IT Strategic Planning with the Approach of Enterprise Architecture

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Abstract

Strategic planning means the future planning of an organization, i.e., the direction in which the organization tends to move. IT strategic planning for any organization is a document dictating the enterprise information architecture in the light of strategic considerations, such as the mission, goals, and priorities of the organization, providing the required action plan to access systems and databases in organizational level. In other words, IT strategic planning is the charter and master plan of the organization in the context of information systems, and more generally in information technology. Despite the existence of various approaches, strategic planning is considered as a complex activity, and many problems prevent the success of this program or challenge the planners. Some approaches are: McFarlan and McKenny strategic network approach, Parsons relationship strategic approach, critical success factors approach, commercial systems planning approach, Nolan growth stages approach, investment strategy analysis approach, and enterprise architecture approach. It is not possible to investigate all these approaches in this paper, so it is suffice to say a brief introduction and review of each. Currently, the enterprise architecture approach or IT architecture approach is the proposed approach to develop long-term plan or IT comprehensive plan. Enterprise architecture is one of the most important and widely used approaches, as well as a powerful tool to organize complex information systems. The purpose of this study is to offer a basic introduction to enterprise architecture approach for strategic planning of information systems. The enterprise architecture approach is well examined in this study as it deals with developing enterprise information and communication technology strategies to provide an appropriate context to better support the business goals, integration between information systems, better utilization of information technology to achieve competitive advantage, prioritizing information systems development projects, facilitating proper decision-making for investments in information technology, improving resource allocation, coherence between different organizational activities, identifying new opportunities, facilitating management control and information flow architecture in different companies and organization.

Keywords: planning, strategic planning, information technology, enterprise architecture
Introduction
Enterprise architecture is a framework to develop, coordinate, and align all activities and elements in an organization in order to achieve the organization's strategic goals. Like other architectures, enterprise architecture gets involved with different parts of the system, but unlike them, the architect faces a system whose components are often non-physical, intangible, and intellectual, and their prevailing relationships has originated from working and/or human relationships and culture. In order to describe such a system, they cannot use common methods of other architectures and needs to use different models. The enterprise architecture can be displayed by a set of inter-connected and relevant models in which selecting the proper model is the responsibility of the architect. Enterprise architecture is rooted in the concept of "information systems architecture", especially "information architecture". The difference between enterprise architecture and information systems architecture is that enterprise architecture involves all aspects of the organization, such as users, the geographical location of the systems, their distribution, processes, motivations, strategies, organization's missions, etc., while information architecture only focuses on the information. In fact, we face some re-engineering in the whole organization from the perspective of information systems in enterprise architecture, which attempts to improve the organization's work processes by employing information technology. This method doesn't have a long history and is newer than other methods, is organization-oriented and data-oriented in their classification, and originates from the increasing use of information technology in organizations, enhanced internal and external organizational interactions, ever growing acceleration of the changes causing information crisis. Although information communication and technology (ICT) results in the increasing human ability and efficiency, such changes don't improve various aspects of the human life themselves, and strategic mechanism and master plans are needed to achieve this goal. The most important plan necessary to achieve these goals is a master plan or a comprehensive plan for information technology.

Definitions
- Strategic planning: according to Peter Drucker, "strategic planning is a continuous process of systematic and risky decisions with the maximum knowledge and awareness of the future results, which systematically organizes the efforts and attempts required to carry out these decisions, and measures their results against expectations by systematic and organized feedback" (Stueart, 1998, p.41). Strategic planning is a process in which the purposes, goals, and plans are set and executed. However, both setting and execution processes are gradual and continuous.

  The time scale for strategic programs is about three years, and is unlikely to be more than five years. Although the long-term perspective is envisioned in a more general level, they have to be enough flexible to respond to changes (Koral, 2001, p.6-7). The strategic planning started in 1960s as comprehensive planning and in its preliminary form. The primary purpose of performing strategic planning was to control the whole organization.
- IT strategic planning: IT strategic planning for any organization is a document determining the organization's information architecture in the light of strategic considerations, such as missions, goals, and priorities of the organization, as well as the action plan required to access systems and databases in organizational level. In other words, the IT strategic
planning is the charter and master plans of the organization in context of information systems and, more generally, information technology (Charouse).

