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Enterprise Architecture, IT Strategy and IT Governance

**TDT4520 Program- and Information systems, Depth Study
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Abstract

Enterprise Architecture, IT Strategy and IT Governance are three concepts that can be hard to separate from each other. They are often used together, they overlap, and there exists mixed usage of definitions and terms regarding these concepts within most enterprises. This paper defines each of these concepts and related models according to several different sources. It describes and compares some methodologies focusing on relations between Enterprise Architecture, IT Strategy and IT Governance. Finally, this paper looks at and discusses some similarities, differences, connections, interfaces and overlaps between each concept and the corresponding methodologies.

Preface

This report was written as a part of the graduate level course **TDT4520 Program- and Information systems, Depth Study** during the fall semester of 2008. The course is 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. I would like to thank Harald Rønneberg for giving me insightful and valuable feedback – both through private guidance and through the course **TDT26 Enterprise Architecture**. His contribution made the task interesting and challenging. I would also like to thank him for guidance on the structure of the report. Last I want to thank some people for keeping me motivated; Jannikke Ludt and Magne Davidsen have both helped with English grammar, report structure and discussing subject with me during the whole semester.

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Christopher Ludt Parmo

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1. Introduction

This introductory chapter presents the motivation for doing this project, the project context, the problem definition, and the outline of the report.

1.1 Motivation

Information Technology becomes more and more important for enterprises. The investments in IT-based information systems increases and many investments fail [1]. Information Technology and systems are already critical to success in many companies, and technology evolves at increasing pace. Almost every big company employs strategies and governance for Information Technology.

To be a successful organization in the modern business world, an enterprise must support consistent decision-making and drive cultural change [1]. Today's business-world is fast-paced, internet enabled and changing. Companies need to adapt to the changing environments. Unfortunately, it might be hard for some companies to emulate their business processes.

IT and computers opened up a whole new set of business opportunities. Some reasons that IT solutions are needed in today's companies include:

- People make mistakes; computers do the same structured processes every time
- People are slow; computers perform computations at a much higher pace
- Human computational power is much more expensive than computer computational power
- Increased reporting, computers make it easier to handle large supplies of data and information

In other words, computers as workers *might* turn out better, faster and cheaper for enterprises when doing repetitive work. They might improve quality, reduce the time spent on the work, and save money. However, it is important that the computer-power is well organized in architecture and/or infrastructure to enable new possibilities in task-solving [2].

Enterprise Architecture is a defined concept with corresponding methodologies that some modern companies adopt in order to tackle organizing of architecture and infrastructure. It can be hard to separate the development of Enterprise Architecture from the development and usage of IT Governance and IT Strategy. It can also be hard to define the Governance and Strategy processes that are needed, or that need to be configured to support the deployment of Enterprise Architecture. The motivation for writing this paper is to define and separate Enterprise Architecture, IT Strategy and IT Governance from one another. It is necessary to partition the terms and to know the difference between the concepts, in order to cover all aspects of Information Technology. This is not possible unless each of these concepts is thoroughly defined. This paper will take a deeper look into the methodologies for using the three concepts, and research how they are related to each other.

1.2 Project Context

This project is written in parallel with the course "TDT26 Enterprise Architecture, Depth Study". The project is a depth study before a Master study. The subsequent Master involves researching and evaluating StatoilHydro's use of Enterprise Architecture, IT Strategy and IT Governance, and also suggest improvements or define inconsistencies or flaws.

StatoilHydro is a Norwegian oil- and gas company with about 29,500 employees and activities in 40 countries. StatoilHydro has their 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. To be competitive in the oil- and gas market, StatoilHydro continuously explores and takes advantage of new technologies, and updates strategies and governance policies. StatoilHydro has expressed a need for mapping their own use of Enterprise Architecture, IT Strategy and IT Governance as concepts, and perhaps define inconsistencies and defects.

1.3 Problem Definition

The problem definition given by NTNU is as follows:

Enterprise Architecture, IT Strategy and IT Governance are three concepts that are sometimes used in the same context and that are often mixed. It seems as if the content of these concepts somewhat overlap. It is needed to define these concepts and define the corresponding equalities, differences, connections, interfaces and overlaps.

The depth study will involve exploring the concepts and corresponding methodologies, describe equalities, differences, interfaces, overlaps and so on.

In this report, I have tried to meet the challenges of the problem definition as good as possible. These concepts are interrelated, but they have many different variations and definitions which I have tried to capture.

I have defined Architecture, Strategy and Governance to get a better understanding of the basis of Enterprise Architecture, IT Strategy and IT Governance. I have also explored the different definitions and variations of Enterprise Architecture, IT Strategy and IT Governance from several sources and viewpoints.

I have described 3 methodologies for developing Enterprise Architecture, IT Governance and IT Strategy. I have not described the methodologies in detail; I have focused on how the methodologies deal with the relevant terms and the connection between them.

1.4 Report Outline

The report defines and describes the differences and challenges stated in the problem definition. Chapter 2, 3 and 4 describes IT Strategy, IT Governance and Enterprise Architecture with corresponding methodologies. Chapter 5 compares the concepts, while chapter 6 summarizes and concludes. Chapter 7 describes the future work and challenges.

Chapter 2, IT Strategy

This chapter starts by describing and defining *strategy* as a concept. The rationale for this is the importance of understanding what a strategy involves before employing it to Information Technology. Strategy can be ambiguous, and it is important to define the term thoroughly before exploring IT Strategy.

The next section of chapter 2 defines and exemplifies *IT Strategy* as a concept. It also touches on IT planning, development of an IT strategic plan, and what impact this has on IT Strategy.

The final section of chapter 2 briefly describes 3 different methodologies for implementing IT Strategy. It focuses on how IT Governance and Enterprise Architecture are represented in these methodologies.

Chapter 3, IT Governance

This chapter describes and defines *governance* as a concept. *Governance* can be unclear, and it is important to define the term systematically before exploring IT Governance.

Chapter 3 also defines and exemplifies Governance relating to Information Technology. *IT Governance* is a wide and ambiguous term, and this section tries to capture the big picture.

The final section of chapter 3 briefly describe 3 different methodologies for implementing IT Governance. It focuses on how IT Strategy and Enterprise Architecture are represented in these methodologies.

Chapter 4, Enterprise Architecture

This chapter explains *Enterprise Architecture*. It starts off by defining what *architecture* is to give a vision of an important element.

The next section defines *Enterprise Architecture*. This is a wide concept, and there are several different perceptions of how wide it is and what to include. I have tried to include the most common perceptions of Enterprise Architecture in this section.

The final section of chapter 4 briefly describe the Zachman framework, TOGAF, and the Gartner framework, which are frameworks for implementing and controlling Enterprise Architecture. It does not describe these frameworks in detail, but it focuses on how they make use of, and are connected to IT Governance and IT Strategy.

Chapter 5, Comparison of Concepts

This chapter will try to give an overall summary of the concepts, and compare relevant differences, similarities, overlaps and interrelations of the belonging methodologies. This is an important chapter, as it lists the different methodologies and how they perceive the relevant concepts.

The outline of this chapter is as follows: First, it summarizes the 3 concepts. Then, it starts with the methodologies of IT Strategy and compares them to IT Governance and Enterprise Architecture. Subsequently, it compares the methodologies of IT governance to IT Strategy and Enterprise Architecture. Finally, it compares the methodologies of Enterprise Architecture to IT Strategy and IT Governance.

Chapter 6, Conclusion

This chapter summarizes and concludes on what has been described and discussed in chapter 2,3,4 and 5.

Chapter 7, Further Work

This chapter discusses the further work to be done. It includes how the work in this paper can be extended and how to proceed with the corresponding Master paper.

2. IT Strategy

This chapter explains strategy, IT Strategy and 3 methodologies for implementing IT Strategy. There are several reasons for exploring IT Strategy. Companies employ IT Strategy mainly because it may contribute more successful IT-investments [3]. A solid IT Strategy can contribute to:

- Successful investments in IT
- Efficiency and more competitive businesses
- More appropriate prioritizing of IT-projects
- Communication between IT-function, management and users
- More leadership involvement
- More correct resource estimations
- Coherence between IT- and business-strategy
- Improved IT-function

Experience shows that many enterprises do not achieve the expected gains of IT usage [4]. A solution to this problem may be enforcing a better strategy. The development of internet and expansion of electronic communication makes IT a less predictable, less stable and a more important part of every enterprise's value creation. This might make IT Strategy a more important tool to evaluate and renew more often for many enterprises.

2.1 Strategy

To understand Information Technology strategy as a concept, one needs to understand the concept of 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 [5].

Strategy can also be defined as a set of main beliefs or formulas that are used to satisfy a company's purpose [3]. These values are general directives for reaching business goals. A strategy can show a pattern of decisions regarding allocation of resources in an entire organization. These decisions will implicitly take into consideration goals and different attitudes towards what is acceptable for an enterprise.

Gottschalk [3] mentions several different ways to explain and implement strategies. Strategies can be associated with plans and planning. They can be used to perform conscious actions or guidelines that handle given situations. They should take into account competition, surroundings, market, advantages and disadvantages. In reality most businesses will combine several strategies. Some of them might overlap, and some of them need to be combined to be utilized to the full extent [3].

One of the most important motives for strategic planning is, as mentioned, competition. All competing enterprises have to meet requirements regarding change, adjustment and creativity in order to play the game. Every move should be planned in order to maximize the utilization. An enterprise has to have a strategy concerning both existing competition and future competition. It should take all decisions and adjustments of the competition into consideration. The consequences of competition will determine a specific enterprise's ability to take advantage of lead in market. According to Gottschalk [3] four requirements have to be met by an enterprise in competition:

- The enterprise has to have knowledge regarding the competition situation
- The enterprise has to have the ability to integrate the knowledge in the strategy process to understand the cause effect relationship
- The enterprise has to have the ability to predict alternative actions and analyze consequences
- The enterprise has to have access to resources exceeding today's needs to enable investments in a future potential

2.2 IT Strategy

Strategic IT planning can be defined as the process of identifying a portfolio of IT-based applications that may help an organization complete its business-strategy and goals. IT Strategy is defined as: A plan consisting of different projects for deploying information technology within an enterprise [3]. Strategic IT-planning and IT Strategy are two different, but interrelated concepts. IT Strategy is about defining how to reach the company strategy on a higher level. IT planning is about identifying physical IT solutions that may help a company improve and complete the business goals. IT planning and IT Strategy are interconnected concepts and they should together be considered by an enterprise that wants to improve. They can sometimes be hard to separate, and many enterprise's employ both concepts under the IT Strategy term. It is however important to stress that the IT Strategy should implement the business strategy, while the IT strategic plan should consider the IT Strategy.

