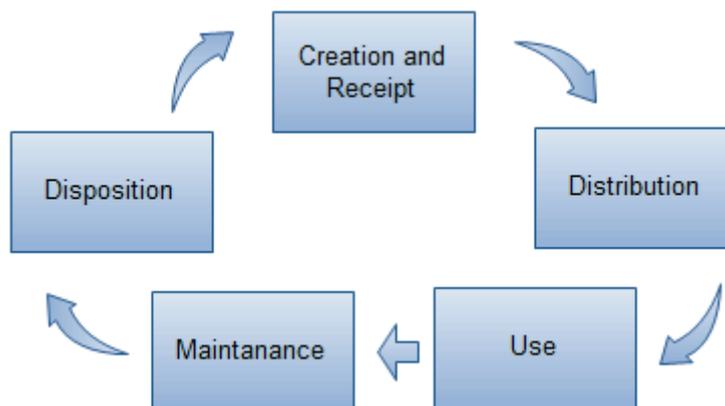


Figure 28 - The Information Management Lifecycle, based on [40]

Information is disposed when it is no longer considered valuable. Information should be **classified** according to information rights. **Classification and control of Information Technology assets** is important to StatoilHydro. Assets relevant for information security may include information, software, physical equipment and computing services. Information should be classified and protected according to sensitivity and criticality [40].

Information is managed within StatoilHydro to ensure that **integrity, confidentiality** and **availability** is maintained [40]. It is important to StatoilHydro that information is managed with integrity and confidentiality, but at the same time has the correct availability. The IMT Governance structure of StatoilHydro defines measures to maintain **availability, integrity** and **confidentiality of information**. These are important concepts when dealing with sensitive information. Measures include what plans, categories and responsibility areas.

Corporate health, safety and environment (HSE) has the overall responsibility for both safety and security within the group. HSE is responsible for monitoring and taking actions to keep a high standard of **information security**. Security of information contains both information valuable to StatoilHydro (such as some of the information in this master thesis) and personal information.

**Access control** contains formal procedures for allocating access rights to information. This includes non-StatoilHydro employees, user- and administrative accounts, and all other personnel connected to StatoilHydro's information.

### 3.6.2 Information Technology Governance

The IMT Governance structure of StatoilHydro is about governing the IT projects, activities and processes.

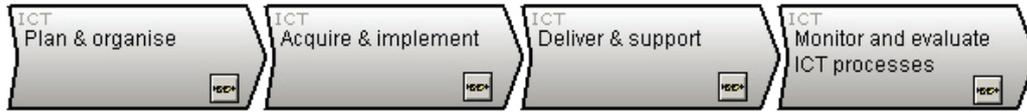


Figure 29 - CobiT IT process & StatoilHydro IT process [38]

The **Information Technology** processes in StatoilHydro are based on the CobiT standard (described in appendix D) and it is supplemented with the ITIL framework for the “Deliver & Support” process and service management [40]. This framework use is analyzed in chapter 4.1.3.

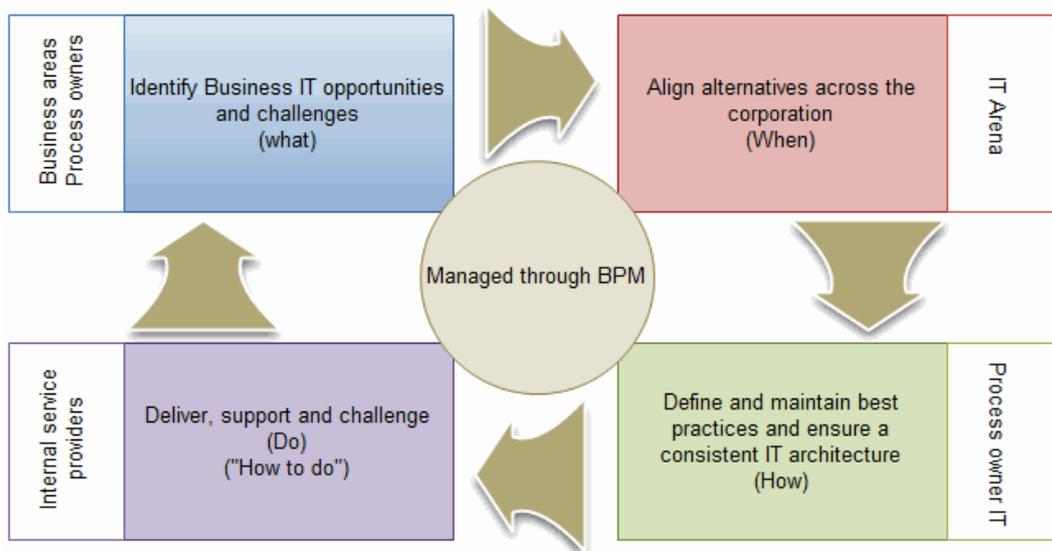


Figure 30 - Information Technology development, based on [40]

Business areas- and process owners identify business opportunities and challenges, anchored in the A2A process (described in chapter 3.2.1.4 and chapter 3.2.3). This is the “what” part of Figure 30 (blue). These opportunities and challenges are presented to the IT Arena (red in Figure 30, described in chapter 3.3). The IT Arena chooses a portfolio of IT projects that ensures alignment and commitment across the corporation. Each process owner (green in Figure 30) is responsible for defining and maintaining best practice on the process they own through the chosen projects. The Internal service providers (purple in Figure 30) will deliver and support the IT projects. The Information Technology lifecycle is managed through the BPM (described in chapter 3.2.2.1) and continually evaluated.

The best practices, architectures and technologies describe how the internal service provider will resolve, deliver and support the solutions for the opportunities and challenges. The internal service providers will challenge business areas and process owners on effective utilization of information technologies and information systems.

The governance of Information Technology within StatoilHydro consists of a set of *general requirements* and *functional requirements* (as previously described).

The **general requirements** include [40]:

- IT solution requirements (for example: All IT solutions shall have measures to protect itself from malicious attacks, enable secure remote operation, enable disaster recovery, be in accordance with certain operating systems, and so on)
- IT solution documentation (for example: All IT solutions shall provide system and operational documents which must include the responsible person for the business needs the IT solution addresses, description of the IT solution, description of critical dependencies, operational and maintenance procedures, and potential deviations from governing documents)

The **functional requirements** regarding Information Technology in StatoilHydro include [40]:

- Utilizing existing applications: When new business requirements emerge, they should be mapped to existing solutions before developing new solutions
- Be in line with market: If a business requirement requires new IT solutions, StatoilHydro will resolve these through requirements consistent with the market
- Being borderless: All solutions of StatoilHydro shall support challenges imposed on the organization due to internationalization and cooperation with external contractors, partners and authorities. There should be one common infrastructure throughout StatoilHydro on which all solutions run
- Ensuring best-practice security: Secure management of information and supporting systems

The IMT Governance documents of StatoilHydro also contain clear corporate retention and disposition policies. These policies include clear requirements for retaining and disposing (archiving among other things) information objects.

## 3.7 Connection of Concepts

This chapter summarizes, compares and separates IMT Strategy, Enterprise Architecture and IMT Governance in StatoilHydro.

### **IMT Strategy**

IMT Strategy in StatoilHydro contains both the **long term** IMT Strategic documents, and the **short term** IMT Strategic goals implemented through Ambition 2 Action [41].

The **long term** IMT Strategic documents discusses short and long term trends for today's oil and gas companies, IT trends and the significant business goals for the IMT Strategy to follow [41]. It defines high-level IMT goals reflecting the significant business goals and it describes how important the IMT goal categories are to each business sector of StatoilHydro. It also defines some lower level IM and IT goals and initiatives that will help complete the high-level IMT goals.

StatoilHydro's IT Strategic documents discuss current- and future state of their five major components of Information Management and Information Technology: The organization and operating model, IT financials, project & portfolio delivery, Enterprise Architecture and Information Management.

The **short term** IMT Strategic goals are implemented through the Ambition 2 Action process. These goals typically only span a year in time and they can almost be considered as a governance measure and not strategic measures.

### **Enterprise Architecture**

The Enterprise Architecture of StatoilHydro is defined as an IT initiative in the IMT Strategy. However, StatoilHydro has a *federated* Enterprise Architecture that includes all operations of the company. This means that although the Enterprise Architecture is defined as an IT initiative, it deals with all operations within StatoilHydro and not just IT operations. It also means that there is not a defined centralized unit for implementing Enterprise Architecture. Enterprise Architecture work is done by different key people at different times.

StatoilHydro's Enterprise Architecture tools mainly consist of the Business Process Model, APOS and Docmap (all described in chapter 3.2.2). StatoilHydro's Enterprise Architecture efforts are not defined and standardized, and they mainly consist of architecture work done by leading advisors and other stakeholders and process owners. StatoilHydro define Enterprise Architecture as "the processes and methodologies used to align IT initiatives with business goals" [31].

StatoilHydro has developed several views for the Enterprise Architecture; Business architecture, Technical architecture, Information architecture and Solution architecture. Data architecture is included in the Information architecture. Roughly speaking, Business architecture contains all business processes, Information and Data architecture covers management of information, Solution architecture includes all applications, and Technology architecture maps all the technology of StatoilHydro. The StatoilHydro architects must ensure that all the views are upheld in project development.

#### **IMT Governance**

StatoilHydro's IMT Governance states that all information shall be correctly available and according to classification/confidentiality, promote integrity, be secured and have designated owners. It defines the appropriate measures for these concepts. The Information Management governance defines a lifecycle for management of information. This lifecycle follows the information from creation, through distribution, use, maintenance, and finally disposition. See Figure 28 on page 76.

StatoilHydro implements both Corporate Governance and IMT Governance through the Management System and the BPM. IMT Governance is a part of the BPM and it is based on the CobiT framework described in appendix D. The IMT Governance of StatoilHydro also consists of a set of general requirements and a set of functional requirements. The general requirements include IT solution requirements and IT solution documentation. The functional requirements are a collection of high level requirements. See chapter 3.6 for a more detailed description.

### 3. StatoilHydro

#### Connection of concepts

IMT Strategy, Enterprise Architecture and IMT Governance are interrelated concepts in StatoilHydro. StatoilHydro does not have a clear definition of the connection of the concepts, but I have tried to explain the mapping between them in Figure 31. The IMT Strategy has some inflection on all governance elements.

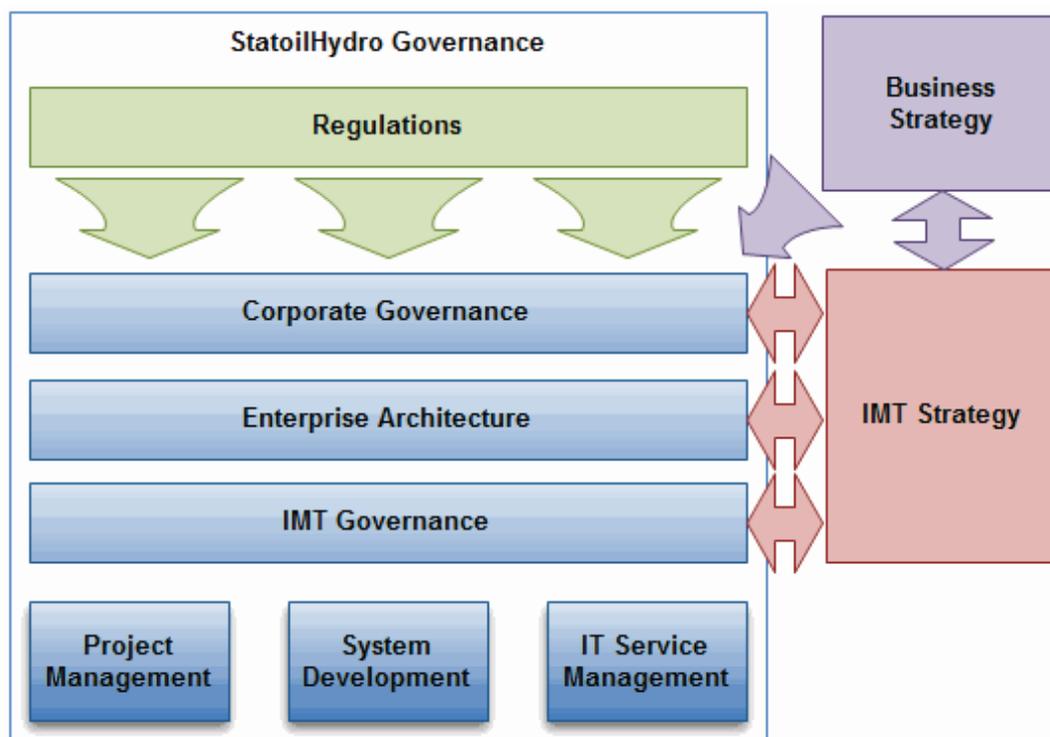


Figure 31 - Connection of concepts, based on information from [33]

Corporate Governance is affected, and sometimes also defined by state laws and other regulations. It is also affected by the IMT Strategy because the IMT Strategy discusses long term and short term trends for oil and gas companies and corresponding IT trends. The IT trends and the defined efforts and measures to meet the IT trends will affect the Corporate Governance in how governance is communicated and upheld. The Enterprise Architecture will decide the governance tools to be used from the IT trends defined in the IMT Strategy. The Enterprise Architecture of StatoilHydro is thought of as “the bridge between strategy and implementation/solutions” [31].

Corporate Governance experience and upper Corporate Governance decides how the development of new IMT Strategies is performed. In addition, Corporate Governance is affected and sometimes defined from the business strategy. The business strategy defines the IMT Strategy. Alignment between the business strategy and the IMT Strategy is crucial to StatoilHydro [35].

StatoilHydro’s Enterprise Architecture is affected by the Corporate Governance and the IMT Strategy. The Corporate Governance system sets the rules and direction for the Enterprise Architecture. Some of the Enterprise Architecture tools are seen as parts of Corporate Governance (BPM , Docmap and APOS). The EA implementation consists mainly of the Business Process Model and some architecture initiatives. StatoilHydro has no clear definition in separation of Enterprise Architecture and Corporate Governance. Some might consider the BPM as part of the EA initiative and some might consider it a part of the CG. This will be further discussed in chapter 4.3 about suggested improvements.

The IMT Strategy considers Enterprise Architecture as one of the five major IT initiatives of StatoilHydro (see chapter 3.4) and it defines EA goals and measures [41]. This separates and connects StatoilHydro’s IMT Strategy from Enterprise Architecture. The Enterprise Architecture may affect the development of future IMT Strategies because of EA best practice and development of future EA. Enterprise Architecture experience should be considered when developing new IMT Strategies.

Some IMT Governance processes are considered a part of the Enterprise Architecture or the Corporate Governance implementation. These IMT Governance processes consist of the CobiT processes defined in the BPM. In addition to this, IMT Governance includes some governance documents regarding IT and IM. See chapter 3.6 for a more detailed description of the structure of IMT Governance. StatoilHydro has no clear definition in connection of Enterprise Architecture and IMT Governance. The IMT Governance is not discussed nor defined in the IMT Strategy.