- Enterprise architecture: the term architecture associates with a general sense in our minds due to its history in human civilization. Rather similar definitions have been proposed for this term in the context of organization and information technology. The architecture might be considered as a fundamental structure of systems, components, their internal and external interaction, and the principles governing their design and development (ANSI/IEEE Std 1471-2000).

On the other hand, the term enterprise is referred to any set in an organization sharing the same goals and operations. This set may include the whole organization, a distinct part of an organization, functional aspects of a system, or even an inter-organizational set (CIO Council, 2012).

Generally, the term enterprise architecture can be defined as an organizational map clarifying the mission structure and required information of the organization, the technologies required to support them, and the transition process to implement these technologies (CIO Council, 2012). In our desired definition in this paper, enterprise architecture is the overall structure of IT planning which drives optimal utilization of information technology to achieve business strategies (Perks & Beveridge, 2011).

With the spread and growth of IT users, specifically with the growth of the internet, in early 1990s, the public and private organizations in developed countries, especially in United States, encountered a wide range of information technology applications and new paradigms of IT-based activities. The emergence and popularity of new vocabularies, such as electronic government, electronic services, electronic business, etc., all impose severe economic and social technologic challenges and opportunities on organizations and institutions to make them use these new technologies. On the other hand, employing these technologies require huge investments in this regard, carrying out which required sufficient economic and technologic justifications, as well as strategic plans. In addition, these organizations also concerned about issues such as legacy systems and equipment, lack of integration between the existing IT resources of the organizations, incompatibility between technological platforms of different organizations, and dozens of other problems. This was specifically significant in state institutions relying on state resources for financial support.

Furthermore, a legislation was passed in the US Congress in 1996, which is known as Clinger-Cohen act, according to which the state organizations and institutions were required to develop their own IT architecture (Clinger-Cohen act, 1996).

Information technology and information systems planning

The organized planning is the platform and portfolio of information systems required for an organization in all levels. IT comprehensive planning in an organization determines the required platform in all aspects (technologic, management, human, etc.) and is the organization guide in designing and implementing different information systems and employing IT tools.

- Ward believes that IT strategic planning is an administrative task which focuses on:
  1. The integration of information systems considerations in the planning process of the organization
  2. Planning for effective and long-term management and optimizing the effects of information, information systems, and information technology
3. The integration of all forms of manual, computer and communications
4. Emphasizing on problems such as little knowledge of managers, communication barriers, and troublesome organizational approaches
   • Leader & Sethi believe that strategic planning of information systems is the process of identifying the portfolio of computer-based applications helping the organization to achieve its business goals.
   • Wang & Tai define information systems planning as a management process to create coherence between information systems and the planning process of the organization, relate the information systems applications to business goals of the organization, and determine the information requirements to achieve organization's long-term and short-term goals.
   • As the first step of enterprise architecture process, IT strategic planning include determining the perspectives and mission goals, specifying the strategic requirements, and providing IT strategic documentation. The purpose of IT strategic planning is to create alignment between IT applications and business strategies of the organization.
   • Adjusting the organization's IT planning with the main objectives of the organization is one of IT/ISP challenges following increased organization productivity.
   • Based on the studies carried out, IT/ISP have been one of the main concerns of IT managers and organization's senior managers in recent years.

Three questions have to be answered in the strategy development process:
1. How is the status of delivering services related to organization's information technology at the moment?
2. What should the status of these services look like?
3. What is the best way for moving toward the desired status?
One has to know what measures have to be taken for this purpose.

Achievements of IT strategic planning
The main achievements of IT strategic planning are:
1. Saving investments regarding information technology and making it purposeful
2. Proving an appropriate platform to implement integrated information systems
3. Transformation and modernization of the existing IT platforms in order to sync with the latest technology
4. Issues to be specified and considered in IT strategic planning
5. Identifying the gaps between the existing situation and the optimal architecture
6. Identifying and investigating the barriers
7. Designing the options and possible alternatives
8. Comparative analysis of the alternatives and selecting the top options
9. Determining the plans and strategies to implement ICT
10. Identifying the required resources to achieve the optimal status
11. Explaining and determining the high priority projects and providing necessary information to create their RFP
12.

Approaches to strategic planning information
The following describes some approaches to strategic planning information.
McFarlan and McKenny Strategic Network

Table 1 resembles networks created by Boston Consulting Group and General Electric, and is suitable for choosing the communication strategy. F.W. McFarlan and J.L. McKenny (1982) identifies four categories of companies on which information technology has different effects. They are referred to as strategic, turnaround, factory, and support, each of which show different organizational requirements for information technology (Ward, 2009, p.42).