The concept IT planning may also vary in names and definitions depending on the company. Some call it a strategic information system plan, others might call it IT-plan, information and communication technology plan or information system strategy (IS strategy). Big companies tend to separate between IT strategies and IS strategies, as information handling often is the most important and integral part of the IT Strategy. Smaller companies tend to have only one plan for both concepts.

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. Through strategic IT-planning a company can identify and realize the best and most rewarding IT-investments [3].

Weill [6] 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 firm? What core processes embody the firm'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.

The most critical challenge in IT management is preparing the coherence between IT Strategy and business strategy [3]. Implementing the IT Strategy as consistent and correct according to the business strategy is very important. The business strategy should be the driving force and the source of the IT Strategy. Strategic IT

planning can help secure this connection. The connection might also go both ways. This means that business strategy certainly affects IT Strategy, but IT Strategy can also impact the business strategy. However, the business strategy should be the driving force of the IT Strategy and not the other way around. IT Strategy may merely affect the business strategy if it results in a better solution.

The outline of the IT Strategy and the topics discussed and planned for will vary from company to company. All companies have somewhat different business strategies, and the IT Strategy should reflect the business strategy and the enterprise's perception of IT. Importance of IT should be included in the strategy, and the importance will set the bar for how extensive the IT Strategy will be. Some concepts to consider when planning for IT Strategy might be *demand*, *procedure* and *investment* [7]. *Demand planning* is dedicated to understanding the demand regarding IT within the enterprise. This can be done through requirements gathering. The procedure of *strategy development* is about defining where the company wants to go, where they are in today's environment, and examine possible different ways to reach the goal(s). *Investment planning* is about determining which projects to perform. This can either be determined from risk, or from degree of value creation.

IT Strategy and strategic IT planning are vague concepts. They are defined by enterprises in how they are implemented and what parts are included and/or excluded. There are unlimited ways of employing these concepts, and each company has a different way of doing it. The following sections of this IT Strategy part of the document will explore IT Strategy from some different implementation and concept methodologies.

2.2.1 *IT Strategy* by Petter Gottschalk

The starting point for an IT Strategy is the business strategy [3]. The IT Strategy affects the business strategy, and the business strategy defines the IT Strategy. When IT Strategy is defined and affected by the business strategy, we talk about alignment (See figure 1). The connection between the business strategy and the IT Strategy is supposed to secure alignment within the company, but also alignment with each other. It is essential that the IT Strategy reflects the goals and visions of the business strategy. When the IT Strategy affects the business strategy, we talk about impact (see figure 1). This is because IT Strategy can help improve the business strategy. The business strategy should not be defined from any parts of the IT Strategy, but the IT Strategy might help set (or change) the direction of the business strategy. For example, the internet may offer new solutions to a company regarding business opportunities that the business management might have overlooked when developing the business strategy. In this way, technology might affect the business goals.

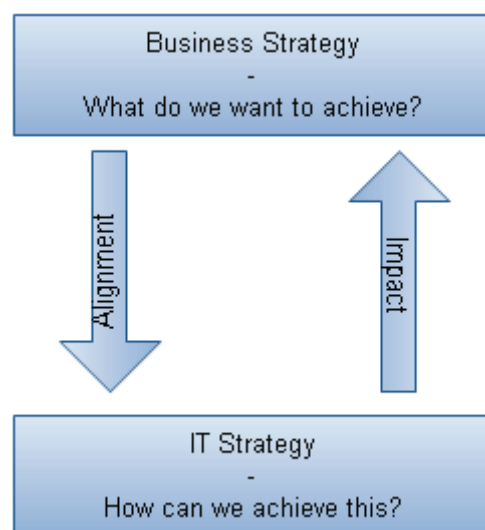


Figure 1 Business Strategy and IT Strategy is mutually dependant

When planning for IT within an enterprise, several questions should be raised. Gottschalk [3] defines a set of high-level questions that should be asked regarding development of an IT Strategy. This includes: *What* does the enterprise want to achieve, and *what* information is needed to fulfill the enterprise's business needs? *How* can these goals and needs be achieved by using IT and information systems? *How* can IT and information systems be applied to achieve business opportunities made possible by technology?

Eisenhardt [8] have defined some areas of rules for IT Strategy that might help understanding the concept:

- *How*: Describes how processes are being carried out within the enterprise. This aims at how systems are acquired, implemented and put to use within the IT-area.
- *Borders*: Describes which possibilities and limits that exist to the enterprise. This comprises what resources are available for implementing and maintaining information systems and information technology.
- *Priorities*: Describes how possibilities are rated to the enterprise. This might mean how system needs are rated to an enterprise.
- *Time-limits*: Describes how time-limits on tasks are set within an enterprise. This might mean development times, up times, test times and so on.
- *Finish-rules*: Describes when the enterprise should pull out of yesterday's possibilities. This could mean when to replace old IT systems.

IT Strategy is a sufficient part of today's enterprises. Use of information systems and information technology is critical for success in the business world [3].

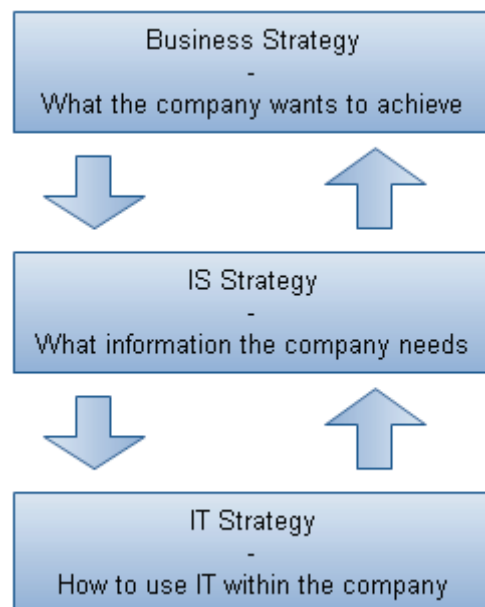


Figure 2 Connection between strategic planning levels

The mission, vision, goals, market strategy, knowledge strategy, and ambitions from the business strategy needs to be considered when developing the Information Systems strategy (IS strategy) [3]. The IS strategy is about defining how technology will help achieve the business strategy regarding information handling. The IT Strategy defines a set of goals derived from the business strategy regarding how IT should be applied within the enterprise (see figure 2 above). IS strategy and IT Strategy are very often combined, and cover the enterprise's direction and strategy (mission, vision, goals, knowledge strategy), persons (competence needs), organization (future organization and governance of the IT function), and an IT platform (computers, networks, databases and applications). This can be extensive, and it shows that in Gottshcalk's model [3] IT Strategy can result in a comprehensive plan.

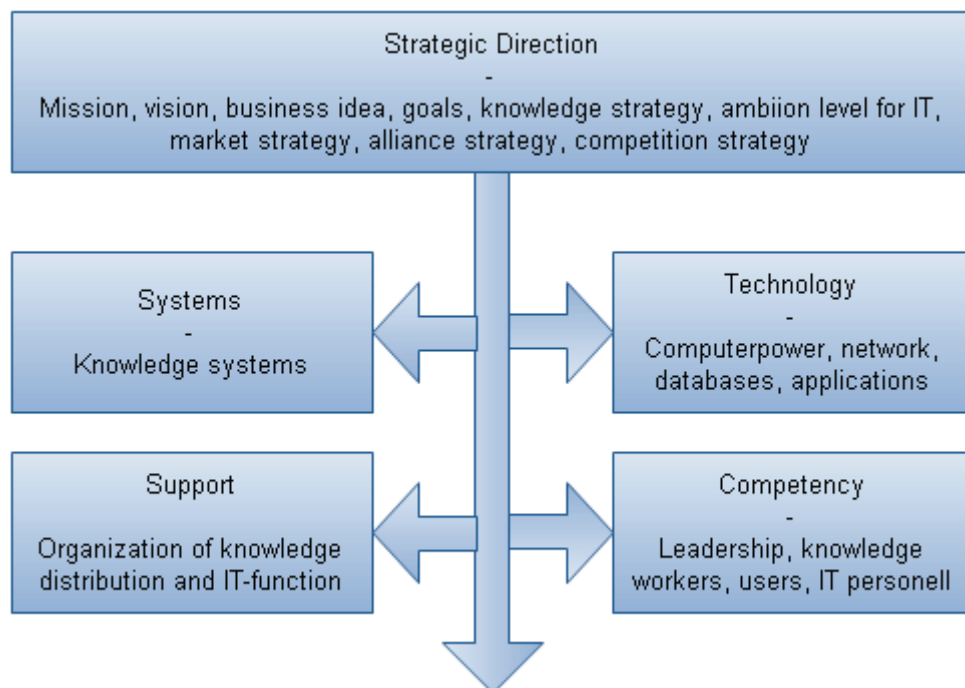


Figure 3 Connection between the elements of an IT Strategy

Figure 3 displays the different IT strategic areas and the connection between them. Strategic direction is set by the business strategy. Systems, Technology, Support and Competence are all areas that need to be considered when developing an IT Strategy.

Gottschalk [3] describes the “Y-model” for implementing IT Strategy. Figure 4 displays the Y-model.

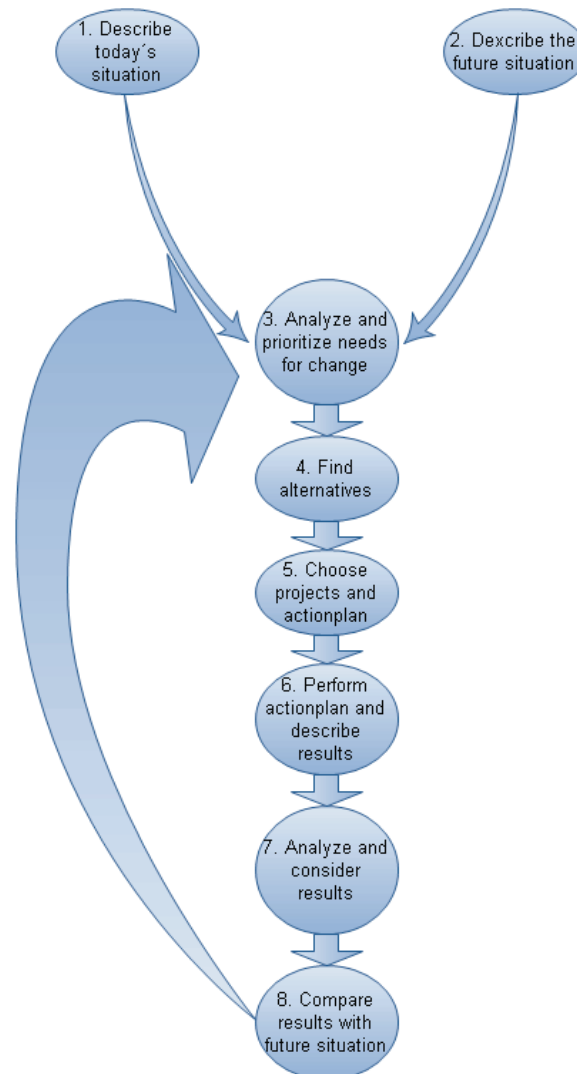


Figure 4 The Y-model

Describing today's situation is about diagnosing the enterprise's current situation IT-wise. This involves the IT architecture, infrastructure and Enterprise Architecture, but also company gains from IT, maturity-level of IT, IT-support in value-configurations, how integrated the current IT Strategy is with the business strategy, and how the current IT Strategy supports the current governance.