	IMT Strategy	EA	IMT Governance
IMT Strategy			
EA			
IMT Governance			

**Table 3 - Clear connections**

Table 3 shows the clear definitions of connections in StatoilHydro’s organization. Green indicates that there is a clear process or document that defines the connection. We can see that the IMT Strategy defines and discusses the Enterprise Architecture. No other connections are defined. The IMT Strategy does not cover the IMT Governance. The EA does not have a clear connection or process defined for IMT Strategy or IMT Governance. IMT Governance does not have any processes that connect it to IMT Strategy or Enterprise Architecture. This is further discussed in chapter 4.3 about suggested improvements.

### 3. StatoilHydro

However, the IMT Strategy indirectly provides direction for IMT Governance as it sets the direction of the company Information Technology. IMT Governance tools, frameworks, experiences and best practices may affect development of future IT Strategies.

StatoilHydro does not have a direct and aware approach for connecting these concepts. Some of the concepts overlap at some points (Governance and EA), and there is no definition of the connection between the concepts.

#### **Summary:**

- All state laws and other regulations strongly affects the Corporate Governance structures
- The IMT Strategy defines goals and vision for IT using the business strategy
- The IMT Strategy defines high-level goals for the Enterprise Architecture
- The IMT Strategy affects the Corporate Governance and therefore also the IMT Governance. The connection between IMT Strategy and IMT Governance is not defined in StatoilHydro's documents
- Enterprise Architecture work enables alignment and integration throughout the entire organization
- The EA tools include: BPM, Docmap and APOS. These tools are also regarded tools of the Corporate Governance (and IMT Governance), and the connection and separation of this is somewhat vague
- EA architecture work includes the architecture work of the leading advisors and the process owners
- IMT Governance sets borders for the company IMT. It defines how IT is governed in StatoilHydro and how information is treated
- The IMT Governance is a part of the Corporate Governance system
- The Enterprise Architecture effort is indirectly governed by the Corporate Governance system
- There is no defined connection of IMT Strategy, Enterprise Architecture and IMT Governance

This results in a Management System and a Business Process Model reflecting best practice work processes, rules and regulations, risk management, all governance mechanisms, and use of tools and information.

## 3.8 Awareness of concepts

This chapter summarizes the research done on awareness of IMT Strategy, IMT Governance and Enterprise Architecture in important areas of StatoilHydro.

Researching awareness includes comparing the answers of StatoilHydro's key employees regarding IMT Strategy, Enterprise Architecture and IMT Governance to my own perceptions. Awareness includes whether the concepts are clear to the key employees of StatoilHydro and whether they all have the same perceptions (and this perception is equal to my own). This is important to research because indifferent attitudes may be the result of poor implementation.

This chapter is written based on the interviews and interview-questions described in appendix F. I have interviewed key IT employees in StatoilHydro to research what they think IT Strategy, Enterprise Architecture, IT Governance and the connection between them entails, both in general and in StatoilHydro.

### **IMT Strategy**

The selection of StatoilHydro's employees included in my survey's perception of what an IT Strategy includes is fairly similar to that I have defined (this is discussed in chapter 4).

The interviewee's state that *an effective IT Strategy is something that can be used in their daily work routine to support decisions*. It should describe IT direction and IT architecture requirements for projects, relevant technologies and how to react to change in business or technology. The strategy should define actions within the IT area for how to cover the gap between 'as-is' and 'to-be' with focus on solution architecture, software architecture, data architecture etc. The IMT Strategy should cover more than 3 years of time and it should be revised at least yearly.

The interviewee's use StatoilHydro's IMT Strategy to decide which IT projects to initiate at which times, direct how they develop the organization, decide whether to buy off-the-shelf or develop systems, and what competence the different result-units and geographical locations are required to have.

The interviewee's states that to secure an effective IT Strategy, it has to be anchored in the company business areas, integrated in the company strategy processes and communicated to relevant stakeholders.

### 3. StatoilHydro

#### **Enterprise Architecture**

Some interviewee's mention the Enterprise Architecture viewpoints (business/process, information, technology and application/solution), but the perception of what EA is differs. This is possibly because Enterprise Architecture is somewhat undefined and unordered within StatoilHydro (as described in chapter 4).

The interviewee's describe Enterprise Architecture as a regulation plan for the company's IT architecture and IT infrastructure, a tool to secure connection between business processes, information and technology, and a description of the governance needed to keep the architecture and models updated over time. They state that Enterprise Architecture affects choice of technology and prioritizing of projects.

An interesting aspect is the view of what is considered the Enterprise Architecture implementation differs. The Interviewee's state that process owners will probably not consider the Business Process Model as Enterprise Architecture, while the leading advisor's probably will. The interviewee's agree that Enterprise Architecture work is too little apparent in StatoilHydro today. This is discussed in chapter 4.2.

The interviewee's considers the future implementation of an architecture board a good idea. StatoilHydro's plan is that the IM and IT process owner (the CIO) establishes an Enterprise Architecture board with representatives from relevant process owners, management systems etc. This board is going to define all Enterprise Architecture requirements. The future plan includes that all IT projects are required to get a technological compliance check approved before developing and implementing new IT solutions in StatoilHydro's established IT infrastructure.

#### **IMT Governance**

There is a mutual agreement among the interviewee's that employing frameworks are important in development of IMT Governance.

StatoilHydro's advantage of employing IT Governance frameworks include that they achieve effective work processes by spending less time on non-valuable clarifications. They can spend their time on developing and implementing IT solutions and assessments that will cover their business needs, instead.

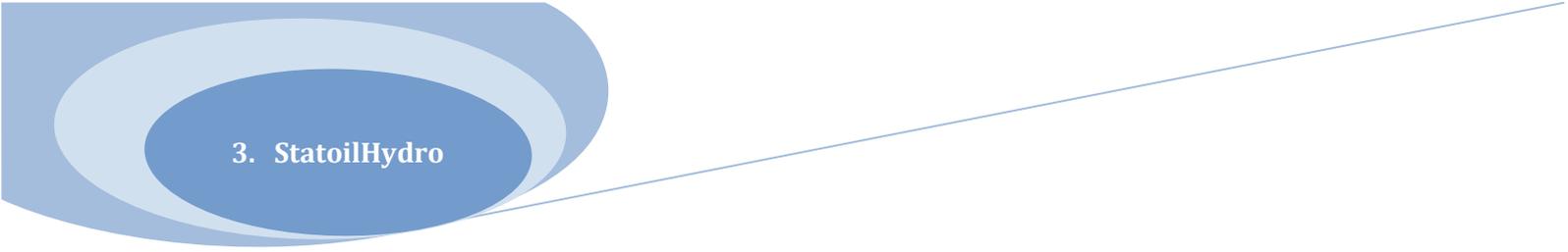
The interviewee's thinks that StatoilHydro sacrifices flexibility for stability when applying a framework, but that it is absolutely necessary for a company their size to employ these kinds of frameworks. They state that it is vital that the governance system is known and followed, and that there still is some work to be done.

#### **Connection of concepts**

None of the interviewee's answers the question about the connection of concepts in StatoilHydro, and this is probably because there is no defined and clear connection.

Some see a close relation between StatoilHydro's strategy, IMT Strategy, Enterprise Architecture and IMT Governance (in that hierarchical order), that is quite similar to my own understanding (chapter 3.7). Kurt Ole Myren states that for a successful strategy implementation the Enterprise Architecture and governance has to contribute to the realization of the strategy, which is in line with the definition in chapter 2.

One person states that *the IMT Strategy is an extension of the business strategy*, and that Enterprise Architecture is very diffuse. He states that EA and IMT Governance together are some of StatoilHydro's most important tools to succeed with the strategies. They all state that EA work is vague within StatoilHydro.



### 3. StatoilHydro

# 4. Discussion

This chapter discusses StatoilHydro's implementation of IMT Strategy, Enterprise Architecture and IMT Governance.

The first subchapter (4.1) deals with StatoilHydro's implementation of well-known frameworks and best practices. It analyses StatoilHydro's goals for these concepts and discusses the choice and combination of frameworks used.

The second subchapter (4.2) deals with awareness of IMT Strategy, Enterprise Architecture and IMT Governance in StatoilHydro. It analyses the current awareness and discusses the sufficiency of awareness related to these concepts in StatoilHydro.

The third subchapter (4.3) discusses the overall organization of IMT Strategy, Enterprise Architecture and IMT Governance in StatoilHydro and relating it to the defined perceptions (chapter 2), previously discussed framework use and awareness. It analyses potential flaws and inconsistencies in the current implementation of concepts, and lists potential improvements.

### 4.1 Frameworks

Implementation frameworks for IT Strategy, IT Governance and Enterprise Architecture are often extensive. The frameworks are usually less useful if significant parts are omitted, as is often the case with smaller. StatoilHydro is a large company both in national and worldwide scale and can therefore implement most parts of a framework. The best practice of the frameworks has the potential to be used to the full extent. This makes it very important to select the correct and most fitting framework implementation.

Aspects of employing framework implementations include:

- Less flexible development
- Based on best practice
- Use of frameworks potentially reduces the workload
- Developed from experience
- Must be understood before employed

There exist a vast number of frameworks for implementing IT Strategy, Enterprise Architecture and IT Governance. This chapter will analyze StatoilHydro's use of the frameworks (summarized in the appendices). StatoilHydro has used parts of TOGAF and Gartner for Enterprise Architecture development, and parts of CobiT and ITIL for IT Governance development.

### 4.1.1 IT/IMT Strategy framework use

StatoilHydro's current long term IMT Strategy is not based upon a framework implementation. Some alternative IT Strategy frameworks are discussed in [1]. However, I did not find these frameworks relevant to include in the appendices. This is because the IT Strategy frameworks are primarily developed for pure IT companies. IT Strategy and strategy development will vary significantly from an oil and gas company to an IT enterprise. StatoilHydro is a large company in both national and international scale and I would expect it to be advantageous to develop a unique and tailored IT Strategy that reflects the company business strategy. Strategy considerations vary considerable from company to company, while Enterprise Architecture and IT Governance development are more general. Standardized framework implementation is therefore less likely to be successful for IT Strategy development.

IT Strategy development requires more than a development method, an implementation framework and best practices. IT Strategies are very much dependent on the company business strategy and IT trends. This is why, in my opinion, StatoilHydro should not use a specific framework when developing their IMT Strategy. Both development-method and what key personnel to include in the strategy-work differ from company to company, and this is not fully accounted for in the frameworks. However, best practices from frameworks are always useful to consider and should be exploited by StatoilHydro in the IMT Strategy development process. I would recommend [44] as a good source for best practices. This source is developed by The Norwegian Computer Society as a checklist for IT Strategy development.

StatoilHydro has used parts of Gartner's Enterprise Architecture framework as inspiration when developing the IMT Strategy [42]. Figure 39 on page 121 defines Gartner's approach to development of EA. StatoilHydro has considered environmental trends (short term and long term trends for oil and gas companies and IT trends) and business strategy when developing the IMT Strategy. This is similar to Gartner's approach and it has resulted in a set of future state IMT Strategy goals, which will help complete the business strategy in each unit of StatoilHydro.

The utilization of concepts and ideas taken from frameworks can be useful. Strategies needs to be developed in compliance with company business strategies, values, structure, ambitions and line of industry. The right people need to be involved in the strategy work, the outcome of the strategy is very dependent on involvement of the people implementing it.

### 4.1.2 Enterprise Architecture framework use

Most Enterprise Architecture frameworks suggest having a single unit dedicated to development and implementation of Enterprise Architecture. This is not the case in StatoilHydro. StatoilHydro has a *federated* Enterprise Architecture organization, as described in chapter 3.5.

StatoilHydro has used parts of the **TOGAF ADM** (described in appendix C) as development method for the Enterprise Architecture. StatoilHydro's approach to Enterprise Architecture development is described in chapter 3.5. StatoilHydro has left out 3 phases from the TOGAF ADM [30]:

- *Migration planning* is about sorting the various implementation projects into order of priority
- *Implementation governance* is about creating the governance for implementation of the EA
- *Architecture change management* primarily provides for changes to the framework and principles set up in the Preliminary Phase.

These phases are left out, as StatoilHydro considers them to be covered by the Management System.

Migration planning is carried out by the IT Arena (see chapter 3.3). All governance is accounted for through the StatoilHydro Management System. As StatoilHydro doesn't have an EA group, EA governance is of less importance. This is discussed in chapter 4.3. Architecture change management should in my opinion have been accounted for as a mechanism in StatoilHydro (this is also discussed in chapter 4.3 about suggested improvements).

**TOGAF's architecture domains** harmonizes with **Gartner's viewpoints**. TOGAF includes business architecture, applications architecture, data architecture and technology architecture as the architecture domains. Gartner has business, information, technology and solution viewpoints. These are mainly the same concepts, although Gartner is more focused on making the viewpoints represent the concerns relevant to a specific set of stakeholders. Gartner's solution viewpoint is developed from the intersection between business, information and technology (see Figure 32). StatoilHydro has employed Gartner's viewpoints in the TOGAF ADM development cycle. In my opinion, this can be done, and this transformation works well in StatoilHydro's Enterprise Architecture.

StatoilHydro has included **Gartner's CRV** in the discovery and defining of requirements for Enterprise Architecture [45]. Gartner's CRV is optimized for handling and connecting the viewpoints through requirements, and therefore the use of Gartner's viewpoint concept is recommended. For StatoilHydro, this results in a combination of TOGAF ADM as development method, containing Gartner's viewpoints being developed through Gartner's CRV. See Figure 32 below.