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<td>Members of free market (3)</td>
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Factory Support

Parsons communication strategy

One major goal of IS planning is to ensure that company requirements regarding information technology are consistent with company framework for information technology management. To emphasize the importance of this consistency, companies have to be aware of their business plan and information strategies (Parsons, 1983). Gregory L. Parsons proposed 6 public communication strategies that provide a wide management framework to guide employing information technology in the company. Each strategy plans an approach through which the company can set the IT goals and policies, evaluate the projects, allocate resources, and determine performance standards. The extent to which the companies consciously choose any of the 6 strategies is variable. Some companies don't have a specific strategy. The information technology (IT) applications are usually less successful in these companies with random strategy, and IT has a rather ineffective performance since the senior management, users, and the internal IS department have no common framework to act. The 6 Parsons strategy are:

- Centrally planned
- Guidance advantage
- Free market
- Exclusivity
- Scare resource
- Necessary loss

Critical success factors

John Rockart et al. began to develop a method to describe executive information needs in 1997. Their achievement is critical success factors. This method focuses on individual managers and their current information requirements. The critical success factors methods can be used to help companies identify the information systems they need. For any executive manager, the critical success factors include a number of guidance areas regarding the work, which have to be driven
properly for organization's growth and development. There are less than 10 factors that any executive manager has to consider. In addition, they are highly time-dependent. The key areas have to receive equal attention from the executive manager. The Center for Information Systems Research (CISR) also found out that most managers have clearly identified these critical factors. Rockart found out that there are four sources to identify these factors. The first resource is the industry where the business takes place. Any industry has some critical success factors which relates to any company within that industry. The second source is the company itself, whose success in the operations and activities of large companies dominating an industry is likely to provide one or more of the critical success factors for the small companies in that industry. The third source is critical success factors of the environment, namely consumption practices, economy, and the political factors of the country (or countries) participating in that activity. The fourth source is fleeting organizational factors, i.e., the areas of company activities which normally don't receive attention, despite the fact that they have to be considered.

Besides these four sources, Rockart discovered two critical success factors. He named one "monitoring", i.e., maintenance of the ongoing operations, and the other "building", i.e., following up the progress of change plans triggered by the executive manager. Rockart looks at critical success factors from one organization to another, one time period to another, and from one manager to another.

**Business systems planning**

Another methodology for planning is business systems planning (BSP) created by IMB company. This is the most popular planning method. The main philosophy of business systems is that data is a company resource. Therefore, it has to be managed from organizational point of view, so that delivers the best services to the organization's goals and supports its decisions. "Organization data" is the term used for a complete set of companies. Practically, this term is uses for those companies with the possibility of being computerized. As the administrative systems develop, more data in an organization become computer-based. It is very difficult to define this large volume of data, so many organizations make no effort in this regard. However, companies that have tried to define institution's data have often used business systems related to IBM Company.

The purpose of business systems is to discover a fixed information architecture supporting all business activities. When all information requirements of a business process (e.g. purchase) are specifies, the information framework will remain fixed until the process remains unchanged. The business systems planning also use this framework as a basis for future business systems planning.

**Nolan growth stages**

The IT task growth stages model in an organization (Figure 1) can be employed as a framework to evaluate Information systems (IS) characteristics (Nolan, 1979). Nolan mainly concentrates on the fact that the IS department in an organization passes through six development stages. As the organization passes through six growth stages, the capabilities of their systems, methods to control them, and their perception will become more comprehensive and advances. Progress to maturity allows the company to make less effort to maintain the task of information systems and concentrates its efforts mainly on using technology to provide operational and strategic advantages (Ward, 2009, p.10).
Investment strategy analysis

Another framework to support systems planning is based on some traditional techniques of portfolio planning and investment analysis (David Norton). David Norton, Nolan's manager, and his colleagues describe the method used in the company to help customers in determining their investment strategy for information systems. Norton expected that four major type of information system applications would be used in 1990s:

- Typical procedures, internal interactions processing as stated in many modern data processing systems;
- Professional support systems, such as engineering support, decision-making support, and similar activities;
- Physical automation;
- Systems employing external staff of the company, such as customers and suppliers.