Describing the future situation is about defining where the enterprise wants to go IT-wise. This involves IT architecture and infrastructure, but also enterprise direction, market strategy, competition, environment, knowledge-strategy, and alliance strategy.

Analyze and prioritize needs for change is about closing the gap between the current strategy situation and the future strategy situation. This can be related to Gartner's framework for improving architecture described in chapter 4.2.3. Gartner's model for implementing Enterprise Architecture and this model for implementing IT Strategy will be compared in chapter 5.

The steps described above involve some similarities with development of Enterprise Architecture. *Describing today's situation* also mentions that the IT Strategy should support the governance of the company. This paper will not describe the other processes of the Y-model in detail, as I don't see them relevant for the scope of this thesis.

2.2.2 *IT matters* by Dataforeningen

IT Matters [4] defines IT Strategy as a tool to help realize Enterprise Architecture, by helping define and detail IT specific relationships. The IT Strategy documents should be considered as part of the company's action plan and show how IT will be used to realize strategic initiatives. The document does also have a strategic value for the IT department because it defines professional company-conditions.

The IT Strategy document can deal with the following professional IT conditions [4]:

- Acquiring of standard packages: principles regarding choice of for example office-support systems, end-user tools, development- and/or case-tools, database management systems, communication software, operative systems etc
- Architecture: IT architecture with description of design, structure and organization of data, information-elements, software, hardware, and specific relationships
- Data: Principles regarding data-storage, maintenance and data consistency.
- Operation: Principles regarding how to perform it operations within a company, or if the operation of IT should be outsourced
- Development: Principles regarding how software development is done within the company
- How to achieve strategy requirements. This includes how it strategy is maintained and supported within the company
- Information: Principles regarding information within the company
- Infrastructure: Principles regarding solidity and flexibility within internal and external infrastructure
- Communication solutions: Principles regarding use of internal and external communication solutions
- Cost- and profit-analysis
- Quality: Requirements regarding availability, user friendliness, service, flexibility, maintainability, usability etc.
- Quality assurance: how to maintain the quality requirements listed above.
- Streamlining and exploring new opportunities: How to keep up with IT evolution
- Organization of IT: How to split work instructions among the different IT divisions. This should define who does what
- Training: Principles regarding training of personnel in IT solutions.
- Rules and standards

- Security: Principles to secure confidentiality, integrity, and availability in IT solutions
- Responsibilities: Defines who is responsible for the existing IT solutions
- Maintenance: Defines how IT solutions should be maintained

Most of these concepts are closely related to IT Governance concepts. IT Matters [4] describes IT Governance as a part of IT Strategy. This shows that IT Strategy can be defined in different ways. This will be further discussed in chapter 5.

Every company has critical challenges that will affect its ability to operate and its ability to have a dynamic response to change [4]. Integral models of the enterprise have to be developed. These models may help the company forge better system solutions. Better solutions might reflect the enterprise's goal more accurately, and they might be easier to maintain with regard to management of change. It is important to formalize the architecture process for the entire enterprise. The enterprise has to model in order to meet immediate requirements, but at the same time the architecture has to meet future needs of change. IT Matters description of these models are very similar to the development of models in Gartner's methodology for developing Enterprise Architecture. This will be compared in chapter 5.

It is important to clarify what strategic meaning and importance IT will have in the company. According to IT Matters, this is an integral part of IT Strategy. The greater the importance of IT, the more resources, time and thought needs to be spent on developing a strategy and architecture. Lesser importance of IT might mean more short term, ad hoc planning. A company needs to decide the significance role of IT and plan accordingly.

Critical factors of success are a vital part of the IT Strategy [4]; it is important to decide in what areas the IT Strategy should challenge the enterprise strategy. The leadership must possess a wish to make IT an integrated part of the strategy-work. Understanding the architecture of the enterprise might be a good starting-point for the strategy-work. The company's maturity and understanding of IT will determine how seriously it will be taken. The level of ambition must be clear, and the obtainable resources must match this. Every person this affects must be informed in some way. This applies to how the strategy-process is carried out, temporary results, and last but not least the final choices.

It is important to clarify whether IT is a strategic asset or a support function [4]. IT Strategy can explain enterprise goals, enterprise strategy and plans regarding how use of IT will help realize the enterprise strategy. When planning, the leadership needs to decide what policies and regulations that needs to be followed in order to apply the IT Strategy. It is also important to determine the size, extent and detail-level of the work that needs to be done. The leadership needs to evaluate what necessary resources are needed to apply these plans. Leaders, key personnel and employee representatives should join forces in the strategy process to secure decisions, duties and promises to reach accomplishment.

When implementing an IT Strategy, IT Matters defines several aspects that should be taken into consideration [4]:

1. Awareness: Describe how the enterprise is externally and internally now
2. Seen from the outside: Capture how the enterprise looks to an outsider. This could be customers, contractors, competitors and own employees
3. Understand the enterprise's specialty: What is the soul and identity of the enterprise? How are the cultures within the company?
4. Foresee the future: Create an understanding of where the business wants to go. Define goals and preferred development
5. Choose: How is the enterprise going to reach the goals? Choose which alternatives to implement
6. Testing: Test the different initiatives
7. Production: Start using the chosen initiative
8. Quality assurance
9. Maintenance

As we can see, IT Matters defines IT Strategy as a different concept than those previously described. This definition of IT Strategy involves governance, which will be described in chapter 3. The comparing of the Governance concept related to this modeling technique will be described in chapter 5.

2.2.3 *Enterprise Architecture as Strategy* by Jeanne W. Ross, Peter Weill and David C. Robertson

This section is based on the chapters about IT Strategy in the book *Enterprise Architecture as Strategy* by Jeanne W. Ross, Peter Weill and David C. Robertson. It will explore the methodology for employing IT Strategy proposed by the book. This book's methodology for employing IT Strategy is closely related to development of Enterprise Architecture. The reason why I chose this book's methodology was to show that IT Strategy can be closely related to Enterprise Architecture (the methodology of chapter 2.2.2 was closely related to IT Governance). IT Strategy and Enterprise Architecture will be compared in chapter 5.

Use of IT challenges the management style, strategic behavior, tactical repertoire, operational behavior-pattern, ability to change, costs and profits, and ability to survive of an enterprise. Today, few business executives would be comfortable leading a company without a strategy, because strategy provides direction [9]. This also applies to IT related decisions. Most companies rely on strategy to guide the IT investment. It can be hard to define strategies, and strategies may change often. Business strategies are multifaceted, encompassing decisions as to which markets to compete in, how to position the company in each market, and which capabilities to develop and leverage. In addition, strategic priorities can shift as companies attempt to respond to competitor initiatives or to seize new opportunities. As a result, strategy rarely offers clear direction for development of stable IT infrastructure and business capabilities [9].

To build a solid foundation for execution of Information Technology within a company, Ross [9] suggests that one must master three key disciplines: *an operating model*, *Enterprise Architecture* and *an IT engagement model*.

To best support a company's business strategy, Ross [9] recommends that the company defines an *operating model*. An operating model is the necessary level of business process integration and standardization for delivering goods and services to customers. An operating model describes how a company wants to thrive and grow (IT Strategy). The operating model involves a commitment to how the company will operate. An operating model can be formed in many ways, differing from company to company. It is, however, important that the operating model represents a general vision of the company's strategies, and how they will enabled and executed.

Enterprise Architecture is the organizing logic for business processes and IT infrastructure, reflecting the integration and standardization requirements of a company's operating model or IT Strategy [9]. Enterprise Architecture will be further described in chapter 4.

The IT engagement model is the system of governance mechanisms that ensure that business- and IT projects achieve both local and companywide objectives [9]. The IT engagement model influences the project decisions so that individual solutions are guided by the Enterprise Architecture. The engagement model is supposed to help provide alignment between the IT and business process decisions. It can be compared to IT Governance, which will be described in the following chapter.

2.3 Summary of IT Strategy

Strategy is 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 [5].

IT Strategy is about determining an organization's long-term IT goals and identifying the best approach for achieving the goals. IT strategies should include plans consisting of different projects for use of IT that will contribute to achieving the company strategy [3]. IT Strategy cover 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).

Strategic IT planning can be defined as the process of identifying a portfolio of IT-based applications that will help an organization complete its business strategy. Strategic IT-planning and IT Strategy are two different, but interrelated concepts. IT Strategy is about defining how to reach the company strategy on a higher level. IT planning is about identifying physical IT solutions that may help a company improve and complete the business- and IT strategies. They can sometimes be hard to separate, and many enterprise's employ both concepts under the IT Strategy term.

3. IT Governance

Getting more value from IT is an increasingly important organizational competence. Research shows that top-performing enterprises generate returns on their IT investments up to 40 percent greater than their competitors [6]. These top-performing enterprises proactively seek value from IT in a variety of ways:

- They clarify business strategies and the role of IT in achieving them
- They measure and manage the amount spent and the value received from IT
- They assign accountability for the organizational changes required to benefit from new IT capabilities
- They learn from each implementation, becoming more adept at sharing and reusing IT assets

Top performing enterprises succeed where others fail by implementing effective *IT Governance* to support their strategies [6]. Almost all major enterprises have IT Governance. Those with effective governance have actively designed a set of IT Governance mechanisms that encourage behavior consistent with the organization's mission, strategies, values, norms and culture. In contrast, enterprises that govern IT by default more often find that IT can sabotage business strategy.

While in the past, business executives could delegate, ignore or avoid IT decisions, this is now impossible in most sectors and industries [10]. Organizations are using technology in managing, developing and communicating intangible assets such as information and knowledge. Corporate success can, to a certain degree, only be attained when information and knowledge is secure, accurate, reliable, and provided to the right person, at the right place, at the right time.

This section of the document will define *governance* and *IT Governance* as concepts, and describe some methodologies for handling *IT Governance*.

3.1 Governance

Governance is defined as the way in which an organization is run and controlled [11]. 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).

Corporate governance consists of a set of processes, customs, policies, laws and institutions affecting the way people directly administer or control a corporation [6]. It also includes the relationships between the many players involved (the stakeholders) and the corporate goals. The principal players include the shareholders, management, and the board of directors. Other stakeholders include employees, suppliers, customers, banks and other lenders, regulators, the environment and the community at large. Good corporate governance is important to professional investors. A McKinsey study found that professional investors are even prepared to pay large premiums for investments in firms with high governance standards [12]. Information gathering and handling is one of the most important aspects of governance and IT Governance [6].