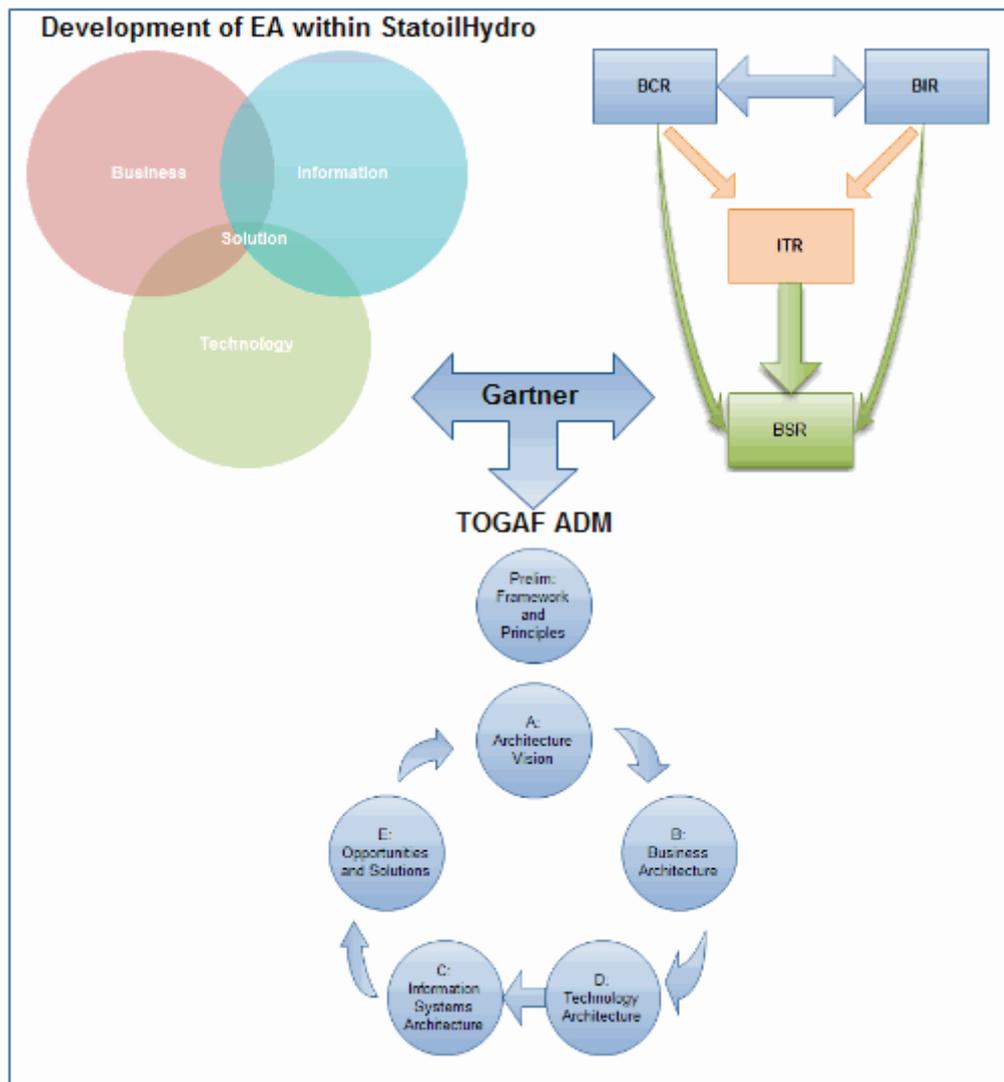


Figure 32 - Development of EA within StatoilHydro, source: TOGAF and Gartner

This seems a bit unordered, and it can be questioned whether it would be more effective to use Gartner's entire optimized framework instead. Gartner's framework is not open source (like TOGAF). Considering the size and economic status of StatoilHydro, I believe they would benefit from investing in Enterprise Architecture through consultants and streamlined and adapted frameworks. This is further discussed in chapter 4.3 about suggested improvements.

## 4. Discussion

StatoilHydro's transition from a document-oriented company to a process-oriented company is, in my opinion, entirely in its place. StatoilHydro's current Management System (described in chapter 3.2) combined with StatoilHydro's organization of EA viewpoints creates a **potentially** strong Enterprise Architecture.

Goals and ambition-level for future state Enterprise Architecture are defined in StatoilHydro's IMT Strategy. The primary goals include [41]:

- Being open, collaborating and innovating with peers and partners
- Having solutions that support an agile and flexible business model driven by business needs
- Being globally enabled, harvesting competence and fostering collaboration across geography and people
- Being able to better understand IT implications from business change and spot opportunities across processes

Both TOGAF and Gartner's framework provides alignment, integration and agility to an enterprise [30, 46]. However, TOGAF and Gartner's goals do not include improvement of collaboration and innovation with peers and partners, improvement of globally enabling, competence harvest, or improvement on understanding IT implication from business change. This means that these goals must be completed from the Enterprise Architecture work done by the process owners and leading advisors.

### 4.1.3 IT/IMT Governance framework use

StatoilHydro's IMT Governance structure is based on a combination of the CobiT framework described in appendix D and the ITIL framework described in appendix E. StatoilHydro has included Information Management Governance under the term IT Governance, and it is therefore named IMT Governance.



Figure 33 - IT Governance processes in CobiT and StatoilHydro [38]

Figure 33 displays the CobiT core processes and StatoilHydro's core IMT Governance processes. Figure 34 and Figure 35 on the next page displays an overview of CobiT's IT Governance processes and StatoilHydro's IMT Governance processes.

The **Plan & Organize** phase in StatoilHydro is almost identical to CobiT's IT Governance framework. StatoilHydro has added 2 processes to the existing 10 in the framework; *manage resources* and *ensure compliance with external requirements*. *Manage resources* is about managing people, applications, technology, facilities and data. *Ensure compliance with external requirements* is about identifying and analyzing external requirements for IT impact, and taking the appropriate measures to comply with them.

The **Acquire & implement** phase is slightly different in StatoilHydro's implementation than the CobiT framework (see the next page), but the idea is generally the same in both implementations. The Acquire & implement core process deals with managing IT projects. StatoilHydro performs a pre-study and an operational specification, describes the system context, chooses architecture and infrastructure, specifies plan and functionality, designs, implements, tests and hands over and the solution, and evaluates project. This is StatoilHydro's flow of acquiring and implementing an IT solution. CobiT has the same ideas, but as it is a framework of very high level and possible to configure and customize. This process is currently being re-developed as StatoilHydro is adopting to agile software development methods [47].

## 4. Discussion

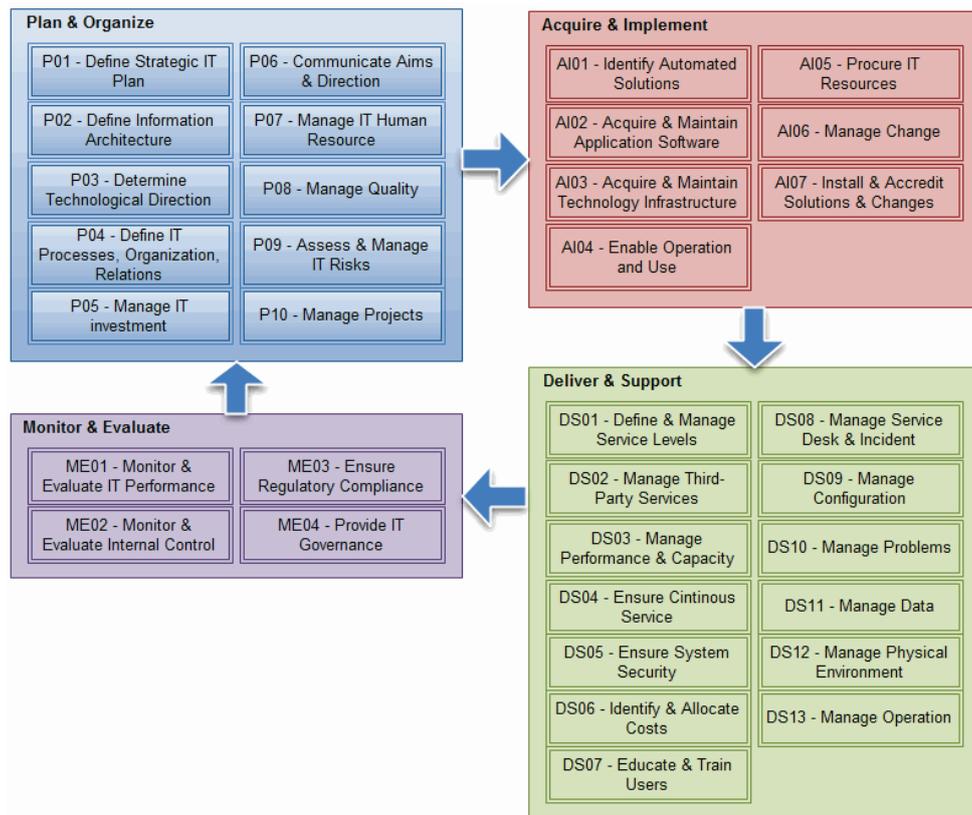


Figure 34 - CobiT IT Governance, based on [48]

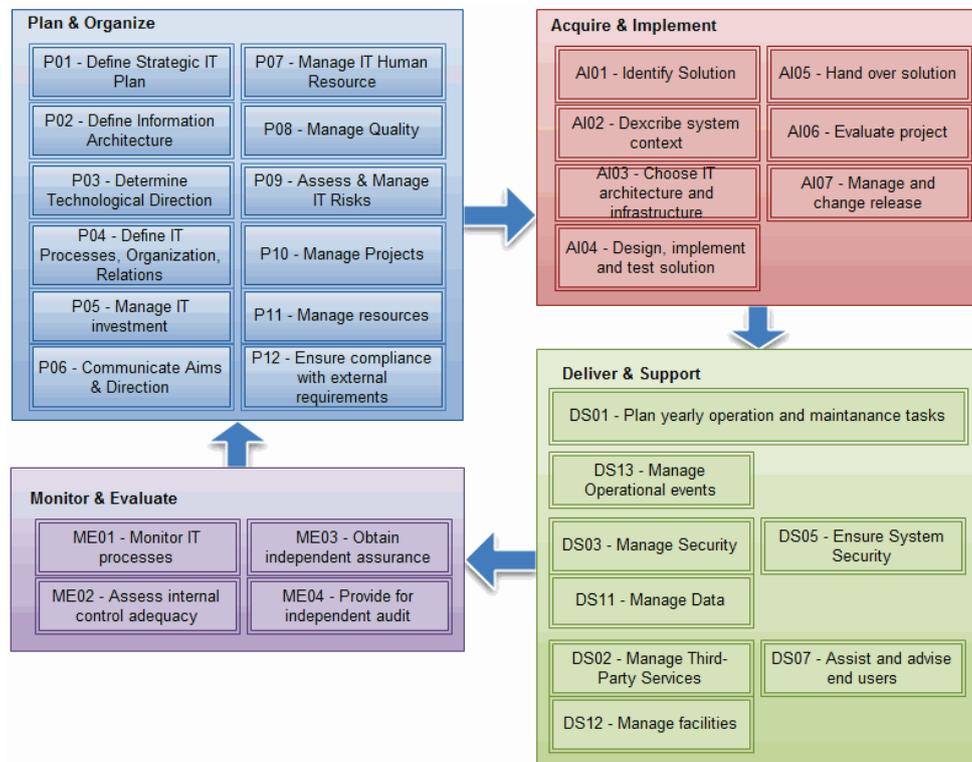


Figure 35 - StatoilHydro's IMT Governance, based on [38]

The **Deliver & Support** phase is loosely based on CobiT and ITIL (described in appendix D and appendix E). It is modified to enable the use of delivery and support that StatoilHydro needs. As we can see from Figure 34 and Figure 35, StatoilHydro has used some of the CobiT processes for deliver and support. The processes left out include Service Management processes, which is placed in a separate governance mechanism. StatoilHydro has used the ITIL framework for developing Service Management. See Figure 36 and appendix E for information on ITIL. ITIL focuses on best practice, and as such can be adapted and adopted in different ways according to individual organization needs. Except for this modification, the processes are in accordance with CobiT and ITIL.

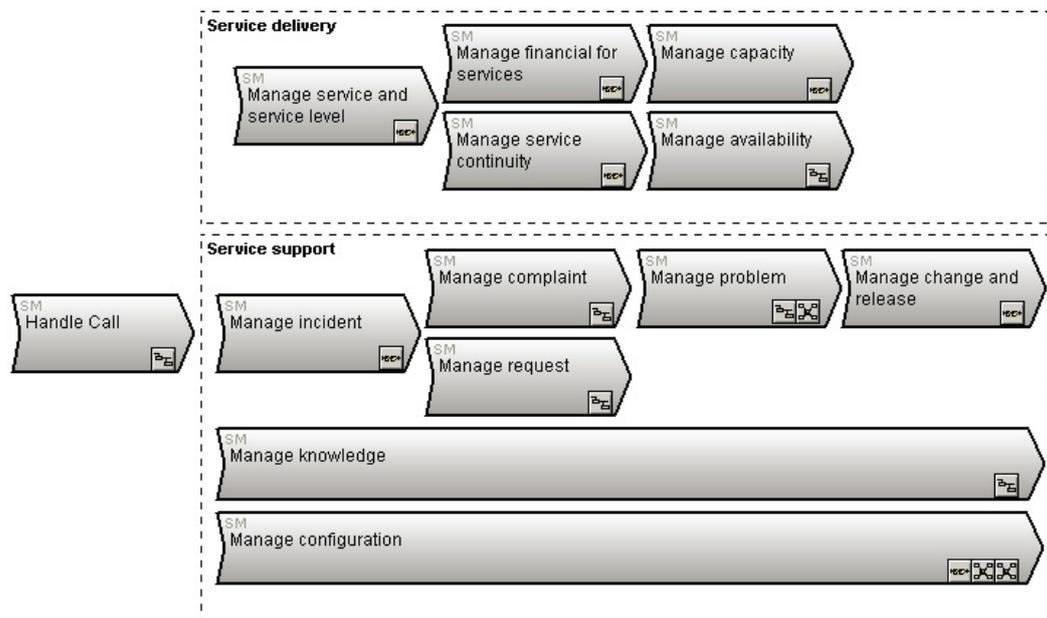


Figure 36 - StatoilHydro's Service Management processes [38]

The 2 first **Monitor & Evaluate** subprocesses are CobiT processes. *Obtain independent assurance* (Figure 35, purple) is enabled by independent assurance reviews carried out at regular intervals. The business goal for this process is to increase confidence and trust among the organization, customers and third-party providers. The business goal for *Provide for independent audit* (Figure 35, purple) is to increase confidence levels and benefit from best practice advice. It is enabled by independent audits carried out at regular intervals.

## 4. Discussion

The IMT Governance implementation of StatoilHydro reflects more use of frameworks than the IMT Strategy and Enterprise Architecture implementations. There is almost no use of frameworks when StatoilHydro develops IMT Strategy, some use of frameworks when StatoilHydro develops Enterprise Architecture and much use of frameworks when StatoilHydro develops IMT Governance. In other words, StatoilHydro has increased the use of development frameworks in the lower levels of the governance hierarchy displayed in Figure 31. It seems that StatoilHydro defines IMT Governance as a more specific concept than Enterprise Architecture, and that Enterprise Architecture is more concrete than IMT Strategy (which is abstract). I would also agree that IMT Strategy is a more variable concept from company to company, while IT Governance is more constant between companies (see Figure 37 below).