There will be investments for providing a fundamental technical infrastructure to use and develop these applications. Telecommunication networks, database standards, and other system software are the main samples. According to Norton, a 2D table is set to create a framework for investment strategy, in which four types of systems and infrastructures are placed in the columns, while the main functional components of the business, such as research and development, marketing, and other tasks and services are placed in the rows (Figure 2).

Norton showed that there are many differences in the methods through which systems invest in information systems. Norton states that performing such analysis will help to bring up sufficient and true reason(s) for using technology. This allows managers to look at area where investments have already been made, and then decide where to stand in order to align information systems investment with business strategy.
Figure 2. Products and customers of information systems

IT/ISP four-stage model
The IT four-stage model if the infrastructure of information systems portfolio in an organization, which has been properly aligned with the organizational strategies and is able to create competitive advantage for the organization.

1. Strategic IT planning: creating a relationship between organization's strategic planning and IT plan
2. Information requirements analysis: identifying the organization system’s basic requirements in order to develop strategic information architecture
3. Resource allocation: simultaneous allocation of IT plans development resources and operational resources
4. Project planning: designing the executive plan of developing the designed systems and allocating the necessary resources to develop these systems

Existing view for master plan
1. Enterprise resource planning (ERP)
2. IT strategy
3. Total system
4. Management information systems (MIS)
5. Enterprise architecture
6. Business recovery planning (BRP)
7. Master plan
8. It architecture

Choosing the enterprise architecture approach to develop ICR master plan
John Zachman, theorist in the field of enterprise architecture, believes that the requirement of changing up-to-date quality-orientation and change acceleration had created a situation driving us to enterprise architecture. In the 21st century, architecture is the determining factor in the success or failure, survival or annihilation of the organizations (Zachman, 1997).
United States Congress passed a law in 1996, known as Clinger-Cohen act, according to which all federal ministries and agencies in the United States are required to develop their own IT architecture. Based on this law, the task of development, modification, and execution of the integrated IT architecture in any organization is on the chief information officer (CIO), the Clinger-Cohen act defines IT architecture as:

"An integrated framework to improve or maintain the existing technology and the new IT business to achieve the strategic goals of the organization and manage its resources"

Following the adoption of Clinger-Cohen act, which is the most important legal document regarding the requirement of developing new information architecture in public organizations of the United States, US organization of management and budgeting (OMB) also published a guideline in 1996 regarding the necessity of coordinating the plans and costs by US federal agencies, such as ministries, organizations, military forces, and universities using state budget, so that they have accomplished projects to develop and formulate their own information architecture.

Generally, the advantages and benefits prevailing in enterprise architecture approach can be categorized in two classes: (1) general interests associated with the organization's business, and (2) benefits associated with the IT department, information systems, and the IT resources supporting the business.

- Enterprise architecture describes the future of the organization in terms of business, plans, information, and technology.
- Enterprise architecture is the technical maps for the complete and regulatory definition of the organization's status quo (baseline) and the optimal environment.
- Enterprise architecture is a bridge between the organization's strategies and their implementation.
- Enterprise architecture is a comprehensive attitude towards organization's tasks and missions, working processes, information entities, communication networks, and hierarchy and task prioritization in an organization in order to create and integrated and efficient information system.
- The purpose of designing enterprise architecture is to provide a working plan regarding information architecture, application architecture, and information technology.
- Designing the enterprise architecture is the process of defining architecture layers to provide the information required for the organization, as well as a map to implement the architecture layers.

What is the importance of selecting an enterprise architecture approach?

The driving forces embedded in enterprise architecture:

- The need for change is the most urgent need of organizations, and the enterprise architecture is the tool for change. The environments and information technologies have increasingly changed over the past ten years. In other words, the new information technologies quickly get obsolete and the organizations have to continuously undergo enormous costs in order to keep up with the latest technologies.
- Limited funding and financial resources make organizations to act more carefully and consider more savings regarding the investment on information technology.
- The need for identifying the current situation, the optimal situation, and the desired path.
Main objectives of enterprise architecture

- Transforming information technology from the state of being a tool to one of the organization resources and in the service of organization missions
- Providing an IT strategic plan, the status quo architecture, the optimal situation architecture, a transition plan from the status quo to the optimal situation, as well as updating the architecture
- Design and implementation of information technology and beneficial use of information and IT by making a relationship between organization's information and present/future processes in the organization

Advantages (directives, standards, and operational services)