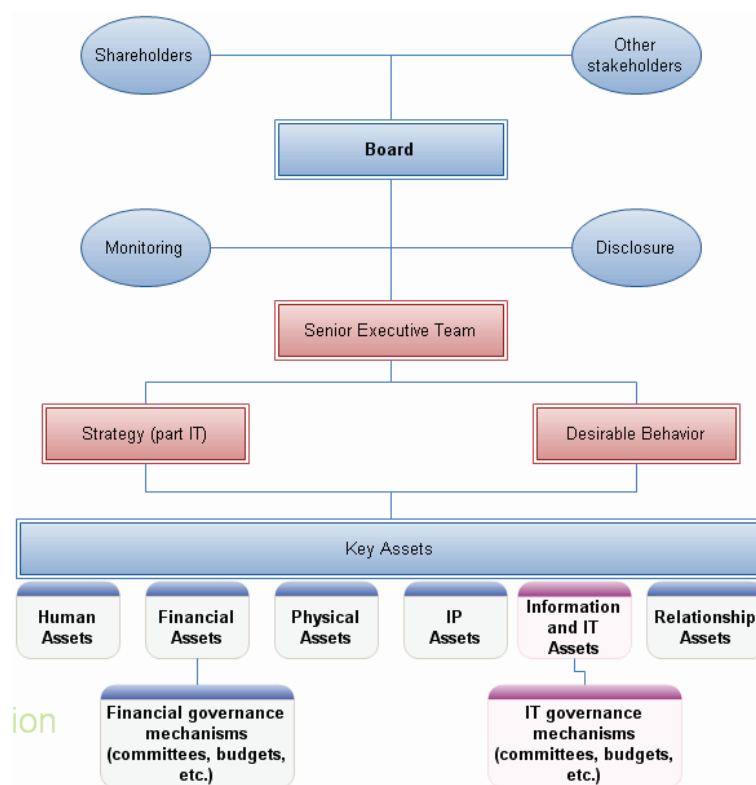


Figure 5 Corporate and Key Asset governance. Red means involved in IT.

Weill [6] proposes a framework for how corporate governance is usually organized, and how to link corporate and IT Governance. The top framework (in figure 5) depicts the board's relationships. *The senior executive team* articulates strategies and desirable behaviors to fulfill board mandates. *Strategy* is described in chapter 2. The lower half of figure 4 identifies the six *key assets* through which enterprises accomplish their strategies and generate business value. Senior executive teams create the mechanisms to govern the management, and use of each of these assets (both independently and together). The key elements consist of: Human assets, financial assets, physical assets, intellectual property assets, IT assets and relationship assets. The key assets of an enterprise are what need to be governed. Governance of the key assets occurs via a large number of organizational mechanisms (for example structures, processes, committee, procedures and audits). *Desirable behaviors* embody the beliefs and culture of the organization as defined and enacted through not only strategy, but also corporate value statements, mission statements, business principles, rituals and structures. Desirable behaviors are different in every enterprise.

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 [13] 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.

Adherence to governance means making informed decisions. Governance presupposes planning, organization, inspection and control. The IT division delivers the comprehensive information with data warehouse systems, business intelligence suites, and management and executive information systems. The management of the business departments will primarily use these systems to facilitate the optimization of the business, to cut costs, to open new markets, to develop or to place new products. IT thus plays an important role in corporate governance [6].

3.2 IT Governance

IT Governance is defined as *specifying the decision rights and accountability framework to encourage desirable behavior in using IT* [6]. This definition aims to capture the simplicity of IT Governance with decision rights and accountability. It does also capture the complexity of governance because desirable behaviors are different in every enterprise.

Other definitions of IT Governance:

- 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 – The ministry of international trade and industry (1999)
- IT Governance is the responsibility of the Board of Directors and executive management. It is an integral part of enterprise governance and consists of the leadership and organizational structures and processes that ensure that the organization's IT sustains and extends the organization's strategy and objectives – IT Governance institute (2001)
- 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 – [14]

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

One of the things IT Governance determines is who makes the decisions within an enterprise. Management, on the other hand, is the process of making and implementing the decisions set by the governance [6]. For example, governance determines who holds the decision rights for budgeting investments in IT. Management determines the actual amount of money invested in a given year and the areas in which the money is invested. IT Governance is not about making specific IT decisions – management does that – but rather about determining systematically who makes or contributes to those decisions.

IT Governance reflects broader corporate governance principles while focusing on the management and use of IT to achieve corporate performance goals. Effective IT Governance encourages and leverages the ingenuity of the enterprise's people in IT usage and ensures compliance with the enterprise's overall vision and values

[6]. For example, a Chief Financial Officer (CFO) doesn't sign every check or authorize every payment. He or she sets up a financial governance specifying who can make the decisions and how. The CFO then oversees the enterprise's portfolio of investments and manages the required cash flow and risk exposure. The same approach should be applied to IT Governance; Governance determines who holds the decision rights and for how much the enterprise invests in IT [6]. Management determines the actual amount of money invested in a given year and the areas in which money is invested. IT management is focused on the internal effective supply of IT services and products and the management of present IT operations. IT Governance in turn is much broader, and concentrates on performing and transforming IT to meet present and future demands of the business and the business' customers [14].

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 [14]. 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. IT Governance should thus consist of the following three different types of mechanisms [6]:

- *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. Firms 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.

See Figure 6 below for examples of the three different types of mechanisms defined by [6].

Decision-making Structures
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
Alignment Processes
Tracking of IT projects and resources consumed Service-level agreements Formally tracking business value of IT Chargeback arrangements
Communication Approaches
Senior management announcements Office of CIO or office of IT Governance Web-based portals and intranets for IT

Figure 6 Common governance mechanisms

Enterprise governance is the system by which entities are directed and controlled. The business dependency on information technology often implies that enterprise governance issues often cannot be solved without considering IT. Enterprise governance should therefore drive and set IT Governance [14], see figure 7 below. IT in its turn can influence strategic opportunities as outlined by the enterprise (as described in chapter 2), and can provide critical input to strategic plans. In this way, IT Governance enables the enterprise to take full advantage of its information, and can be seen as a driver for enterprise governance. See figure 7 below.

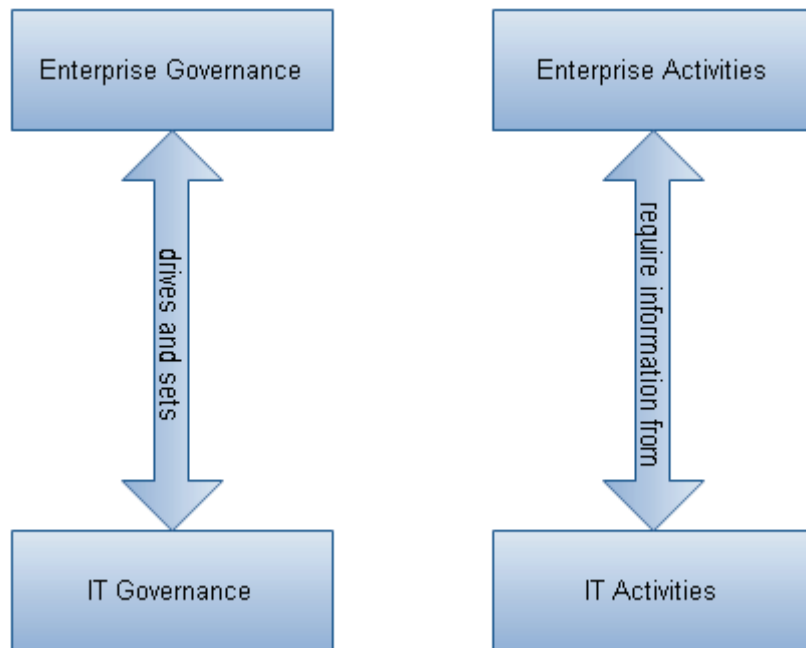


Figure 7 CobiT: Governance, control and audit for Information and related technology. Available online: www.itgi.org

Stilpon [15] articulates two complementary sides of governance:

- *Behavioral aspect of corporate governance*: Corporate governance encompasses the relationships and patterns of behavior between different agents in a limited liability corporation; the way managers and shareholders but also employees, creditors, key customers, and communities interact with each other to form the strategy of the company
- *Normative aspect of corporate governance*: Corporate governance also refers to the set of rules that frame these relationships and private behaviors, thus shaping corporate strategy. These can for example be the company law, securities regulation or listing requirements.

The behavioral side of IT Governance defines the formal and informal relationships and assigns decision rights to specific individuals or groups of individuals. The normative side defines mechanisms formalizing the relationships and providing rules and operating procedures to ensure that objectives are met [6].

An important issue to notice when applying IT Governance is that IT is expensive. IT is important and pervasive to all enterprises in some way, and it is always essential to govern it [6]. To address the economic issue, many enterprises are creating or refining IT Governance structures to better focus IT spending in strategic priorities. Often, centrally managed IT is no longer possible or desirable.

There was a time when requests for IT spending came only from the IT group. Now IT spending originates all over enterprises. Some estimates suggest that only 20 percent of IT spending is visible in the budget [16]. The rest of the spending occurs in business process budgets, product development budgets, and many other type of budgets. Well designed IT Governance arrangements distribute IT decision-making to those responsible for outcomes. Enterprises can struggle to understand the value of their IT-related initiatives, because value cannot always be readily demonstrated through a traditional discounted cash flow analysis. Value results not only from incremental process improvements, but also from the ability to respond to competitive pressure. It can be difficult to advance how much a new capability or additional information is worth. Effective IT Governance creates mechanisms through which enterprises can debate potential value and formalize their learning [6].

As IT implementations enable increasing standardization and integration of business processes, the roles of technologists and business leaders become increasingly intertwined [6]. IT decision-making necessarily becomes joint decision-making. Successful firms not only make better IT decisions, they also have better IT decision-making processes [17]. According to Ross [17], it is essential to involve the right people in IT decision-making. Senior management often does not have the bandwidth to consider all the requests for IT investments that occur in a large enterprise. Senior management may become a bottleneck. Carefully designed IT Governance provides a clear, transparent IT decision-making process that leads to consistent behavior linked back to the senior management vision, while empowering everyone's creativity [6].

The next 3 subsections will present methodologies for implementing IT Governance.