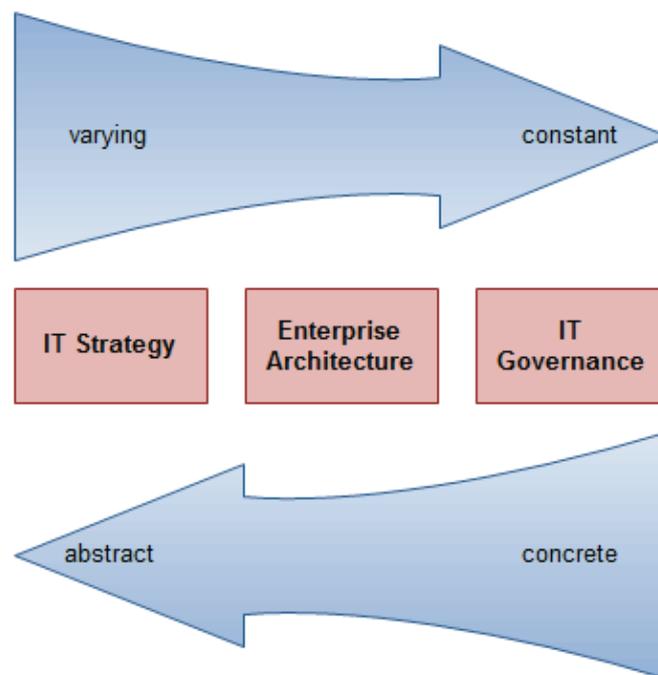


Figure 37 - Framework relations to concepts

CobiT is a fairly common open source framework for implementing IT Governance. CobiT processes are used as the core of StatoilHydro's IMT Governance structure. CobiT supports IT Governance by providing a framework to ensure that [48]:

- IT is aligned with the business
- IT enables the business and maximizes benefits
- IT resources are used responsibly
- IT risks are managed appropriately

StatoilHydro's IMT Governance shall:

- Draw up, communicate and implement the group's policies, strategies and requirements within IM and IT
- Identify best practices and communicate them across the group
- Identify opportunities and challenges within the three sub-functions IM, IS and IT
- Holistically evaluate and align the IM and IT initiatives throughout the corporation
- Produce and deliver IM and IT services

Some of StatoilHydro's goals are covered by CobiT's promises. Policies, strategies and requirements are communicated through the IMT Governance and the Business Process Model. Alignment and evaluation of IMT processes is achieved through the use of the CobiT framework processes. However, two of the goals that may not be covered by StatoilHydro's IMT Governance processes include:

- Identify best practices and communicate them across the group
- Identify opportunities and challenges within the three sub-functions IM, IS and IT

It is the StatoilHydro process owner's responsibility to ensure that his/her process reflect best practice and to identify opportunities and challenges within IM, IT and IS. It is the responsibility of the IT Forum (which consist of IT process owners, among others) to address the opportunities and challenges. In my opinion, these goals are not addressed and reflected well enough in the IMT Governance system of StatoilHydro. This will be discussed in chapter 4.3 about suggested improvements.

I think use of frameworks for a specific concept like IT Governance is a good decision. It is important to state that frameworks must not be implemented blindly. When using a framework implementation the solution must be streamlined according to the company goals and visions.

### 4.2 Awareness and connection of concepts

This chapter discusses the awareness and connection of IMT Strategy, Enterprise Architecture and IMT Governance within StatoilHydro.

#### **IMT Strategy**

The results of the interviews and my own research show that the IMT Strategy seems not to be visible enough in StatoilHydro. Some of the interviewees did not know that StatoilHydro had an IMT Strategy. When writing this master thesis I had access to all IT employee tools and documents. It was a challenge to locate the IMT strategic goals. In my opinion, the outline of the IMT Strategy should be visible. Sharing the entire strategy with every employee seems ambitious, but the high-level IT goals should be well known to all IT employees. This will expectedly increase the consciousness about the high level IT goals in their daily work, as they already do with the StatoilHydro values (see chapter 3.2.1.2). The StatoilHydro IMT goals are implemented in Ambition 2 Action, but communicating the goals is still important, according to my opinion.

#### **Enterprise Architecture**

There is a stronger focus on Enterprise Architecture in the current IMT Strategy than previously used IMT Strategies, which indicates that StatoilHydro's awareness of EA as a concept is increased

The interviewees agree that Enterprise Architecture work is not visible enough in StatoilHydro today and it is mutually agreed that StatoilHydro does not have an enterprise-wide approach for EA. StatoilHydro has some business units that perform EA out of own interests, but they do not have a current enterprise-wide model.

The interviewee's regards the future establishment of the architecture board as positive. They state that today there is some inconsistency in the interaction between "management systems", process owners and corporate IT. They say that the Enterprise Architecture commitment has been left in the hands of the process owners. If Enterprise Architecture effort is going to be successful in StatoilHydro, it has to be anchored in a higher level in the organization, and it must be consistently performed through the entire organization. Possible solutions are further discussed in chapter 4.3.

### **IMT Governance**

It is mutually agreed among the interviewee's that frameworks are important in development and implementation of IT Governance. StatoilHydro's advantage of employing IT Governance frameworks include that they achieve effective work processes by not spending time on non-valuable clarifications.

The interviewee's state that it is vital that the governance system is well known and followed and that StatoilHydro still might have some work left. As far as I see it, the IMT Governance processes in the Business Process Model seem excellent. They are communicated through the Management System and they are easy to understand and follow. StatoilHydro only has to make sure that they actually are followed.

### **Connection of concepts**

None of the interviewee's really answers the question about the connection of concepts in StatoilHydro, and this is possibly because there is no defined and clear connection.

The IMT Strategy sets goals for the Enterprise Architecture, but other than this StatoilHydro has not defined the relation between these concepts. I have tried to identify the connection in chapter 3.7. The putative connection discussed is comparable to the high level connection defined by Kurt Ole Myren and Roald Kvamstad described in the interview summaries in appendix F.

## 4.3 Suggested Improvements

I believe StatoilHydro's ongoing transition from a document-driven company to a process-driven company is entirely in its place. Using work processes and a Business Process Model to define regulations, risk management, governance and best practice descriptions seem much more efficient and agile than using documents.

### **IMT Strategy**

StatoilHydro does not employ a framework for developing IMT Strategy, although parts of Gartner's Enterprise Architecture framework have been used as inspiration. StatoilHydro has developed IMT Strategy from environmental trends and business strategy. This is similar to Gartner's approach and it has resulted in a set of strategic goals which will help complete the business strategy in each unit of StatoilHydro.

StatoilHydro's IMT Strategy is comparable to my perception of IT Strategy, defined in chapter 2.2. It reflects and aligns with the business strategy and it considers environmental trends. IT Strategy is a somewhat vague and variable concept, but I feel that StatoilHydro has captured the essence of the definitions from chapter 2. StatoilHydro's IMT Strategy could, however, be more extensive. It does not include *hiring policies* for the IT Staff or *competition strategies*.

In my opinion, StatoilHydro needs some standards for developing future IMT Strategies. The standards should define who to include in the IMT Strategy development process, routines for gathering business intelligence on IMT, guidelines for capturing current IT trends and standards for reporting best practice experience from the development process. The standards could also include processes for frequently updating the IMT Strategy and validation of whether the IMT Strategy goals are reached. This would make future IMT Strategy more efficient through iterative improvement.

The IMT Strategy development process should be included in the governance system. A structured process would make it easier to perfect the IMT Strategy development. This would also make it easier to connect IMT Strategy to IMT Governance and Enterprise Architecture, which would improve the interaction of the concepts discussed later in this chapter.

### **Enterprise Architecture**

Use of Enterprise Architecture frameworks in StatoilHydro includes a combination of Gartner and TOGAF ADM. As discussed in chapter 4.3 StatoilHydro might consider using a single framework for EA development, or even hire consultants to perfect the EA effort. The combination of framework use for Enterprise Architecture development seems somewhat unordered and I believe it would have been more effective to use Gartner's entire optimized framework instead of the combination described in chapter 4.1.2. However, Gartner's framework is not open source (like TOGAF). StatoilHydro, being a large and sound organization, may benefit from investing in Enterprise Architecture through consultants and streamlined and adapted frameworks.

As StatoilHydro has actively used the Gartner and TOGAF frameworks, their perception of EA as a concept is similar to the perception defined in chapter 2.3. Enterprise Architecture is still very "young" within StatoilHydro, and therefore I believe StatoilHydro needs specific governance mechanisms for implementing it. I expect that this would allow StatoilHydro to become more effective in integrating and optimizing the EA effort. If StatoilHydro are going to achieve integration, be agile and achieve alignment of all sectors in their architecture work they need to make it more specific. This is done by governing it. As I see it, EA work in StatoilHydro today is carried out by a set of people at a random set of time. I would recommend the architecture work to be more defined, so that it has to be performed by all sectors.

There is no specific process or tool for registering best practices regarding the Enterprise Architecture work in StatoilHydro. There are some key people working with architecture, but what happens if one of these key people needs to be replaced? There are no architecture development/implementation processes and no best practices. The architecture work is based on the experience and judgment of the key personnel, and makes this unnecessary vulnerable. I would recommend StatoilHydro to employ processes or structures for evaluating current architecture work. One alternative is to implement the Enterprise Architecture work and the evaluation of current architecture work in the Ambition 2 Action processes and goals.

Another alternative is to develop a more specific EA implementation framework. Today, the EA implementation is done with experience from TOGAF and Gartner (as explained), but this development method is not described in detail in StatoilHydro's process descriptions. It is merely based on past experience. Creating a "develop EA" or a "maintain EA" process (as a governance mechanism) can be very useful for future EA development and preservation. This process should contain central aspects of StatoilHydro's current EA development and implementation methodologies. It should reflect a clear, concise, integrated and agile way of re-implementing and handling Enterprise Architecture.

## 4. Discussion

Both TOGAF and Gartner's framework provides alignment, integration and agility to an enterprise [30, 46]. However, TOGAF and Gartner goals does not mention improvement on collaboration and innovation with peers and partners, improvement on globally enabling, competence harvest, and improvement on understanding IT implication from business change. This means that the goals must be completed from the Enterprise Architecture work done by the process owners and leading advisors. It is hard to identify whether these goals are ever completed without defined processes and mechanisms supervising the processes. I suggest that processes for evaluating these goals are included in the IMT Governance system.

StatoilHydro has employed skilled and experienced senior architects responsible for each viewpoint. In addition to this, StatoilHydro has employed leading advisors for assuring EA deployment throughout the enterprise. This brings a lot of experience and width to the Enterprise Architecture development. However, replacing retiring/leaving key personnel in the EA development and implementation could be difficult, as much of the Enterprise Architecture work is based on experience (and not defined in processes).

### **IMT Governance**

StatoilHydro's IMT Governance is implemented through CobiT processes, ITIL and governing documents (described in chapter 3.6). As StatoilHydro is implementing IMT Governance using well known IT Governance frameworks, their perception of IT Governance is quite similar to the one defined in chapter 2.4. My defined perception of IT Governance includes three important structures: Decision-making structures, alignment processes, and communication approaches (see chapter 2.4). All of them are covered thoroughly by StatoilHydro.

However, some responsibilities seem flawed. It is the StatoilHydro process owner's responsibility to ensure that his/her process reflect best practice and to identify opportunities and challenges within IM, IT and IS. It is the responsibility of the IT Forum (which consist of IT process owners, among others) to address the opportunities and challenges. In my opinion, these goals are not addressed and reflected well enough in the IMT Governance system of StatoilHydro. The responsibility is delegated, but there are no specific processes that ensure that this is completed and evaluated. Defining and visualizing these processes will not only ensure that it is completed, but also that it is completed in the best possible way (best practice) with the most fitting tools and with the correct information. Identifying opportunities and challenges is very important to an agile and modern company.

I suggest that StatoilHydro employ IMT Governance best practice identifying and testing mechanisms. There is no centralized tool for registering and testing best practice experience. One alternative is to create tools and processes for registering and handling best practice experience entries from **all** relevant employees, and not just the process owners. This is an extensive measure, but it is crucial that the work processes reflect best practice. Best practice can only be achieved by collecting experience from the line role.

It is also important to ensure that CobiT and ITIL are not implemented “blindly”. Although these are well known best practice frameworks they need to be adjusted and configured to StatoilHydro’s operations.

IMT Governance documentation is unordered and incomplete. This makes the IMT Governance system hard to extend and evaluate. Why are the current processes chosen? Why are some CobiT processes left out? Why has StatoilHydro decided to use the ITIL framework for Service Management?

### **Connection of Concepts**

StatoilHydro does not have a defined relation between IMT Strategy, Enterprise Architecture and IMT Governance. The IMT Governance and Enterprise Architecture are hardly mentioned in the IMT Strategy, and there is no development/implementation/maintenance process for IMT Strategy and Enterprise Architecture in the governance system.

If StatoilHydro is going to implement IMT Governance and Enterprise Architecture, the topics need to be defined and discussed more thoroughly in the IMT Strategy. The connection between the concepts needs to be evaluated. Relevant processes must be defined in the governance system and there must be a clear connection and separation of the concepts reflected in the governance hierarchy. This is the only way to secure that all viewpoints are covered and that there are no redundancies.

### **Awareness**

The IMT Strategy goals are not visible to IT employees in StatoilHydro. The IMT Strategy is hard to identify, and although I don’t think the entire IMT Strategy should be visible, I find it important for the IT employees to know StatoilHydro’s IT visions.

Enterprise Architecture is a somewhat ambiguous concept in StatoilHydro. Because it is not defined properly in the governance structure of StatoilHydro, EA is differently comprehended throughout the company. There should be a common understanding of the Enterprise Architecture structure and work in StatoilHydro. EA work processes and governance mechanisms must be defined (as described in a previous improvement). This would increase the awareness of Enterprise Architecture as a concept.

## 4. Discussion

The IMT Governance structure looks solid, but it is important to ensure that all employees are aware of it and follow it on a daily basis.

### Summary

My suggested improvement areas for StatoilHydro's implementation of IMT Strategy, Enterprise Architecture and IMT Governance include:

- **IMT Strategy** framework/standards for development:
  - Flaw: There is no process description for development of IMT Strategy
  - Flaw: There is no recording of good/bad experience from the IMT Strategy development process
  - Improvement: An IMT Strategy development framework/process should define who to include, routines for gathering business intelligence on IMT, guidelines for capturing current IT trends and standards for reporting best practice experience from the development process
- **Enterprise Architecture** governance mechanisms:
  - Flaw: There are no clear process descriptions for EA
  - Flaw: Architecture work is "optional"
  - Flaw: Key personnel is hard to replace
  - Flaw: Enterprise architecture is perceived as ambiguous
  - Improvement: Implement work processes for best practice EA development, implementation and maintenance
- **Enterprise Architecture** best practice mechanisms:
  - Flaw: There is no recording of best practice experience
  - Flaw: EA work is based on experience
  - Improvement: Create processes that record experience, evaluate and enable iterative improvement of Enterprise Architecture work
- **IMT Governance** discovery mechanisms:
  - Flaw: No processes for discovering future IM and IT challenges and opportunities exists
  - Improvement: Create process descriptions and tools for handling IM and IT challenges and opportunities, that enable every relevant employee to participate in this activity
- **IMT Governance** best practice mechanisms:
  - Flaw: There is no centralized tool for registering and testing work process best practice experience
  - Improvement: It is important to involve the line role in identification of best practice. I suggest that StatoilHydro create tools and processes for registering and handling best practice experience entries from all relevant employees. Reviewing this experience would make it easier for the process owners

- **Connection of Concepts;** missing connection
  - Flaw: IMT Governance and Enterprise Architecture are hardly mentioned in the IMT Strategy
  - Flaw: There is no development/implementation/maintenance process for IMT Strategy and Enterprise Architecture in the governance system
  - Improvement: IMT Governance and Enterprise Architecture need to be defined and discussed more thoroughly in the IMT Strategy
  - Improvement: The connection of the concepts needs to be evaluated. Relevant processes must be defined in the governance system and there must be a clear connection and separation of the concepts reflected everywhere
- **Awareness:** IMT Strategy goals are not visible
  - Flaw: The IMT Strategy goals are not visible to all relevant employees
  - Improvement: Make IMT Strategy goals visible to all IT employees. It is important to be aware of the IT visions in the daily work routine of the IT employees
- **Awareness:** Enterprise Architecture is ambiguous
  - Flaw: There is no common understanding of EA structure and work among the interviewee's
  - Improvement: Define Enterprise Architecture and EA work. Implement Enterprise Architecture governance mechanisms (as described in a previous improvement)

I have suggested a very high level set of governance processes that cover some of these improvements in Figure 38 below.

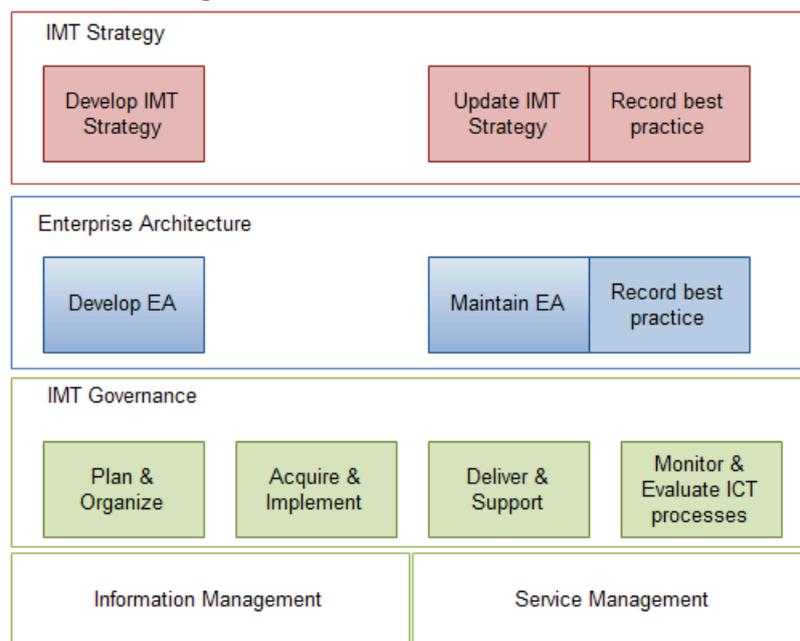


Figure 38 - Suggested governance processes

## 4. Discussion

Figure 38 displays the suggested governance processes:

- **Develop IMT Strategy:** Includes standards for whom to include in the development process, routines for gathering business intelligence on IMT, guidelines for capturing current IT trends and process descriptions for strategy development
- **Update IMT Strategy:** Includes standards for updating the IMT Strategy, with focus on relevant technologies, information, business requirements IT trends and environmental trends. The IMT Strategy goals needs to be made visible to IT employees
- **Record best practice:** This is a part of updating the IMT Strategy and it will help iteratively improve the development process
- **Develop EA:** This could include strategies for hiring consultants or choice of frameworks. This process should reflect a clear and concise way of developing Enterprise Architecture in StatoilHydro.
- **Maintain EA:** This process includes how improvement on collaboration and innovation with peers and partners, improvement on globally enabling, competence harvest, and improvement on understanding IT implication from business change is performed. It should reflect a clear, concise, integrated and agile approach on implementing and maintaining Enterprise Architecture in StatoilHydro.
- **IMT Governance:** This contains the IMT Governance processes already applied. It includes Information Management and Service Management. Some lower level processes and tools needs to be created for recording IM and IT challenges and opportunities. It is important to involve the line role in identification of best practice. I suggest that StatoilHydro creates tools and processes for registering and handling best practice experience entries from all relevant employees.

These suggestions should cover the possible improvements listed on page 109. The processes are limited to certain employees. For example, the IMT Strategy processes should only be visible to relevant employees.

# Conclusion

This master thesis has classified and analyzed StatoilHydro's use of IT Strategy, Enterprise Architecture and IT Governance.

The problem definition given by NTNU is as follows:

*The master thesis will extend the students depth study. Through the master thesis the student shall study and evaluate how IT Governance, Enterprise Architecture and IT Strategy are related in StatoilHydro. The student shall also research StatoilHydro's awareness of the concepts. The student shall propose improvements and/or changes based on this evaluation.*

My personal goals derived in cooperation with StatoilHydro for this master thesis is as follows:

1. Define perceptions of IT Strategy, Enterprise Architecture and IT Strategy, and the connection between them (this work is based on work done in [1]).
2. Define and structure StatoilHydro's implementation of IT Strategy, Enterprise Architecture, IT Governance and important relating concepts, governance mechanisms or infrastructures
3. Define the connection between the relevant concepts within StatoilHydro
4. Research awareness of the concepts in StatoilHydro
5. Discuss StatoilHydro's implementation of IT Strategy, Enterprise Architecture and IT Governance with focus on use of frameworks and interaction between the concepts
6. Discuss possible weaknesses and inconsistencies StatoilHydro's implementation of the relevant concepts might reflect, and suggest improvements

These goals are completed on the following basis:

## **Goal #1 – Chapter 2.2-2.5**

I have defined perceptions of IT Strategy, Enterprise Architecture and IT Governance from literature review and study of well-known implementation frameworks. These perceptions are discussed and connected in chapter 2.5. The perceptions are based on work done in [1].

### **Goal #2 – Chapter 3**

This goal is perhaps the most extensive and it is also the goal I have spent the most time completing. I have spent the majority of my time understanding and classifying StatoilHydro's organization and structuring of IT Strategy, Enterprise Architecture and IT Governance. StatoilHydro is a large enterprise and it took me some time to identify the important aspects and understand the connections. I had to research a whole lot more than just the IT Strategy, Enterprise Architecture and IT Governance to understand "the big picture". Some of the other organizational matters which I find important are discussed in chapter 3.1-3.3. I found it useful to describe StatoilHydro's governance system from the top down, as this is a part of explaining StatoilHydro's solution of IMT Strategy, Enterprise Architecture and IMT Governance. StatoilHydro's IMT Strategy, Enterprise Architecture, IMT Governance and other important governance and organization are explained and defined in chapter 3.

### **Goal #3 – Chapter 3.7**

The existing connection of StatoilHydro's IMT Strategy, Enterprise Architecture and IMT Governance is defined in chapter 3.7. It is important to state that this is my own view of the connection of concepts within StatoilHydro as I could not find any defined existing relations in governing documents (except that Enterprise Architecture is mentioned in the IMT Strategy).

### **Goal #4 – Chapter 3.8 and chapter 4.2**

This goal is completed through short interviews with key personnel in StatoilHydro. The awareness of the concepts is listed and discussed. See chapter 3.8, chapter 4.2 and appendix F.

### **Goal #5 – Chapter 4.1**

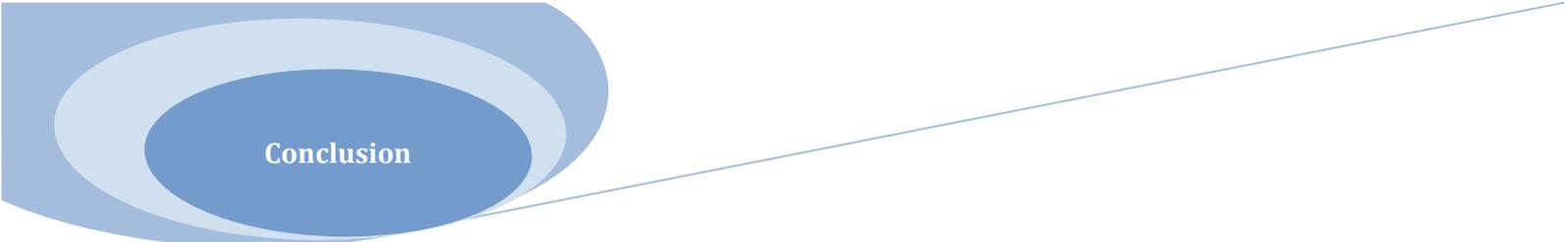
I have discussed StatoilHydro's implementation, connection of concepts and framework use in chapter 4.1. This discussion is based on my own opinions after a literature review of the frameworks. The frameworks are discussed with focus on combination of frameworks, lack of framework use and framework goals. The connection of concepts is based on my own perception, as there is no described defined connection in StatoilHydro's governing and strategic documents.

### **Goal #6 – Chapter 4.3**

This goal is discussed based on my own opinions. I have discussed StatoilHydro's approach on IT Strategy, Enterprise Architecture and IT Governance in chapter 4.3, compared it to my own defined perceptions, and I have suggested possible flaws and corresponding improvements.

It is important to state that everything I have written in this master thesis is derived from my own opinion and perception of status, unless it is cited and referenced. My perception may mirror the general perception or it may not. I might have overlooked facts or misinterpreted information. StatoilHydro's governance system and concepts are defined from document review and study of organization. If my interpretation of existing documents is totally out of line, this may indicate that StatoilHydro benefit from reviewing the usability, availability and understandability of their governing documents, governance system, or other.

My overall goal for this master thesis was to make it useful for StatoilHydro by mapping their use and implementation of IT Strategy, Enterprise Architecture, IT Governance, connection of the concepts, flaws and possible improvements. I wanted this master thesis to be useful both as a complementary encyclopedia and as a reference to consider when developing new IT Strategies, Enterprise Architecture or IT Governance.

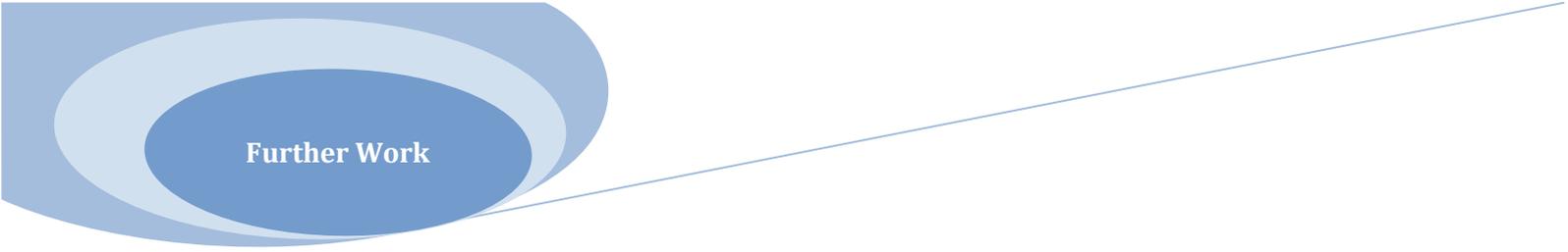


## Conclusion

# Further work

This chapter suggests three possible future tasks that will improve the work done in this master thesis.

1. Research awareness on a deeper level: It would be interesting to research the awareness of the IMT Strategy, Enterprise Architecture and IMT Governance on a deeper level. This can be done by more extensive interviews or surveys aimed to classify the **actual** awareness and use of the concepts. Particularly Enterprise Architecture as it is the “youngest” of the concepts. This research can help StatoilHydro analyze their implementations and the effect of their implementations.
2. Analyze the IMT Governance implementation: This master thesis does not research lower level IMT Governance processes. It would be interesting to investigate StatoilHydro’s use of IT Governance frameworks on a deeper level and find out if the framework-combination of CobiT and ITIL is the best way to do this. Identifying redundancies, overlaps, short-comings, flaws and improvements of the actual IMT Governance process implementation would be useful. Future work could also include researching the actual use of the IMT Governance processes among relevant employees, and the effect of the implementation.
3. Analyze and suggest other best practice frameworks: This master thesis only analyzes current framework use for each concept. An interesting research project could be to investigate other frameworks and see if any are more fitting to StatoilHydro’s goals and needs.

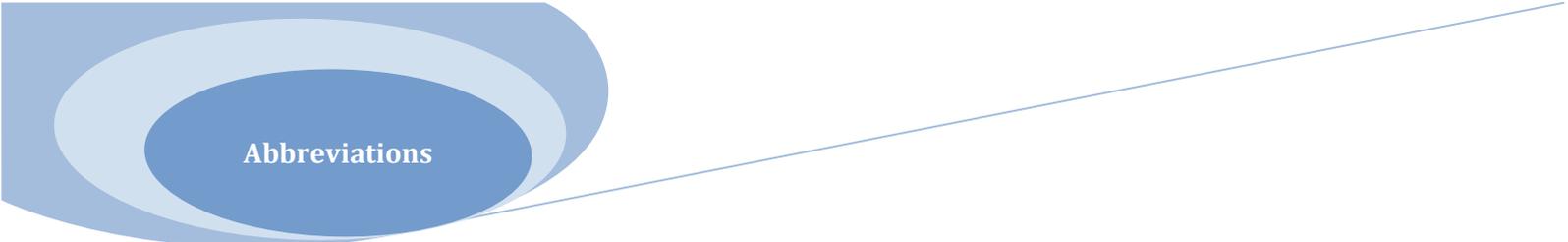


Further Work

# Abbreviations

APOS	Work process oriented governance (translated from Norwegian)
BAS	Business Application Systems
BCR	Business Change Requirements
BIR	Business Information Requirement
BPM	Business Process Model
BPMN	Business Process Modeling Notation
BSR	Business Solution Requirement
CG	Corporate Governance
CobiT	Control Objectives for Information and related Technology
CRV	Common Requirements Vision
Docmap	Document map
EA	Enterprise Architecture
Gartner	EA framework
GBS	Global Business Services
HSE	Health Safety and Environment
ICT	Information Communication and Technology
IM	Information Management
IMT	Information Management and Technology
IT	Information Technology
ITIL	Information Technology Infrastructure Library
ITR	Information Technology Requirements
ITS	Information Technology Solutions
KPI	Key Performance Indicator
M&M	Manufacturing and Marketing
MS	Management System
OTS	Oil Trading and Supply
TOGAF	The Open Group Architecture Framework
UML	Unified Modeling Language
Zachman	EA framework

Table 4 - Abbreviations



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# Appendix A

## The Gartner Framework

Bittler [49] states that Enterprise Architecture bridges the gap that otherwise might exist between business strategy and implementation. Gartner has developed a process model that provides organizations with an approach for developing Enterprise Architecture (see Figure 39). The model focuses on documenting current state architecture, developing requirements, principles and models for a future state architecture, and closing the gap between the two. It focuses on representing a holistic view of the enterprise, considering business strategy and environmental trend evolution, and governing and managing the enterprise processes.