3.2.1 *IT Governance* by Weill Ross

Effective IT Governance should address several issues. It is important to establish what decisions must be made to ensure effective management and use of IT. This includes; Who should make the decisions, and how should the decisions be made and monitored [6]. The following concepts regarding IT Governance should be clarified within the enterprise:

- IT principles: Clarifying the business role of IT within the enterprise
- IT architecture: Defining integration and standardization requirements
- IT infrastructure: Determining integration and standardization requirements
- Business and application needs: Specifying the business need for purchased or internally developed IT applications
- IT investment and prioritization: Choosing which initiatives to fund and how much to spend

These concepts are exemplified in figure 8:

<div>IT principles decisions</div> <div>High-level statements about how IT is used in the business</div>		
<div>IT architecture decisions</div> <div>Organizing logic for data, applications, and infrastructure captured in a set of policies, relationships, and technical choices to achieve desired business and technical standardization and integration</div>	<div>IT infrastructure decisions</div> <div>Centrally coordinated, shared IT services that provide the foundation for the enterprise’s IT capability</div>	<div>IT investment and prioritization decisions</div> <div>Decisions about how much and where to invest in IT, including project approvals and justification techniques</div>
	<div>Business application needs</div> <div>Specifying the business need for purchased or internally developed IT applications</div>	

Figure 8 Key IT Governance decisions

Gaining above-industry-average business value from IT is something every major enterprise strives to achieve. IT principles are a related set of high-level statements about how IT is used in the business [6]. Once articulated, IT principles become a part of the enterprise’s management lexicon and can be discussed, debated, supported, overturned and evolved. IT principles should provide a clear direction for using IT to enable the business strategy. Example IT principles could be: Architectural integrity, consistent and flexible infrastructure,

rapid deployment of new applications, re-use before buy, and buy before build, etc. The IT principles should be consistent with the enterprise's business principles. IT principles should define desirable behavior for both IT professionals and IT users. IT principles can also be used as a tool for educating executives about technology strategy and investment decisions. IT principles should at least clarify what the enterprise's working model is, how IT will support this model, and how IT will be funded. Answers to these questions evolve in reflection to organizational learning, new business strategies and determine the broad criteria for IT investment.

IT investment may address three dilemmas: how much to spend, what to spend it on and how to reconcile the needs of different constituencies [6]. How to reconcile the differing needs is about aligning IT investment with strategic priorities. One of the most important attributes of a successful IT investment process is ensuring that the enterprise's IT spending reflects strategic priorities. Investments processes must reconcile the demands of individual business units as well as demands to meet enterprise-wide needs.

IT architecture decisions and IT infrastructure decisions can be linked to Enterprise Architecture governance. The principles developed in these branches are virtually equal to the principles developed for Enterprise Architecture governance, described in chapter 4.

3.2.2 CobiT Framework

CobiT provides 34 processes and their corresponding high-level control objectives and management guidelines, including their maturity models and key goals [18]. 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

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 a very 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.

3.2.3 *Strategies for IT Governance* by Wim Van Grembergen

According to Van Grembergen [14], an IT Governance framework can be deployed using a mixture of various structures. IT Governance is dependent upon a variety of sometimes conflicting internal and external factors. Determining the right mechanisms is therefore a complex endeavor and it should be recognized that what strategically works for one company does not necessarily work for another, even if they are in the same industry sector. A holistic approach towards IT Governance acknowledges its complex and dynamic nature, consisting of a set of independent subsystems that deliver a powerful whole [19].

To be able to place IT Governance structures, processes and relational mechanisms in a comprehensible relationship to each other, Van Grembergen [14] proposes the framework displayed in figure 9.

Integration Strategy	Structures	Processes	Relational mechanisms	
Tactics	IT executives and accounts	Strategic IT decision-making	Stakeholder participation	Strategic dialogue
	Committees and councils	Strategic IT monitoring	Business/IT partnerships	Shared learning
Mechanisms	<ul style="list-style-type: none"> - roles and responsibilities - IT Strategy comm. - IT steering comm. - IT organisation structure - CIO on Board - project steering committees - e-business advisory board 	<ul style="list-style-type: none"> - Balanced (IT) scorecards - Strategic Information systems planning - CobiT - Service level agreements - Information economics - Strategic alignment model - Business/IT alignment models - IT Governance maturity models 	<ul style="list-style-type: none"> - Active participation by principle stakeholders - Collaboration between principle stakeholders - Partnership rewards and incentives - Business/IT colocation 	<ul style="list-style-type: none"> - Shared understanding of business/IT objectives - Active conflict resolution - Cross-functional business/IT training - Cross-functional business/IT job-rotation

Figure 9 Structures, processes and relational mechanisms for IT Governance

Structures involve the existence of responsible functions such as IT executives and accounts, and a diversity of IT committees. Processes refer to strategic IT decision-making and monitoring. The relational mechanisms include business/IT participation and partnerships, strategic dialogue and shared learning. Figure 9 provides an overview of mechanisms that can support IT Governance.

As mentioned earlier, IT Governance should be an integral part of enterprise governance. It is therefore a concern of the board of directors who are responsible for governing the enterprise. Van Grembergen [14] proposes the IT Strategy committee to consist of board members and non-board members. The committee should assist the board in governing and overseeing the enterprise's IT-related matters. The committee should ensure that IT is a regular item on the board's agenda and that it is addressed in a structured manner. In addition, the committee must ensure that the board has the information it needs for the enterprise to achieve the ultimate objectives of IT Governance.

The framework proposed in this section is built upon the CobiT framework described in chapter 3.2.2.

3.3 Summary of IT Governance

Governance is defined as the way in which an organization is run and controlled [10]. Governance 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.

Corporate governance consists of a set of processes, customs, policies, laws and institutions affecting the way people directly administer or control a corporation [6]. It also includes the relationships between the many players involved (the stakeholders) and the corporate goals.

IT Governance is defined as specifying the decision rights and accountability framework to encourage desirable behavior in using IT [6]. IT Governance mainly consists of: Decision-making structures, alignment processes and communication approaches. Decision-making structures are the normal approach to generating commitment and obligation. Alignment processes are IT management techniques for securing extensive involvement in the management and use of IT. Communication mechanisms are intended to help “spread the word” about IT Governance decisions and processes.

4 Enterprise Architecture

This chapter considers Architecture, Enterprise Architecture and corresponding methodologies. Enterprise Architecture is a wide concept, but it is perhaps more defined through concrete frameworks than IT Strategy and IT Governance. However, the frameworks differ in how much strategy and governance is mixed into the Enterprise Architecture development process.

Companies often strive to complete the following objectives:

- Available documentation
- The ability to integrate and unify business processes
- The ability to integrate and unify data across the enterprise
- The ability to link data to external partners
- Increased enterprise agility
- Reuse of enterprise models, information and experiences
- Reduced solution delivery time
- The ability to maintain a common vision of the enterprise's future

As the following section of this thesis will explain, these are all central concepts in the development, implementation and support of Enterprise Architecture.

4.1 Architecture

Architecture can be the structure and design of a system or a product [20]. It can also be defined as the description of a set of components and the relationship between them [21]. Within Information Technology we have 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.

There are several reasons to organize important infrastructure. Some important reasons include:

- Alignment: How the enterprise is positioned and formed. The enterprise will have to retain and maintain alignment over time because of changes in the business world. Business solutions will change, management requirements will change, and the enterprise scope will change [2].
- Integration: Integration is essential in the semantic structures of the enterprise, the connectivity of the enterprise, and in the means of the enterprise. It is vital that the architecture integrates all aspects of the enterprise, and it is hard for an enterprise to achieve integration of all aspects without using architecture [2].
- Change: The architecture must be built to handle change. Technology and business objectives change over time. A well supported architecture will help handle change with minimum of time, disruption and cost [2].
- Reduced “time to market”: Reducing the time it takes to implement [2]. Architecture can help reduce the “time to market” by creating routines and guidelines for business situations. The architecture should be built to handle different processes at a reasonable speed.

Conceptual architecture principles perform valuable roles in company architecture [1]. An ideal architecture includes clear, well understood and sanctioned principles, combined with an executive commitment to enforce them. This can help drive enterprise-wide change in a consistent manner across business units, projects, processes, infrastructure and solutions. Consistently, well understood and sanctioned principles are important to guide every employee of a company. They will reduce number of guesses made, and reduce insecurity within the enterprise by guiding decision-making according to the company strategy [1].

4.2 Enterprise Architecture

It is often difficult to coordinate activities within a company. Activities as simple as sending an invoice, taking an order, or mailing a package can easily go wrong when done by people – even after considerable practice. To focus management attention on higher-order processes, such as serving customers, responding to new business opportunities and developing new products, managers need to limit the time they spend on routine activities. They need to automate routine tasks so that they are performed reliably and predictably without requiring any thought. This is where foundation for execution comes into play. In short, a foundation for execution regarding IT is the IT infrastructure and digitized business processes automating a company's core capabilities. Building a foundation doesn't focus only on competitively distinctive capabilities. It also requires rationalizing and digitizing the routine, everyday processes that a company has to get right to stay in business [9].

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 [22]. 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. The primary reason for developing Enterprise Architecture is to support the business by providing the fundamental technology and process structure for an IT Strategy [23]. This in turn makes IT a responsive asset for successful modern business strategy.

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 [24]. Enterprise Architecture involves the organizing logic for business processes and IT infrastructure reflecting the integration and standardization requirements of the company's operating model [9].

The key to effective Enterprise Architecture is to identify all the processes, data, technologies, and customer interfaces that take the operating model from vision to reality [9]. The key elements of Enterprise Architecture are different for every enterprise as every enterprise has different business strategies and different needs. Key elements may include: shared technology environment, customer data, interfaces for capturing and assessing data, standardized processes and shared data

built on its single instance of an Enterprise Resource Planning (ERP) system, and many more.

Implementing Enterprise Architecture requires strong program and project management expertise along with an IT portfolio management process, while maintaining the architecture requires a robust change management process and procedures [22]. A primary objective for an enterprise architect group is to create a framework to drive consistent decision-making across multiple business units, disparate departments, and multiple projects and initiatives [1]. Without such a framework, independent groups make independent decisions. The result is inconsistency. Bad signs might include information islands, isolated business processes, inefficient technology selection and a lack of integrated business solutions.

Brown [25] defines several different aspects of values Enterprise Architecture might provide for companies. These values are similar to the values that architecture might provide for an enterprise. The following values are important to an enterprise when choosing Enterprise Architecture:

- The enterprise will achieve readily available. Ready and easy accessible documentation will help the enterprise become more agile [25].
- The enterprise will achieve the ability to unify and integrate business processes. It becomes easy to spot duplicate processes and remove or integrate them. This may also increase the efficiency of processes.
- The enterprise will achieve the ability to unify and integrate data across the enterprise and to link with external partners [25]. It will save the enterprise time and money and greatly improve the ability of different business applications to interoperate.
- The enterprise will achieve reduced solution delivery time and development costs by maximizing reuse of enterprise models
- The enterprise will develop the ability to create and maintain a common vision of the future shared by both the business and the IT communities; driving continuous business/IT alignment. This value forces the harmonious linking of strategic and business planning to business architecture, from business architecture to IT architecture, and from IT architecture to IT implementation [25].