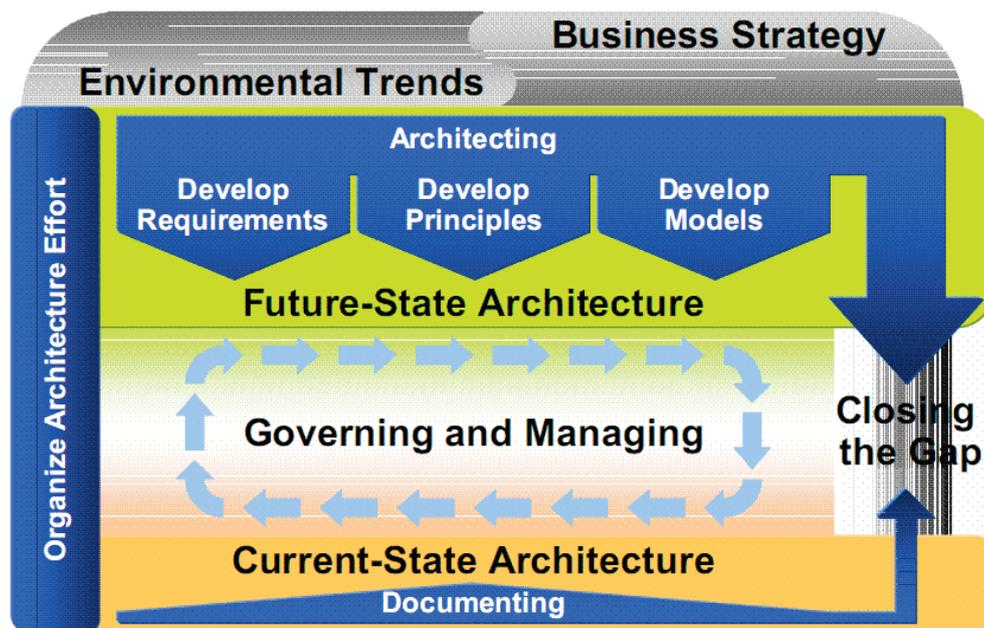


Figure 39 - Enterprise Architecture Process model. Source: Gartner

## CRV

An interesting aspect of Gartner's methodology is the development of a **Common Requirements Vision (CRV)**. This is a part of developing requirements in Figure 40. The CRV is a systematic process beginning with an identification of influencing environmental trends and the most important driving enterprise business strategies. These strategies are then decomposed into the *business change requirements (BCRs)*, *business information requirements (BIRs)*, *information technology requirements (ITRs)*, and the *business solution requirements (BSRs)* [50]. See Figure 40.

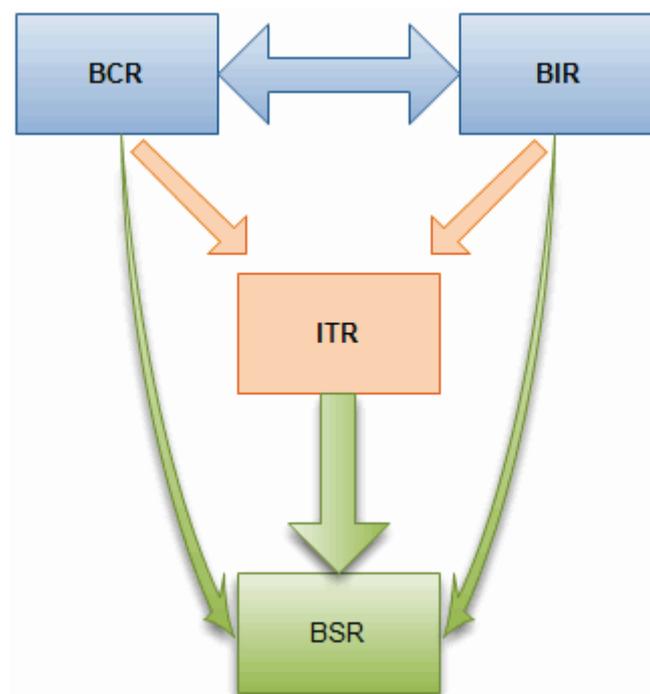


Figure 40 - CRV source: Gartner

The BCRs and BIRs are derived directly from the **enterprise business strategies (EBSs)**. These two represent the business capabilities that must be implemented to satisfy the strategy. The ITRs are derived through the analysis of BCRs and BIRs and define technology capabilities that must be broadly available as supporting infrastructure. The BSRs are a result of the integration of business-level requirements with technology capabilities.

The CRV is both a phase and a deliverable. It represents the linkage between the business strategy and the overarching requirements that the enterprise must meet to satisfy the strategy, and it defines the business strategic content on which the future-state Enterprise Architecture is built [50]. The CRV is thus a process for discussing, capturing and documenting a set of enterprise strategies, a set of common strategic requirements and the impact of global environmental trends on the enterprise.

The aspects that will be discussed in more detail in the rest of this section of the document regarding the Gartner framework are governance and strategy. According to Gartner, governing refers to the processes and organizational structures along with their associated input and decision rights, that guide the enterprise behavior [49].

## Development and Strategy

The Gartner framework mentions several potential governance processes, but the two that are described in detail and that are regarded the most important are *governing the structure and content of Enterprise Architecture* and *the linking of project portfolio management with Enterprise Architecture compliance*. *Governance of the content of Enterprise Architecture* relates to establishment of the final decisions regarding the approval of new or modified Enterprise Architecture content. *Governing Enterprise Architecture compliance* and *project management* should explain how to deal with situations where a project believes it must proceed in a manner inconsistent with at least one element of the defined future state architecture. Projects should not have the authority to make such a decision on their own. Paras [50] states that the previously mentioned CRV process should be closely governed by the principles of IT Governance.

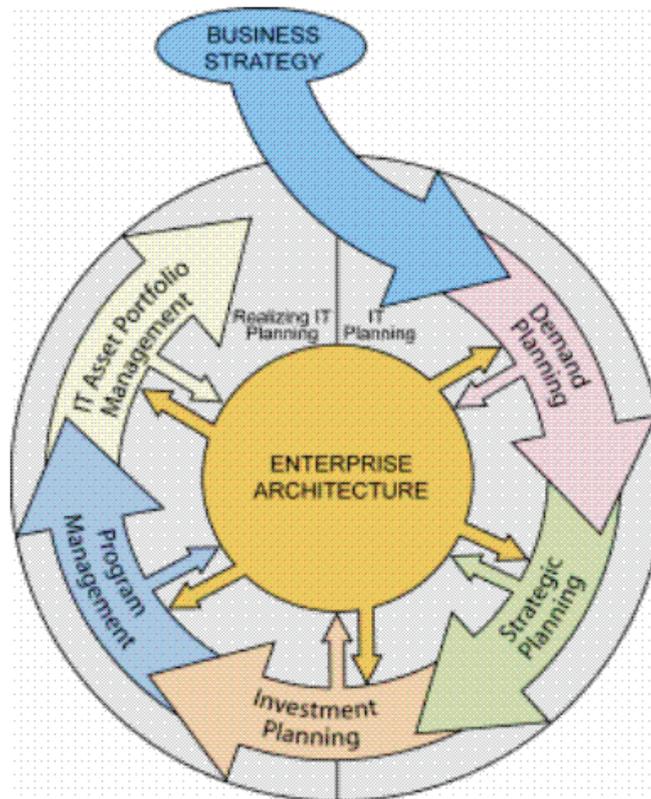


Figure 41 - Enterprise Architecture and IT planning synergies. Source: Gartner

As Figure 41 shows, development of Enterprise Architecture is closely interrelated and connected with IT planning and realizing processes. Weiss [46] suggests that Enterprise Architecture provides input, and receives output from these processes. The planning processes shown in Figure 41 (demand planning, strategic planning and investment planning, all discussed in chapter 2.2) are parts of the IT planning process described by Gartner. These planning processes should develop an IT

Strategic Plan, clarifying the broad direction of the use of IT within the enterprise and document the decisions made about the planned IT investment programs and projects. They should describe how the enterprise will apply IT to support the enterprise mission, which investments have been chosen and what the investments accomplish. Weiss [46] states that the development of the planning processes is not a part of the Enterprise Architecture development, but that they should be done in parallel while communicating. The development of the IT Strategic Plans are often considered parts of IT Strategy.

Realizing this planning and strategy requires a foundation of solid governance that supports the execution processes [46]. The governance should specify the rules, procedures and organizational structures for ensuring accountability through appropriate participation and handoffs. Weiss [46] states that governance processes are focused on providing an ownership role to business stakeholders. It should ensure that IT can act effectively as steward for the technical aspects of managing the assets. The development of complete IT Governance is not a part of the development of Enterprise Architecture using the Gartner framework. The Gartner framework does however specify some governance processes that should be present when closing the gap between current state architecture and future state architecture. The Gartner framework specifies that the development of a future-state Enterprise Architecture should consider the business strategy and the environment as core capabilities.

## Viewpoints

The Gartner Enterprise Architecture framework also describes four primary architectural viewpoints: Business, Information, Technology and Solution (see Figure 42 below). Each viewpoint represent the concerns relevant to a specific set of stakeholders [51]. Roughly speaking, the **Business** viewpoint represent the organizational concerns of the business architects, the **Information** viewpoint represent information flow and information modeling concerns of the information architects and the **Technology** viewpoint represent the technical implementation and operational concerns of the technology architects.

The **Solution** viewpoint deals directly with the single most important and challenging architectural issue: combining and reconciling the loosely coupled and often conflicting viewpoints of the primary stakeholders into a unified architecture for an enterprise solution [51]. Solution architecture consists of, and must take into consideration the three previous architectural viewpoints.

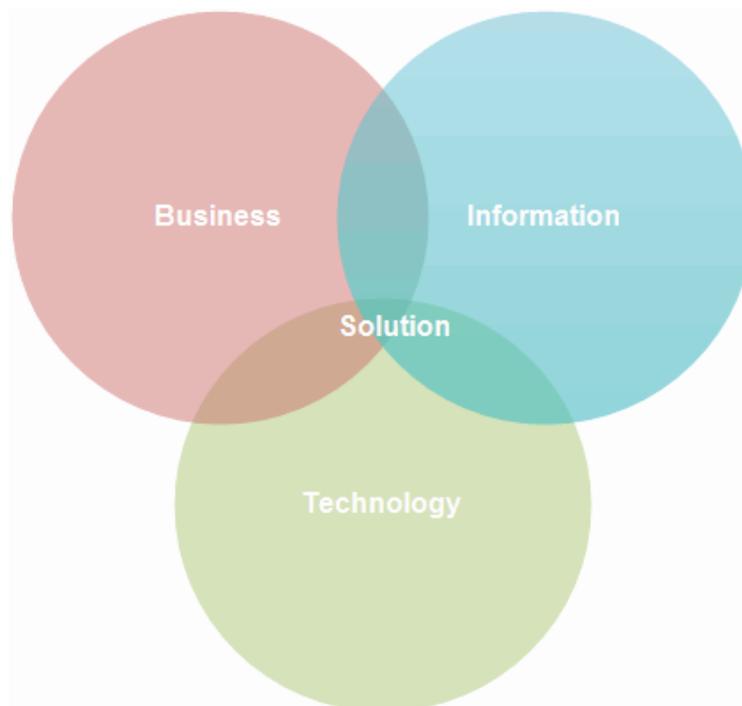


Figure 42 - Architectural Viewpoints

# Appendix B

## The Zachman Framework

The Zachman framework is a logical structure for classifying and organizing the descriptive representations of an enterprise that are significant to the management and to the development of enterprise systems. The framework graphic depicts the design artifacts that constitute the intersection between the roles in the design process. It defines the owner, designer and builder of a design process. It also defines what a component is, how it works, where it is located, who are responsible, who does what work for the component, significant events to the component, and why it exists. The framework will help an enterprise classify its organization of components.

The Zachman framework is described as a planning tool [52]. It can help an enterprise make better choices and position issues in the context of the enterprise and see a total range of alternatives. It is simply a tool to help plan and perform Enterprise Architecture development, and it does not specify much strategy or governance mechanisms. It can be used to organize architectural artifacts, which can be useful to consider when developing Enterprise Architecture, IT Strategy and/or IT Governance. The closest thing to a governance mechanism in the Zachman framework is the “who-column”, which can specify the owner and who does what work on a component. This can be used as a governance mechanism to formalize management of certain components. The closest thing to a strategy mechanism in the Zachman framework is the “why-column” that justifies why a component exist. It can help see which strategies the component completes.