The IT unit typically addresses four levels of architecture below the Enterprise Architecture: business processes architecture (the activities or tasks composing major business processes identified by the business process owners), data or information architecture (shared data definitions), application architecture

(individual applications and their interfaces), and technology architecture (infrastructure services and the technology standards they are built on) [9]. The term Enterprise Architecture can be confusing. Some might refer to one or more of these architectures as the Enterprise Architecture. They are simply IT architectures. Enterprise architecture consists of current state IT architectures, but the term also includes future state architecture and processes.

The rapid introduction of new technologies in IT creates strategic threats and opportunities. The fact that information is so readily available means that information assets decay nearly as rapidly as they accumulate. To respond quickly to the threat of aggregators, enterprises need a flexible *IT infrastructure* [6]. The infrastructure must balance the dual needs of cost effectiveness in meeting both current business requirements and the flexibility to support future business needs. Foresight in establishing the right infrastructure at the right time enables rapid implementation of new electronically based business initiatives as well as consolidation and cost reduction of current business processes. Inability to respond to technology induced market changes can threaten a firm's survival.

Enterprise Architecture are, as described, a collection of plans that represent business aspects (e.g. goals, conditions, business processes), business aspects of IT support (e.g. application systems, data records, individual programs) and technical aspects of IT support (e.g. computer platforms, networks, software components) and their interaction in past, present and future instantiations. Given that each of the above-mentioned aspects may possess a considerable degree of complexity, it is usually the case that systems *excerpts* or *views* are represented by multiple plans [13]. Views are generally formed when one attempts to represent aspects that are relevant to specific stakeholders. An example view could be the specific view and needs of a database architect.

An Enterprise Architecture model enables one to compile operation aspects into a business architecture model, aspects of specialist IT support into a business architecture model and aspects of technical IT support into a systems architecture model. See figure 10 below.

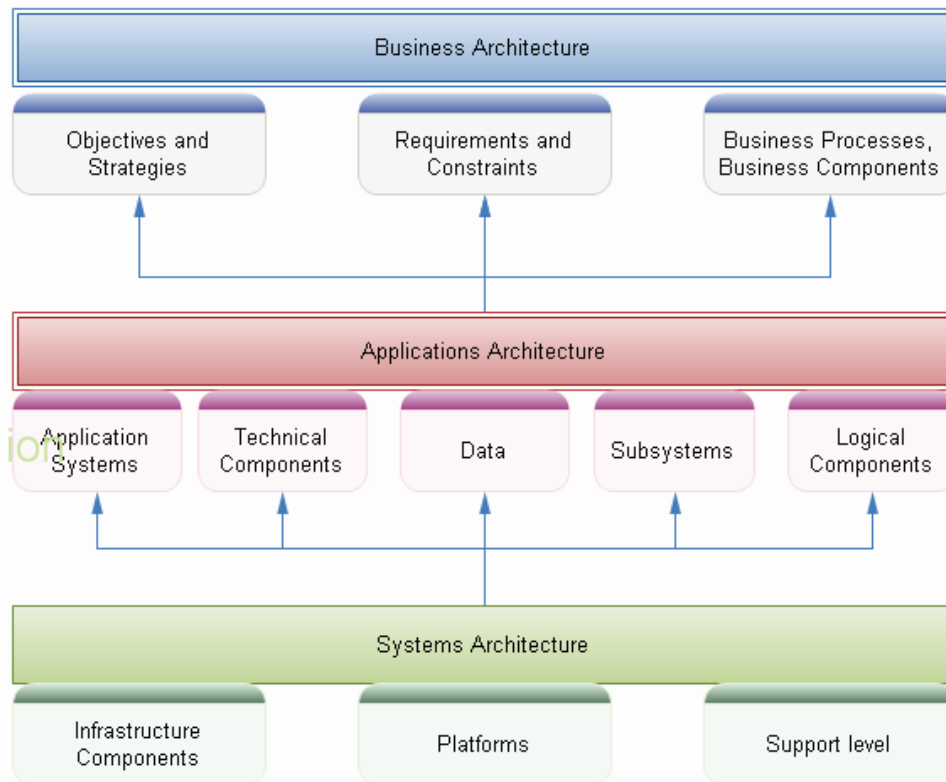


Figure 10 Architecture structures

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 [13]. 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* [13].

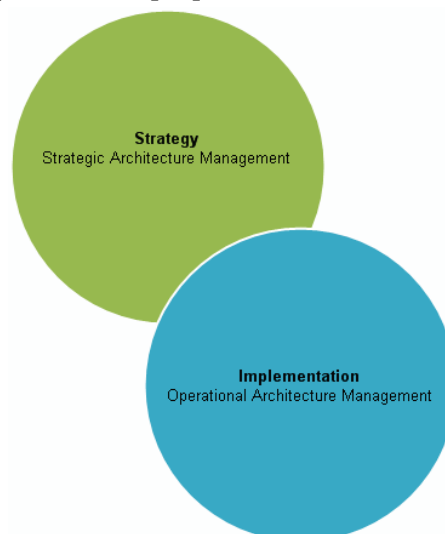


Figure 11 Enterprise Architecture Management

Architecture management involves planning, development, use, and maintenance of Enterprise Architecture. It organizes relevant processes, and guides and controls development. Architecture management can thus be said to prescribe methods of achieving the close integration of business processes, IT applications and IT infrastructure.

Architecture management is responsible for:

- The strategic processes for documenting, analyzing and planning Enterprise Architecture (see figure 11)
- The operational processes for the comprehensive implementation of Enterprise Architecture and for checking its compliance with reference architecture models defined infrastructure standards (see figure 11)
- The defining of documentation procedures
- Analysis and planning methodologies
- Evaluation procedures
- Tools and their integration into the tool landscape
- Procedures and responsibilities
- Key figures and controlling

Architecture management is the process that accompanies Enterprise Architecture, and it includes some parts of strategy and governance that can be compared to IT Strategy and IT Governance. IT Strategy and IT Governance is however more extensive, as Architecture management only involves strategy and governance related to the Enterprise Architecture.

The **IT architecture** is *the organizing logic for data, applications, and infrastructure, captured in a set of policies, relationships, and technical choices to achieve desired business and technical standardization and integration* [6]. 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 [6].

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 [26]. Without a proper infrastructure an enterprise may have limited sharing of resources, information and expertise. The various elements of IT infrastructure 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 what more infrastructure is needed to meet the business process goals.

IT Infrastructure and IT Architecture are important concepts within Enterprise Architecture, but it is important to separate and have clear definitions of them when developing the Enterprise Architecture.

4.2.1 The Gartner Framework

Bittler [7] 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 12). 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.

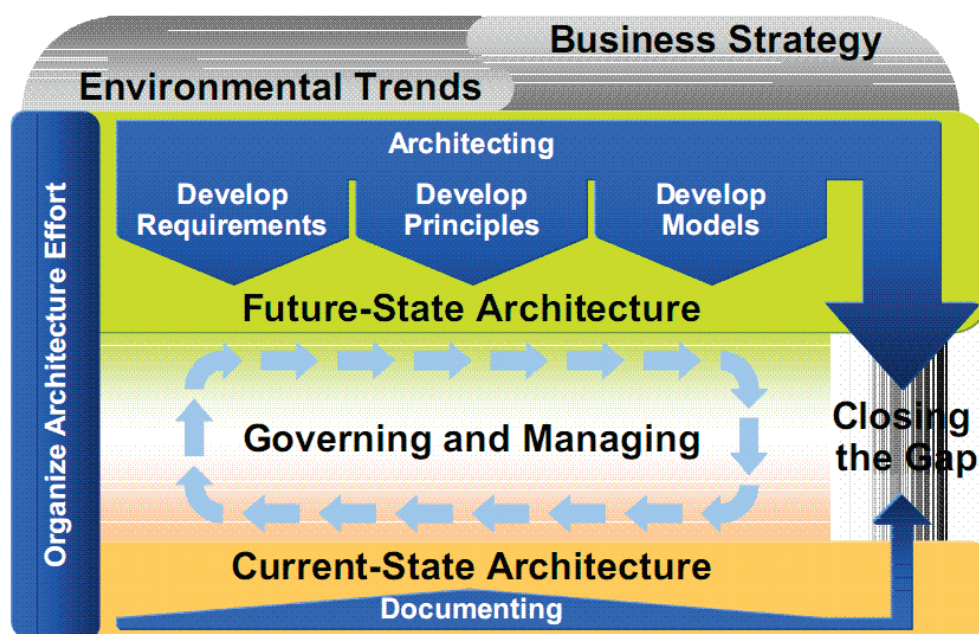


Figure 12 Enterprise Architecture Process model. Source: Gartner

The aspects that will be discussed in more detail in 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 [7].

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.

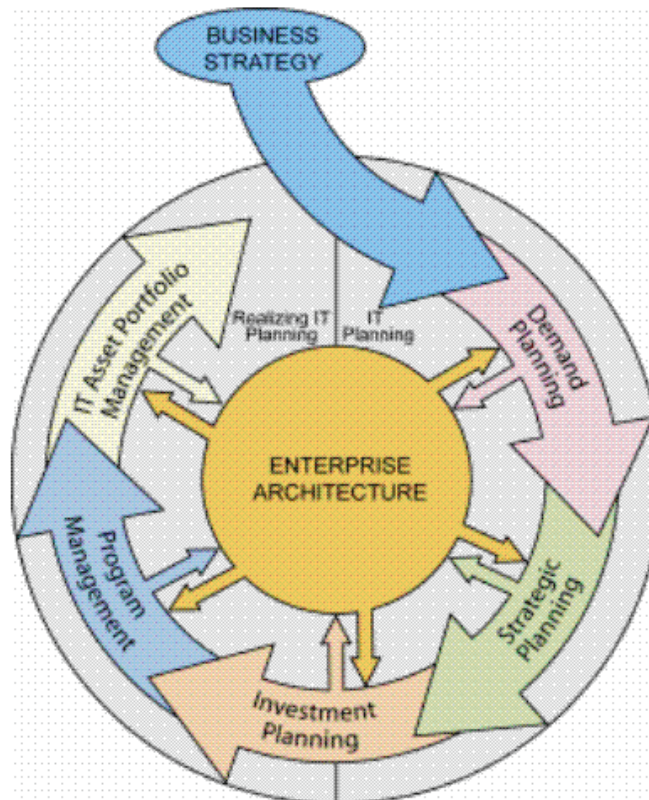


Figure 13 Enterprise Architecture and IT planning synergies. Source: Gartner

As figure 13 shows, development of Enterprise Architecture is closely interrelated and connected with IT planning and realizing processes. Weiss [27] suggests that Enterprise Architecture provides input, and receives output from these processes. The planning processes shown in figure 13 (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 [27] 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 [27]. The governance should specify the rules, procedures and organizational structures for ensuring accountability through appropriate participation and handoffs. Weiss [27] 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.

4.2.2 *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 [28]. 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.

4.2.3 TOGAF

TOGAF is an open source tool for implementing Enterprise Architecture. In TOGAF, architecture has two meanings depending on its conceptual usage [23]:

- 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. Figure 14 displays the TOGAF Architecture Development Method (ADM), which is the framework used when developing Enterprise Architecture.

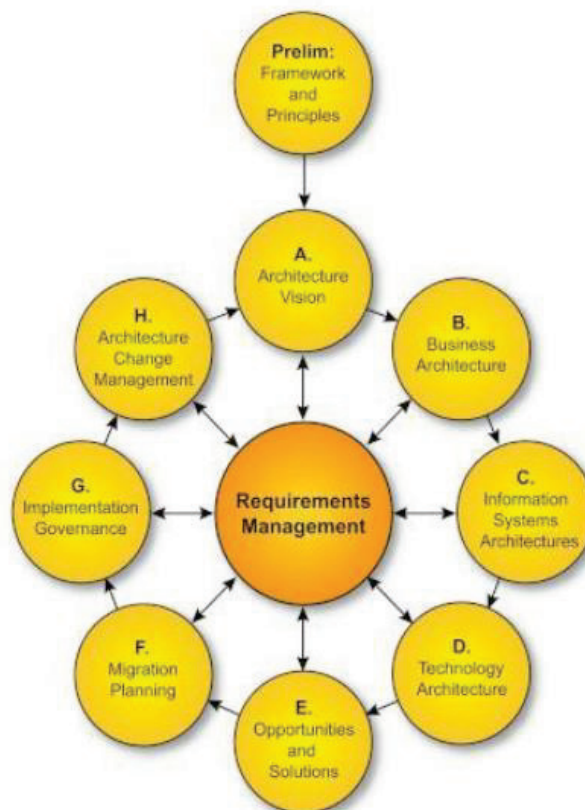


Figure 14 TOGAF framework

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 [23].

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 [23]. 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 [23]:

- 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 [23] 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 [23] 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).

4.3 Summary of Enterprise Architecture

Architecture can be the structure and design of a system or a product [20]. It can also be the description of a set of components and the relationship between them [21]. Some reasons to organize using architecture include: Alignment, integration, change and “reduced time-to-market”.

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 [22]. Enterprise architecting can consist 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 should define the current state architecture, the future state architecture, and the gap between them.

Enterprise Architecture management involves planning, development, use and maintenance of Enterprise Architecture. It organizes relevant processes and guides and controls development.

The **IT architecture** is the organizing logic for data, applications and infrastructure, captured in a set of policies, relationships, and technical choices to achieve desired business and technical standardization and integration [6].

IT infrastructure is the foundation of planned IT capability (both technical and human) available throughout the business as shared and reliable services [26]. The various elements of IT infrastructure can 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, and an enterprise-wide intranet.

Gartner, Zachman and TOGAF are three frameworks for implementing Enterprise Architecture.

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 [3].

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 [13]. 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 [13]. 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

Just like other structures, enterprises can be described in terms of their architecture. The architecture of an enterprise can be described in terms of a set of plans [13]:

- Operationalized enterprise- and IT goals
- Business process models
- Organizational models
- Development plans for IT applications and infrastructure
- Analysis models for IT applications
- Technological models of IT infrastructure

It is important to stress that not all these plans may be needed in a specific enterprise. The needs depend on the enterprise's goals for IT and architecture.

Planning, controlling and optimizing the use of IT resources and measuring the associated performance are a matter of doing the right things and acting efficiently. Minimizing risks is a matter of creating security. Essentially, it is all about effectiveness, efficiency and reliability: Do the right things at the right time in the right way. Enterprise Architecture gives the necessary overview and understanding of the interconnections of business goals, business processes, department requirements, projects, IT applications, IT platforms and IT infrastructure. It should tie these elements together, reveal hidden points of impact and dependencies, documents costs, risks, availability, stability and many other attributes. Enterprise Architecture can act as a basis for IT Governance [13].

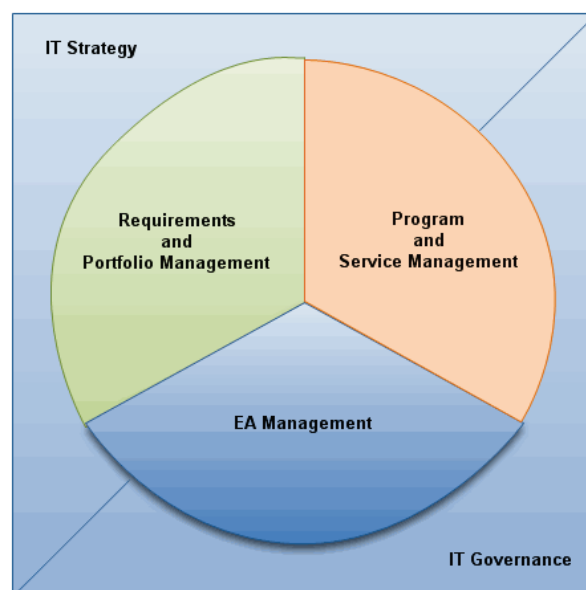


Figure 15 IT Strategy vs. IT Governance vs. EA Governance

Figure 14 and figure 15 offer a view of the interaction that takes place among the processes of requirements management, portfolio management, program management, service management and Enterprise Architecture management as guided by IT Strategy and IT Governance. Under the direction of IT Strategy and IT Governance, requirements and portfolio management, Enterprise Architecture management, and program management form the IT management framework.

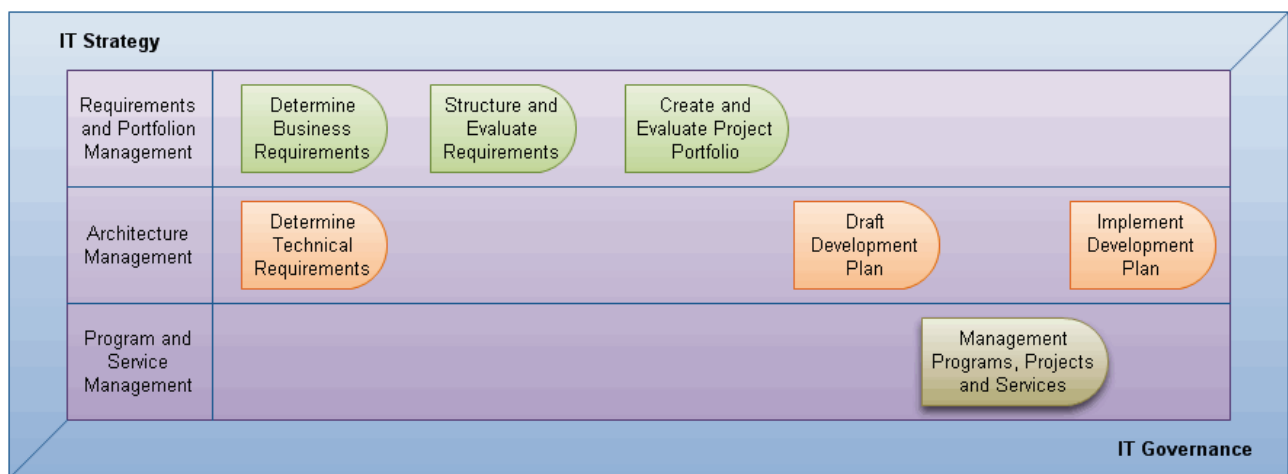


Figure 16 IT Strategy vs. IT Governance vs. EA Governance

IT Strategy supplies the direction. Requirements management provides the results and requirements. Enterprise Architecture informs the navigating IT Governance. Portfolio management harmonizes wishes of the stakeholders according to available resources and it is responsible for optimal allocation of resources. Program and service management are responsible for project, program and line implementation. The transformation of business- and IT Strategy into operational reality is controlled by the IT Governance processes [13]. Enterprise Architecture constitutes the Chief Investment Officer's (CIO) management information system. It enlightens and provides navigational information. The Enterprise Architecture process creates transparency, delivers information as a basis for decision-making and control, and thereby enables IT Governance. Enterprise Architecture supports the management in its effort to do the right things at a minimal risk.

[29] tries to explain the difference between *IT Governance* and *governance of Enterprise Architecture* (described in chapter 4.2.3). It states however, that there is no right answer. The differentiation between the two depends totally on the culture and preferences of the people in the company, the company culture, and the company strategy. Governance of Enterprise Architecture first and foremost revolves around decisions that are taken that will *control the future design* of the

IT environment. Enterprise Architecture governance sets in place design related policies, standards, guidelines and procedures that must be present. It is concerned with ensuring design reliability of the business as a whole, and it will also govern the decisions that are outside of the domain of IT. All initiatives must adhere to Enterprise Architecture governance. IT Governance on the other hand, is more operational and is *related to the services delivered* by IT operations. IT Governance addresses aspects like project management, configuration management, incident and problem management, business continuity planning and disaster recovery planning [29]. IT Governance will set up vendor contracting and procurement policies, standards, guidelines and procedures.

Both IT Governance and Enterprise Architecture governance provide policies, standards, guidelines and procedures to follow. All of IT is subjected to Enterprise Architecture governance, but Enterprise Architecture governance does not cover all IT activities. Enterprise Architecture governance covers decision-making beyond the scope of IT, IT Governance only apply to the IT environment [29]. Pieterse [29] states that the primary difference between IT Governance and Enterprise Architecture governance is :

- IT Governance is primarily operational and secondary strategic with the focus on directing how IT services enable business operations
- Enterprise Architecture 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 competency

The methodology for developing IT Strategy described in chapter 2.2.1 has some similarities with development of IT Governance and Enterprise Architecture. It contains elements are parts of IT Governance (it describes something that can be compared to the IT principles concept), and Enterprise Architecture (the definition of current state, future state and gap analysis). It also contains several elements that are not associated with IT Governance or Enterprise Architecture (for example when to pull out of yesterdays opportunities, what priorities is relevant to the enterprise, what resource strategies should be applied, what time-limits are set within the enterprise, competition strategies and so on).

Gottschalk [3] states that Enterprise Architecture might become a map for the organization's stakeholders and lead to the development of IT strategic plans and IT Strategies. IT Strategies should be developed according to the business strategies, but the Enterprise Architecture can work as a road plan to help align them. However, the development of Enterprise Architecture can also influence the

development of IT Strategy, and the development of business strategy. This is because Enterprise Architecture and IT Strategy can help improve the business strategy. The business strategy should not be defined from any parts of the IT Strategy or Enterprise Architecture, but the IT Strategy and Enterprise Architecture might help set (or change) the direction of the business strategy.