ENTERPRISE ARCHITECTURE - A FRAMEWORK

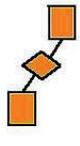
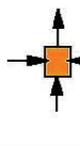
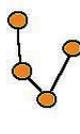
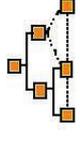
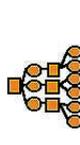
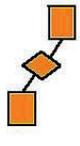
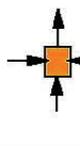
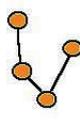
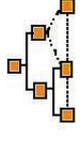
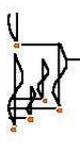
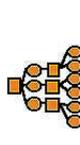
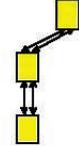
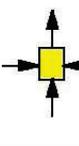
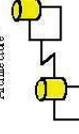
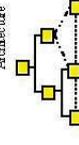
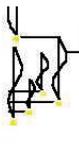
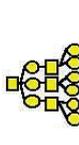
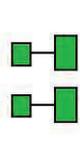
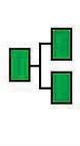
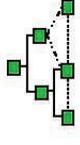
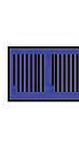
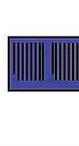
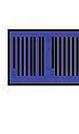
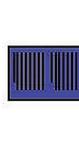
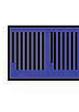
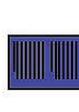
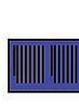
	DATA	FUNCTION	NETWORK	PEOPLE	TIME	MOTIVATION	SCOPE (CONTEXTUAL)
SCOPE (CONTEXTUAL)	List of Things Important to the Business 	List of Processes the Business Performs 	List of Locations in which the Business Operates 	List of Organizations Important to the Business 	List of Things Significant to the Business 	List of Business Goals/Strat 	SCOPE (CONTEXTUAL)
Flavor	ENTITY = Class of Business Thing 	Function = Class of Business Process 	Node = Major Business Location 	People = Major Organizations 	Time = Major Business Event 	Ends/Mean=Major Bus. Goal/Critical Success Factor 	Flavor
ENTERPRISE MODEL (CONCEPTUAL)	e.g. Semantic Model 	e.g. Business Process Model 	e.g. Logistics Network 	e.g. Work Flow Model 	e.g. Master Schedule 	e.g. Business Plan 	ENTERPRISE MODEL (CONCEPTUAL)
Owner	Ent = Business Entity Rel = Business Relationship e.g. Logical Data Model 	Proc = Business Process IO = Business Resources e.g. "Application Architecture" 	Node = Business Location Link = Business Linkage e.g. "Database System Architecture" 	People = Organization Unit Work = Work Product e.g. Human Interface Architecture 	Time = Business Event Cycle = Business Cycle e.g. Processing Structure 	Ent = Business Objective Means = Business Strategy e.g. Business Rule Model 	Owner
SYSTEM MODEL (LOGICAL)	Ent = Data Entity Rel = Data Relationship e.g. Physical Data Model 	Proc = Application Function IO = User Views e.g. "System Design" 	Node = IS Function Link = Line Characteristics e.g. "System Architecture" 	People = Role Work = Deliverable e.g. Presentation Architecture 	Time = System Event Cycle = Processing Cycle e.g. Control Structure 	Ent = Structural Assertion Means = Action Assertion e.g. Rule Design 	SYSTEM MODEL (LOGICAL)
Designer	Ent = Segment/Table/etc. Rel = Pointer/Func/etc. e.g. Data Definition 	Proc = Computer Function IO = Screen/Data Formats e.g. "Program" 	Node = Hardware/System Software Link = Line Specifications e.g. "Network Architecture" 	People = User Work = Screen Format e.g. Security Architecture 	Time = Estimate Cycle = Component Cycle e.g. Tuning Definition 	Ent = Condition Means = Action e.g. Rule Specification 	Designer
TECHNOLOGY MODEL (PHYSICAL)							TECHNOLOGY MODEL (PHYSICAL)
Builder							Builder
DETAILED REPRESENTATIONS (OUT-OF-CONTEXT)							DETAILED REPRESENTATIONS (OUT-OF-CONTEXT)
Sub-Contractor							Sub-Contractor
FUNCTIONING ENTERPRISE	e.g. DATA 	e.g. FUNCTION 	e.g. NETWORK 	e.g. ORGANIZATION 	e.g. SCHEDULE 	e.g. STRATEGY 	FUNCTIONING ENTERPRISE

Figure 43 - Example of Zachman Framework [52]

# Appendix C

## The TOGAF Framework

TOGAF is an open source tool for implementing Enterprise Architecture. In TOGAF, architecture has two meanings depending on its conceptual usage [30]:

- A formal description of a system, or a detailed plan of the system at component level to guide its implementation
- The structure of components, their inter-relationships, and the principles and guidelines governing their design and evolution over time

TOGAF is a more extensive framework for implementing Enterprise Architecture: Business architecture, data architecture, applications architecture and technology architecture. Data architecture and applications architecture can be compared to the previously described Information Systems architecture.

## ADM

Figure 44 displays the TOGAF Architecture Development Method (ADM), which is the framework used when developing Enterprise Architecture.

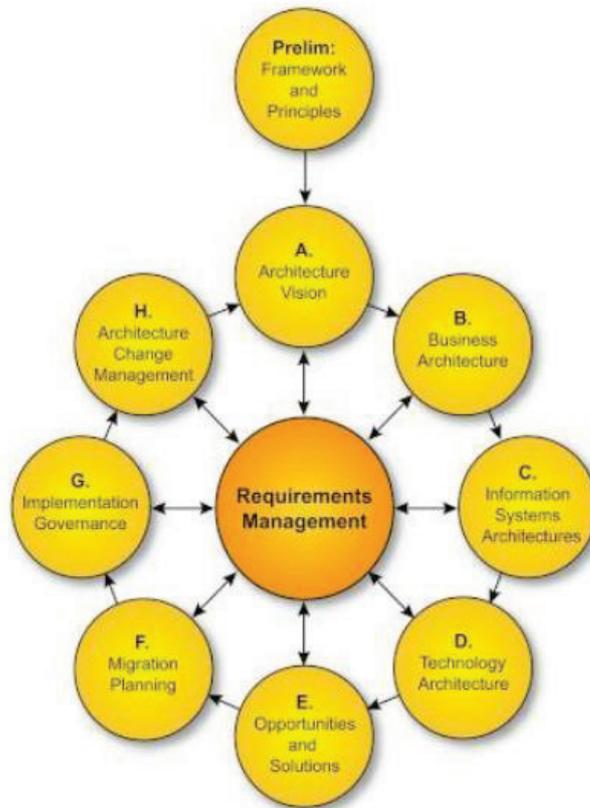


Figure 44 - TOGAF ADM [30]

TOGAF involves a preliminary phase that defines architecture principles and governance for the development of the Enterprise Architecture. The preliminary phase is about developing the framework to be used, and defining the architecture principles that will inform any architecture work. The principles include both business principles and architecture principles. Defining the business principles is normally outside the scope of the architecture function. The architecture principles are normally based on the business principles. Architecture governance is closely linked to the architecture principles. The body responsible for governance will also normally be responsible for approving the architecture principles, and for resolving architecture issues.

The next phase of TOGAF is the architecture vision phase. This phase validates business principles, business goals, and strategic business drivers for the company. It defines the architecture effort, the vision and the goals of the architecture according to the business principles. This phase should secure the alignment between business and the architecture goals, and it needs a secure formal approval to proceed.

The next phases of the TOGAF framework is about defining the business architecture, information systems, technology architecture, migrating, defining opportunities and implementing. This paper will not discuss these phases. However, TOGAF also involves an implementation governance phase. This phase formulates recommendations for the project, and governs the overall implementation and deployment [30].

A key element to successful architecture governance strategy is a cross-organization architecture board to oversee the implementation of the strategy and govern the process [30]. The board should be representative for all stakeholders of the Enterprise Architecture, and will typically comprise a group of executives responsible for the review and maintenance of the overall architecture.

Governance of Enterprise Architecture (EA governance) typically does not operate in isolation, but with a hierarchy of governance structures, which can include all of the following domains [30]:

- Corporate Governance
- Technology governance
- IT Governance
- Architecture governance

Enterprise Architecture governance is the governance described above (governance of the TOGAF ADM). Corporate Governance is a broad topic, which might include technology, IT and architecture governance. Technology governance is about governing the technology within the enterprise.

IT Governance is defined by [30] as a provider of the framework and structure that links IT resources and information to enterprise goals and strategies. IT Governance should institutionalize best practices for planning, acquiring, implementing and monitoring IT performance regarding the business objectives. The Open Group [30] states that IT Governance and an appropriate organization for implementing the strategy must be established with the backing of top management. TOGAF specifies the previously described CobiT framework as a good tool for implementing IT Governance. TOGAF defines how to develop architecture governance, but it states that IT Governance is a much broader topic beyond the scope of most Enterprise Architecture frameworks (including TOGAF itself).

## Continuum

The enterprise continuum sets the broader context for TOGAF by explaining the different types and scopes of the architecture artifacts and assets that can be derived from it and leveraged during its use [30]. **Lang seting?**

The simplest way of thinking of the enterprise continuum is as a “virtual repository” of all the architecture assets (models, patterns, architecture descriptions and other artifacts) that exist both within the enterprise and in the IT industry at large.

The decision as to which architecture assets a specific enterprise considers part of its own enterprise continuum will normally form part of the overall architecture governance function within the enterprise.

The Enterprise Continuum consists of the Architecture Continuum and the Solutions Continuum [30]. The Architecture Continuum specifies the structuring of reusable architecture assets and includes rules, representations and relationships of the information system(s) available to the organization. The Solutions Continuum describes the implementation of the Architecture Continuum by defining reusable solution building blocks.

# Appendix D

## The CobiT Framework

CobiT provides 34 processes and their corresponding high-level control objectives and management guidelines, including their maturity models and key goals [53]. The Framework explains how IT processes deliver the information that the business needs to achieve its objectives. CobiT processes cover four domains: *Planning and Organization*, *Acquisition and Implementation*, *Delivery and Support*, and *Monitoring and Evaluation*.

The *Planning and Organization* domain covers the use of IT to achieve goals and objectives. It is supposed to help accomplish optimal results and to generate the most benefits from use of IT. Processes in the *Planning and Organization* domain include:

- Define a Strategic IT plan and direction
- Define the Information Architecture
- Determine technological direction
- Define the IT processes, Organization and Relationships
- Manage the IT investment
- Communicate management aims and direction
- Manage IT human resources (HR)
- Manage quality
- Assess and manage risks
- Manage projects

The *Acquire and Implement* domain includes identifying IT requirements, acquiring technology, and implementing technology within the company's current business processes. It may also address the development of a maintenance plan that companies adopt in order to extend the life of IT systems. Processes in the *Acquire and Implement* domain include:

- Identify automated solutions
- Acquire and maintain application software
- Acquire and maintain technology infrastructure
- Enable operation and use
- Procure IT resources
- Manage changes
- Install and accredit solutions and changes

## Appendix D

The *Deliver and Support* domain covers areas such as execution of applications within IT, and support processes that enable effective and efficient execution of these IT systems. Support processes include security issues and training. Processes in the *Deliver and Support* domain include:

- Define and manage service levels
- Manage third-party services
- Manage performance and capacity
- Ensure continuous service
- Ensure systems security
- Identify and allocate costs
- Educate and train users
- Manage service desk and incidents
- Manage the configuration
- Manage problems
- Manage data
- Manage the physical environment
- Manage operations

The *Monitor and Evaluate* domain deals with a company's strategy in assessing its needs, and whether or not the current IT system still meets the requirements. Monitoring can also cover independent assessment of effectiveness of an IT system in its ability to meet business objectives. Processes in the *Monitor and Evaluate* domain include:

- Monitor and evaluate IT processes
- Monitor and evaluate internal control
- Ensure regulatory compliance
- Provide IT Governance

CobiT is an extensive framework for IT Governance. Some of the processes in CobiT touch on subjects related to IT Strategy and development of Enterprise Architecture. CobiT focuses on strategic alignment, value delivery, resource management, risk management and performance measurement.

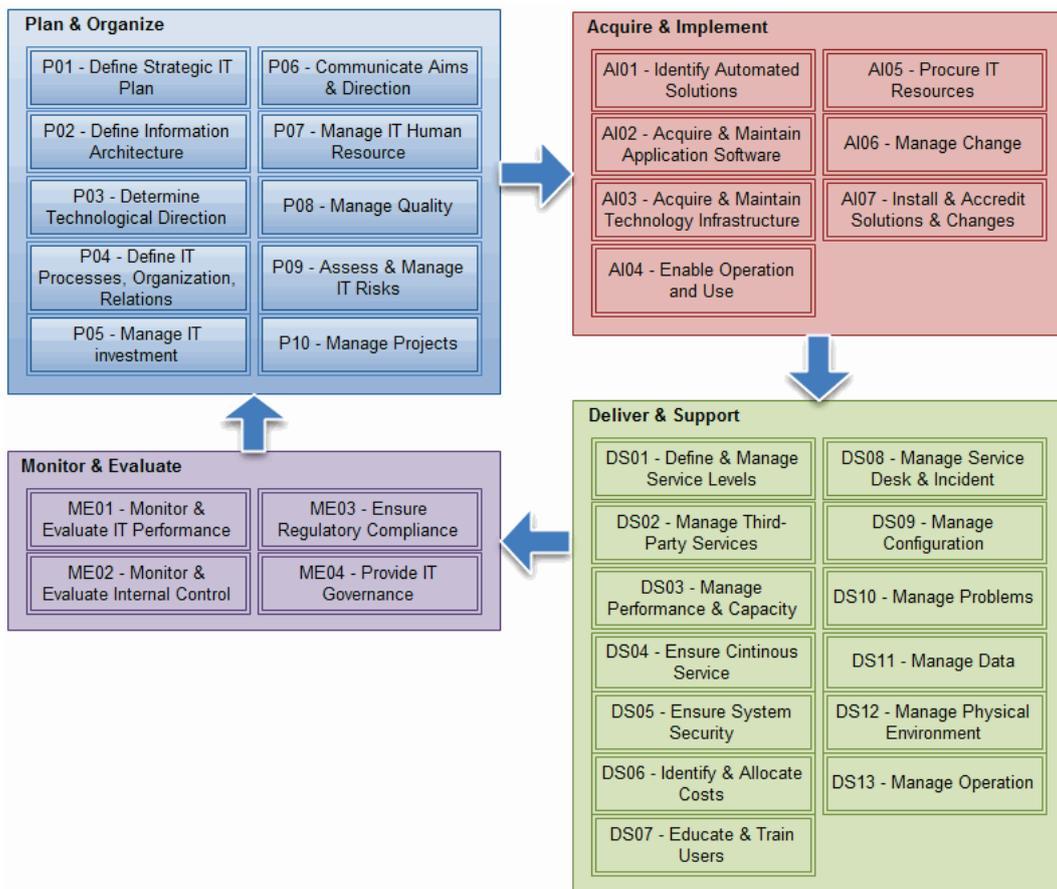
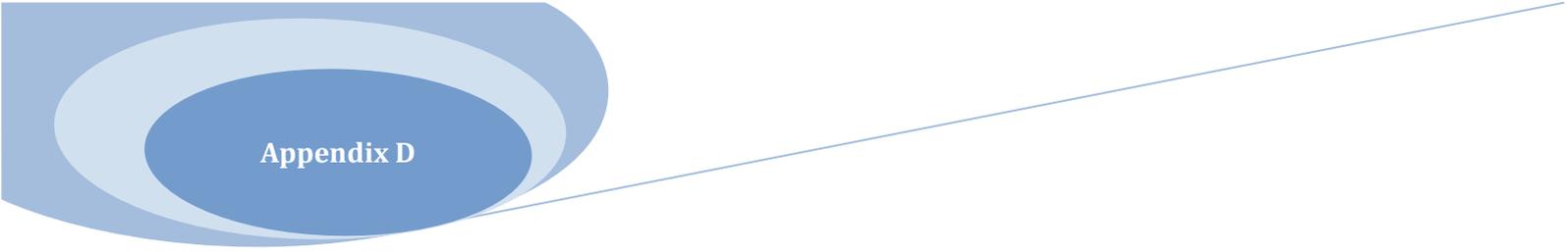


Figure 45 - The CobiT processes [48]



Appendix D

# Appendix E

## The ITIL Framework

**Information Technology Infrastructure Library (ITIL)** is a set of concepts and policies for managing information technology infrastructure, development and operations. It is a world-known, almost de facto standard for IT **Service Management**. ITIL consists of a series of books giving guidance on the provision of quality IT services, and on accommodation and environmental facilities needed to support IT [54]. The names *ITIL* and *IT Infrastructure Library* are trademarks of the United Kingdom's Office of Government Commerce.

ITIL focuses on best practice, and as such can be adapted and adopted in different ways according to each individual organizations needs. ITIL provides businesses with a **library** and a customizable **framework** of best practices to achieve quality service and overcome difficulties associated with the growth of IT systems.