Den Norske Dataforening [4] defines IT Strategy as another tool to help realize Enterprise Architecture, by helping define and detail IT specific relationships. However, [4]'s definition and framework of IT Strategy (described in chapter 2.2.2) is somewhat different from other definitions. Den Norske Dataforening [4] describes parts of IT Strategy as a concept similar to IT Governance (it states that IT Strategy is the tool of the management to control and govern the enterprise's use of IT). This confirms that enterprises, methodologies, frameworks, developers, architects etc. all have different opinions or viewpoints of what to include under the terms IT Strategy, IT Governance or Enterprise Architecture. In this case it seems as if IT Governance is a part of IT Strategy. This makes the concepts hard to separate. Definitions of these concepts are different from enterprise to enterprise and framework to framework. There are, however, some elements that always are associated with strategy and some elements that are always associated with governance. The rest can be placed under either "wing".

Ross [9] states that to build a solid foundation for execution of Information Technology within a company, one must master three key disciplines: *an operating model*, *Enterprise Architecture* and *an IT engagement model*. Ross [9] defines the *operating model* as IT Strategy and the *IT engagement model* as an IT governance mechanism. These disciplines are defined and described in chapter 2.2.3. *An operating model* describes how a company wants to thrive and grow. It is important that the operating model also represents a common vision of how a company will enable and carry out strategies. *Enterprise Architecture* is the organizing logic for business processes and IT infrastructure, reflecting the integration and standardization requirements of a company's operating model. *The IT engagement model* is the system of governance mechanisms that ensure business- and IT-projects achieve both local and companywide objectives. The engagement model is supposed to help provide alignment between the IT and business process decisions.

The Gartner framework mentions several potential governance processes, but the two that are described in detail are: Governing the structure and content of Enterprise Architecture, and linking of project portfolio management with Enterprise Architecture compliance. As shown in figure 13 and described in chapter 4.2.1, development of Enterprise Architecture are consistent and

connected with IT planning processes and IT Strategy development. Enterprise Architecture provides input, and receives output from these processes.

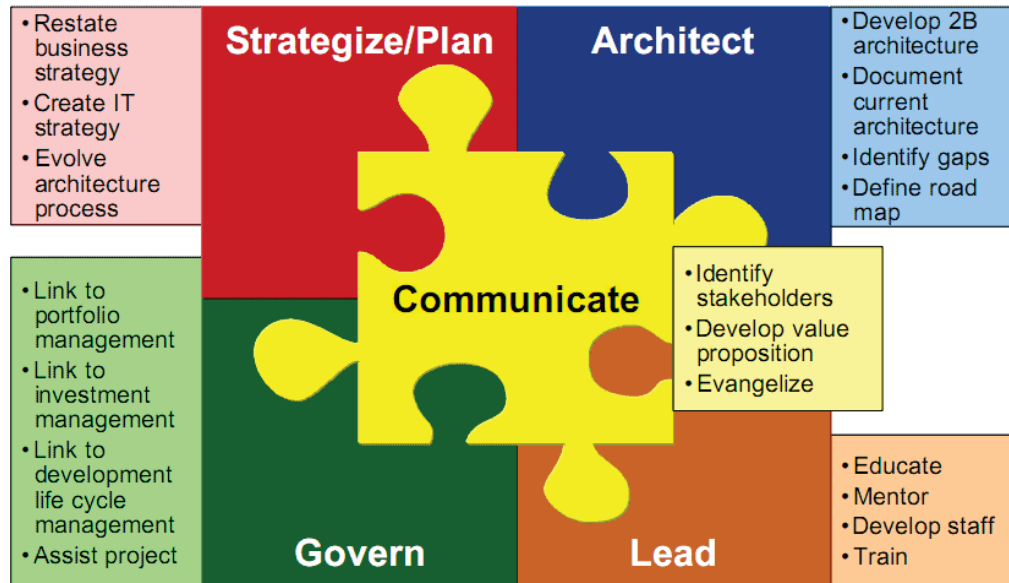


Figure 17 Strategy vs. Architecture vs. Governance vs. Managements Source: Gartner

Figure 16 displays Strategy, Architecture, Governance and Management as parts of a puzzle. In order to get the whole picture all aspects must be considered. It is not important where the different disciplines are placed (for example whether IT principles are a part of Governance or a part of Strategy), but rather that all disciplines are covered.

Realizing an IT Strategy requires a foundation of solid governance that supports the execution processes [27]. The governance should specify the rules, procedures and organizational structures for ensuring accountability. IT Governance processes are focused on providing an ownership role to business stakeholders, and also ensuring that IT can successfully act as controller for the technical aspects of managing assets [27]. The development of complete IT Governance is not part of any of the Enterprise Architecture frameworks. The Enterprise Architecture governance touches on some parts of IT Governance, as previously described, but it might also include non-IT subjects. IT Governance is more extensive than Enterprise Architecture governance because it covers all IT elements.

The TOGAF Framework (described in section 4.2.3) states that the primary reason for developing an Enterprise Architecture is to support the business by providing the fundamental technology and process structure for an IT Strategy. TOGAF is an extensive framework, which can be used to develop some strategies

and some governance in addition to Enterprise Architecture. TOGAF involves a preliminary phase that involves defining architecture principles and governance for the development of the Enterprise Architecture. Principles are essential in IT Governance, and these Enterprise Architecture principles should reflect the IT Governance principles. The next phase of TOGAF is the architecture vision phase. In this phase business principles, business goals, and strategic business drivers for the company are validated. The vision phase needs to reflect the IT Strategy as it tries to implement the business strategies. TOGAF separates Corporate Governance from Technology Governance, IT Governance and Architecture Governance (see chapter 4.2.3). Architecture Governance is the governance of the Enterprise Architecture.

IT Governance is defined by TOGAF as a provider of the framework and structure that links IT resources and information to enterprise goals and strategies. TOGAF specifies the CobiT framework (chapter 3.2.2) 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.

As previously described, IT Strategy focuses on business competition. IT Governance and Enterprise Architecture frameworks do not take this business aspect into consideration. IT Strategies are often 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.

Some see IT planning and strategies as a platform for IT Governance. IT Governance should help set rules for how the IT Strategy is carried out. IT Strategy describes *what* one has to do to reach the business strategies. IT Governance describes *how* the enterprise should be governed to complete the IT Strategy and the business strategies. In some aspects these concepts might overlap, depending on the enterprise that develops them.

The Enterprise Architecture contains both strategy elements and governance elements. One needs an Enterprise Architecture governance mechanism to govern the Enterprise Architecture process. In addition, the Enterprise Architecture development should be guided by the IT Strategy. This is somewhat complex, but the development of the Enterprise Architecture should also provide input to the IT Strategy, and it may help change the direction of the strategy (when developing the Enterprise Architecture, some new and better directions might occur. This can result in change in the IT Strategy). Knowing the current state Enterprise Architecture can help when developing strategies.

6 Conclusion

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. Enterprise Architecture and IT Strategy overlap at some points. For example, both encompass Information System strategy. The Enterprise Architecture does not always cover the whole business strategy. IT Strategy should reflect the entire business strategy, which includes subjects like competition, surroundings, market, hiring-policies etc. Enterprise Architecture includes elements of both strategy and governance, but not to the extent that IT Strategy and IT Governance do. Enterprise Architecture is more 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 Enterprise Architecture governance provide policies, standards, guidelines and procedures to follow. However, Enterprise Architecture governance does not necessarily cover all IT activities, but IT Governance does. IT Governance is primarily operational and secondary strategic with the focus on directing how IT services enable business operations. Enterprise Architecture 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 competency. TOGAF (described in chapter 4.2.3) specifies the CobiT framework (described in chapter 3.2.2) 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, and beyond the scope of most Enterprise Architecture frameworks.

The difference between IT Strategy and IT Governance is somewhat blurry. As we see from chapter 2.2.2, some definitions of IT Strategy can be very similar to what is defined as IT Governance. Every company has their own perceptions and definitions of IT Governance and IT Strategy. However, in the general sense, IT Strategy should define the direction of IT within a company. It should tell an enterprise *what* it wants to achieve with IT. IT Governance should consist of the guidelines and principles that will govern an enterprise so that it achieves the IT Strategy. IT Governance should tell us *how* to achieve our goals (see figure 18).

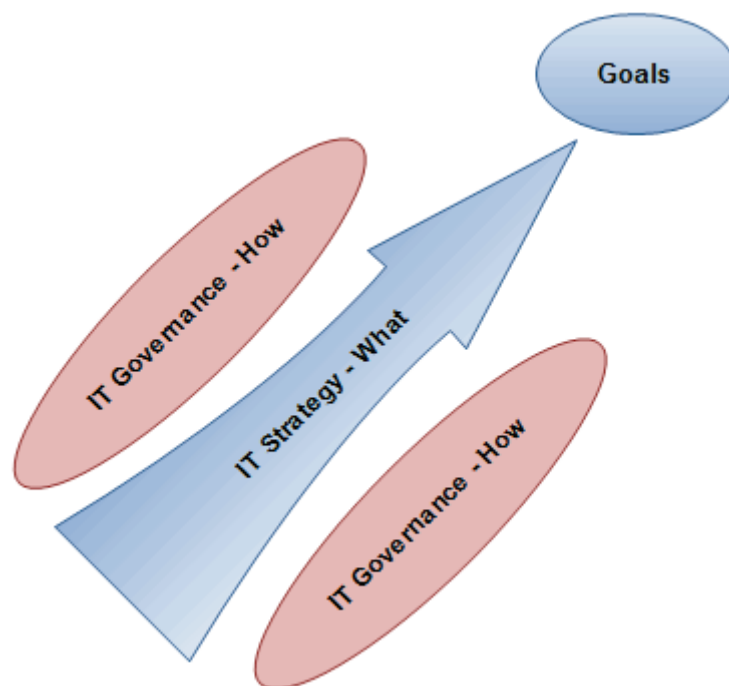


Figure 18 Governance principles will guide the Strategy

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. 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 [23] a provider of the framework and structure that links IT resources and information to goals and strategies.

7 Further Work

This paper can be extended with a deeper analysis of the frameworks, and perhaps other frameworks of IT Strategy, IT Governance and Enterprise Architecture. If I had more time, I would have investigated and explored the CobiT framework in closer detail, and perhaps compared it further to Enterprise Architecture governance in the TOGAF framework.

This thesis can be extended with further investigation of different sources (both on the internet and in books). The resources on these subjects are close to unlimited because there are so many opinions on how to organize it. As there are so many resources on these subjects, one of my goals before starting this project was not to get lost in material. This is why I have limited the sources of my work.

This project is written in parallel with the course "TDT26 Enterprise Architecture, Depth Study". The project is a depth study on a preceding Master study. The subsequent Master will involve research and evaluation of StatoilHydro's use of Enterprise Architecture, IT Strategy and IT Governance. The Master will also include suggestions of improvements, and reveal inconsistencies or flaws. This paper is hopefully a sufficient starting point for the described Master study.

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