The ITIL **library** consists of 5 key volumes of Service Management: Service strategy, service design, service transition, service operation and continual service improvement. Within these a variable number of very specific disciplines are described:

- **Service strategy** encompasses a framework to build best practice in developing a long time service strategy. It covers many topics including: general strategy, competition and market space, service provider types, service management, organization design and development, financial management, demand management and key roles and responsibilities of staff engaging in service strategy.
- **Service design** includes design of architecture, processes, policies, documentation, and allowing for future business requirements.
- **Service transition** relates to the delivery of services required by the business into live/operational use, and often encompasses the “project” side of IT. This area covers topics such as managing changes the business environment.
- **Service operation** is the part of the business cycle where the services and value are actually delivered. Also the monitoring of problems and balance between service reliability and cost are considered. Topics include balancing conflicting goals, event management, incident management, problem management, request fulfillment, asset management, service desk, technical and application management, as well as key roles and responsibilities for staff engaging in service operation.

- **Continual service improvement** is about aligning IT services to changing business needs by identifying and implementing improvements to the IT services that support the business processes.

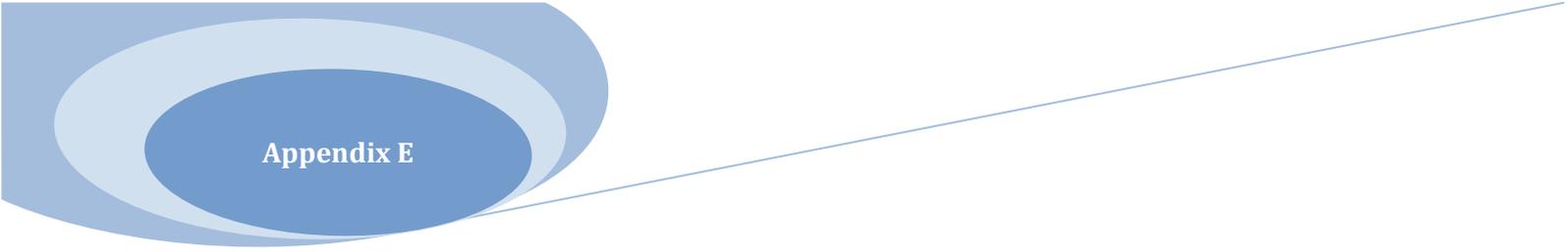
The ITIL **framework** is divided into eight sets. The sets are further divided into a number of disciplines. The eight sets and their disciplines include [55]:

- **Service Delivery: What services IT delivers to support the business**
  - IT Financial Management
  - Capacity Management
  - Availability Management
  - IT Continuity Management
  - Service Level Management
- **Service Support: How IT secures that customers have access to the correct services**
  - Change Management
  - Release Management
  - Problem Management
  - Incident Management
  - Configuration Management
  - Service Desk
- **Planning to Implement Service Management: How the process of implementing ITL is performed**
- **Security Management**
- **ICT Infrastructure Management: The necessary processes and tools**
  - Network Service Management
  - Operations Management
  - Management of local processors
  - Computer installation acceptance
  - Systems Management
- **The Business Perspective: Explains important principles and demands to the business part of an organization**
- **Application Management: The governance of software development**
- **Software Asset Management: How software licenses are organized**

A figure of the ITIL Service Management framework is included on the next page.



Figure 46 - ITIL framework [54]



Appendix E

# Appendix F

This appendix contains the short interviews performed on key personnel in StatoilHydro.

## Questionnaire

IT Strategy, Enterprise Architecture and IT Governance

If you don't know the answer to a question or if it doesn't concern you, you can leave the answer blank.

1. What do you think an effective IT Strategy contains and what time span do you think it should consider?
2. How does StatoilHydro's IMT Strategy affect <your area of work/your unit> in your daily work routine?
3. What is Enterprise Architecture?
4. What do you consider StatoilHydro's Enterprise Architecture work, and how is it organized?
5. Are any of your daily work routines connected to StatoilHydro's Enterprise Architecture?
6. How are you affected by StatoilHydro's IMT Governance in your daily work routine?
7. What do you feel is StatoilHydro's advantage of using a best practice framework for implementing IT Governance?
8. What is your perception of the connection between StatoilHydro's business strategy, IMT Strategy, Enterprise Architecture and IMT Governance?

## Interview with Geir Owe Wærsland

IT Special Advisor– Energy Trading Services, iTrade Responsible  
[gow@statoilhydro.com](mailto:gow@statoilhydro.com)

### Summary of answers

1. A good IT Strategy must describe at least two relations:
  - a. A description of how to react when someone in the enterprise has the need for IT support.
  - b. A description of how to handle change in business because of change in technology. This can be capturing an opportunity before competition or handling a possible technical risk as early as possible.These relationships are generic and do not need a limitation in time. If the IT Strategy is going to contain preferred technologies (Software and Hardware) it should be adjusted yearly.
2. I assume that you mean the governing documents. These do not cover the previously mentioned relationships from question 1. I am not familiar that we actually have an IMT Strategy, Today's governing documents governs the way we work in my projects. In addition to this they pressure us to make system changes that are technically reasoned.
3. Enterprise Architecture for me contains two relationships:
  - a. A model of the enterprise (contains business, information, system and technology models). And most importantly the connection between these models.
  - b. A description of the governance we have to keep the architecture and models updated over time.
4. I can't see that we have an enterprise-wide approach for this. We have some business units that perform EA from own interests, but we do not have a current enterprise-wide model. Best case we have a model of business processes and a repository of IT systems and their lifecycle state. I would like to see (a lot) more focus from CIMT on implementing an EA model in the enterprise (of course in cooperation with business units and process owners).
5. We have one architecture team creating a common EA model for NG and OTS. We use TOGAF as a framework.
6. It affects choice of technology and prioritizing of projects.
7. I think that it is important to use standards such as CobiT. We are about to change the IMT Governance system. The most important is of course that the governance system is known and followed. We still have some work left to do there.
8. I am not aware that StatoilHydro has an own IMT Strategy. I feel we need more focus on Enterprise Architecture. To succeed in this we must invest in keeping the models updated, make them known throughout the enterprise, make use of them and force them into every project.

## Interview with Frode Barstad

IT Leader of Manufacturing & Marketing OTS

[froba@statoilhydro.com](mailto:froba@statoilhydro.com)

Summary of answers:

1. An effective IT Strategy is something that can be used in the daily work routine to support decisions. It should provide clear guidance on choice of solutions, models for outsourcing, technology choices and so on. For example principles on building systems on our own or by off-the-shelf solutions, use own employees or put out on enterprise, drive everything in our own infrastructure or use external service deliveries etc. An IT Strategy should have a 5-10 year span, but it should be revised yearly at a minimum.
2. I use the IMT Strategy to secure day-to-day decisions. An example is buying off-the-shelf software instead of developing in house.
3. Enterprise Architecture is a tool to secure connection between business processes, information and technology. These concepts are less interesting separated, but combined one can get effective IT. I usually portray Enterprise Architecture as three cogwheels, where process, information and technology are the wheels. This illustrates the interaction in a good way.
4. Enterprise Architecture is too little apparent. The future establishment of the architecture board is very positive. Today there is something in the interaction between “management systems”, process owners and corporate IT that doesn’t fit. Process owners in StatoilHydro have a very strong mandate throughout the StatoilHydro book and they have a clear responsibility for information and tools. The Enterprise Architecture commitment has been left in the hands of the process owners. The problem here is that the EA initiative and methods is the IMT leaders’ initiative. I feel that some process owners are trying to indicate themselves as business- and “non-IT” personnel. If Enterprise Architecture effort is going to be successful in StatoilHydro, it has to be anchored on a higher level in the organization, and as much as possible “IT flavor” has to be removed.
5. Is this a “trick question”? If you define the work processes in the Business Process Model as EA, then the answer is yes. Regarding the previous question: Process owners will probably not consider this Enterprise Architecture, while the leading advisor’s probably will. I think this applies to other IT Governance as well; the responsible for governance will not consider governance as part of EA.
6. In a large degree. On the corporate level you have the whole framework for prioritizing of projects, CIMT and approval and compliance check. ITIL service management processes affect me in little or no degree, but it affects GBS.
7. If you are asking about ITIL then the answer is that I think you sacrifice

flexibility for stability when applying a framework. But I think this is absolutely necessary for a company our size to employ these kinds of frameworks.

8. The IMT Strategy is an extension of the business strategy. Enterprise Architecture is, as described, very diffuse. The idea is that EA and IMT Governance together is some of our most important tools to succeed with the strategies. Some might say that the strategies (both business and IMT) should be a part of the Enterprise Architecture, but this is not the case in StatoilHydro yet.

## Interview with Kurt Ole Myren

IT Leader of GBS

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Summary of answers:

1. An effective IT Strategy says something about IT direction and IT architecture requirements for projects. This should be demands that the projects have to follow when new solutions are designed and implemented. The strategy should cover 3-5 years. To secure an effective IT Strategy, it has to be anchored in the company business areas, integrated in the company strategy processes and communicated to relevant stakeholders.
2. StatoilHydro's IT Strategy affects me 100% in my daily work, as it says something about which IT projects to initiate at which times. It also directs how we develop our organization and what competence the different result-units and geographical locations are required to have.
3. Enterprise Architecture to me is a regulation plan for the company's IT architecture and IT infrastructure. This regulation plan should set demands on how projects implement new IT solutions and applications.
4. Our plan is that the IM and IT process owner (the CIO) establishes an Enterprise Architecture board with representatives for relevant process owners, management systems etc. This board will define all EA requirements. The future plan include that all internal service delivery areas establishes equal boards and that all IT projects has to get a technological compliance check approved before developing and implementing new IT solutions in StatoilHydro's established IT infrastructure.
5. Yes, I follow StatoilHydro's IM/IT PROFF (processes for the future) considering demand-supply governance (Reference: StatoilHydro is planning a new system with demand and supply governance. This is not included in the scope of this thesis) where EA is a part f IT Governance.
6. As local process leader my responsibility is to see that the IMT Governance is followed in GBS.
7. Our advantage is that we achieve effective work processes by not spending time on non-valuable clarifications. We can spend our time developing and implementing IT solutions and assessment that will cover our business needs.
8. I see a close connection between StatoilHydro's strategy, IMT Strategy, Enterprise Architecture and IMT Governance (and they are connected in that order). For a successful strategy implementation the Enterprise Architecture and governance has to contribute to the realization of the strategy.

## Interview with Roald Kvamstad

Service Responsible, Leader CSO GBS BAS

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Summary of answers:

1. Some of the focus here is on IT technological direction and requirements to IT architecture. I want to add that the IT Strategy also should say something about the future of solutions that was based on “green” technology when they were acquired, but now are based on more “red” technology (Reference: Red means that the technology is phased out and no longer relevant). This is because we need to consider solutions that are built to last 15-20 years even though they are no longer based on the “best” technology. In addition to a general enterprise IMT Strategy, the IMT Strategy needs to be an integrated part of the of the business strategy for the different units in StatoilHydro. This strategy should define actions within the IT area for how to cover the gap between as-is and to-be with focus on solution architecture, software architecture, data architecture etc.
2. My “unit / area of work” is IT solutions regarding “energy trading gas” and “energy trading oil”. Given my answer on the last question; that I separate between a) a general IMT Strategy with technology focus, and b) the IMT Strategy directly linked to a business strategy for a business area - I would say that: a) is used when needed. This is when considering the technology in offered solutions from a third part and when considering technology for internal development. b) is used more actively than a) when solutions within our IT services are designed.
3. To me, Enterprise Architecture is the sum of the architectural “dimensions” used for a specific process area, and this covers processes, information, solution, software/technology and data. An example for this is the EA-team **TREAT** (iTrade Enterprise Architecture Team) which covers OTS’s common IT activities within the trading area.
4. Within my area of work I would consider the previously mentioned architectural team TREAT as something that covers the architectural views of StatoilHydro. TREAT has a responsibility in “lifecycle”, which means not just related to running or new projects, but also management of finished solutions. My opinion is that Enterprise Architecture today is not implemented in all areas of StatoilHydro today.
5. I would say that the future state of Enterprise Architecture is about to start (reference: With the establishment of the architecture board). I contribute to architectural decisions followed by GBS’s employees and projects. These decisions are documented in the “iTrade Wiki”.
6. In my role as service responsible for two of the IT services, this is about following the new processes. This is performing the process activities that

belong to the “service provider”, with focus on the governance part.

7. To me, a framework is one united process that describes clearly what needs to be done in what order and who is responsible. It is important to define who is accountable, who is responsible, who the contributors are and who is to be informed. Especially when dealing with processes involving much communication.
8. There is a close connection between StatoilHydro’s strategy, IMT Strategy, Enterprise Architecture and IMT Governance, and they are connected in that order. For a successful strategy implementation the Enterprise Architecture and governance has to contribute to the realization of the strategy.

## Interview with Knut Sebastian Tunglund

Leading Advisor GBS and Chief Engineer infrastructure

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Summary of answers:

1. An effective strategy should secure interaction, common goals and prioritized activities. An IT strategy should define the use of IT. The important aspects of the strategy are not the goals, but the effect it embodies now and the coming year. A strategy should reach far enough to describe goals, and short enough to be relevant.
2. In my area of work (GBS BAS) the IMT Strategy affects sourcing first and foremost. What should be developed in-house and what should be outsourced? It should also plan for long term competence building.
3. This is the interaction between business goals, strategies, organization, work processes, competence, methodologies and IM/IT. It defines ways to describe the connections.
4. We have a lot of Enterprise Architecture work today, but it might not be known to everyone as EA work. I experience that much of the EA work is included with the process owners. This includes the ways to work, IT tools, information use and so on. In addition to this we are trying to apply an enterprise architecture board. This is not yet implemented, and it is hard to see the implications this might have.
5. With my definition of Enterprise Architecture this includes a lot. For example how I report, what systems I use, how I treat information, where IT systems are developed, etc.
6. As my area of work includes IT, the IMT Governance affects me strongly. It defines what projects I work on, how I work on these projects etc. In addition I spend some of my time developing governance rules.
7. I think it helps develop the IMT Governance. This includes enabling dialogue and formulating requirements. I don't believe it is used directly by the ones that are governed by this.
8. They are all dependencies. This is also a hierarchy as the IMT Strategy is directed by the business strategy, but it is not the other way around.

## Interview with Åge Haldorsen

Project Leader, NG FC ITG

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Summary of answers:

1. It must be defined from the business strategy.
2. <blank>
3. To me, Enterprise Architecture is the business aspect; business processes, business information and solution architecture. It is also software architecture and integration architecture.
4. It contains some different actions through governing documents. This includes processes. It is not very organized.
5. Some, but not a lot
6. <blank>
7. <blank>
8. I don't know.