- Makes collaboration between IT and business processes.
- Ensures that IT directly supports strategic goals.
- Directs to use emerging technologies.
- Improves purchase in the context of IT.
- Reduces improvement costs.
- Reduces IT support costs and long-term maintenance costs.
- Helps other business departments to reach consensus regarding the area of IT activities.
- Facilitating change management
- Enhancing data sharing
- Reducing data redundancy
- Reducing the time needed for a software development cycle
- Business recovery planning
- Investigating the advantages of the investments
- Decreasing the loss caused by leaving key employees

The main advantage:
In completes the structure of the organization

Enterprise architecture pyramid

To facilitate holistic view in understanding the scope of information technology and IT-based recreation of the organization, the enterprise architecture approach usually follows the IT architecture pyramid model provided by the US National Institute of Standards Technology (Figure 3).

Figure 4 represents different layers of planning and deployment of information technology within an organization, which is referred to as organization's information architecture pyramid, or enterprise architecture.
As it can be observed, a layer approach has been employed for IT-based enterprise architecture, in which each lower layer is the underlying platform of its upper layer. On the other hand, its implementation is carried out from top to bottom. Moreover, this pyramid indicates that the IT-based enterprise architecture requires cooperation in all strategic and operational levels in the architecture process, which can be obviously seen in the pyramid, i.e., the strategic nature approaches operational nature from top to bottom since this technology affects all organizational levels and prevails in all decisions at this level.

Today, the information is, in fact, a strategic resource known along with other organizational resources (financial resource, human resource, facilities, and technology). Therefore, the technologies associated with information procurement and employment are also of strategic importance for the organizations.

Now it would be beneficial to look more accurately into the enterprise architecture pyramid to better understand the enterprise architecture. Therefore, we will briefly review its different layers from top to bottom.

1. **Business layer.** The top of IT architecture pyramid describes the dimensions related to the organization's business and trades. The activities performed at this level include business strategies; organization's technology; policies, scope, and decisions about IT commercial paradigms, such as electronic business, etc..

   Furthermore, issues such as organizational structure of business processes, planning and control systems, and administrative management mechanisms to achieve strategies and organizational objectives are elaborated in this layer, and the relationship between them is modeled.

2. **Information layer.** Emerging computer systems and increasing their use in organization revealed that mechanization of the processes and operations doesn't necessarily guarantee their accuracy and efficiency. In other words, mechanization of incomplete and inefficient processes only accelerates performing a "wrong task", therefore, the required information has to be optimized and modeled during the organization's processes for the effective application of IT. Then, the required systems will be specified based on clustering the information and communication of information groups with working systems. Concepts like business recovery planning (BRP) to modify and optimize workflow and information are addresses in this layer.
The main information required for doing the organizational task is identified in the information architecture layer. In this layer, the logical models of information datasets of data repository, and their relationship with organization tasks and application systems are identifies and defined. First, the subject areas of the organization will be identified and categorized through which the information model will be created. Then, logical data banks and the relationship between subject areas and organization tasks will be modeled in the form of various diagrams. Concepts like mechanisms and knowledge management procedures are also discussed in this layer.

3. **Application layers.** This layer includes applied systems necessary to achieve the functions defined in upper layers. Systems like enterprise resource management (ERP), customer relationship management (CRM), management information systems (MIS), supply chain management (SCM), etc. are addressed in this layer. Identifying and describing the applications and modules, and their relationship with organization processes and other applications are done in application architecture layer. The relationship between applications and organization tasks, as well as functional areas of the organization, is another item developed in this layer of architecture.

4. **Technology or infrastructure layer.** This layer is, in fact, the apparent body of information technology, and something that the public may imagine. This level of information technology encompasses hardware and software technologies, namely microprocessors, personal computers, computer networks, telecommunication and electronic infrastructures, software platform, etc. In fact, establishment of the organization's information systems is done based on this layer. In the infrastructure architecture layer, the hardware and software technologies and the telecommunication networks required for establishment of organization's applied systems will be identified and explained.

The requirements and technological entities of the organization are classified based on four main technological areas (the software platform for data management, operation systems, information processing hardware for telecommunication technologies, and middleware).

However, it is the technological aspects of information technology that is seen in the first place. Too much interest in this layer lures many of organizations and makes them neglect the understanding of the philosophy and fundamentals (upper layers) of IT applications. There are many organizations equipped with the latest computer technologies, but take the least advantage of its associated benefits.

Figure 4 shows IT strategic planning based on enterprise architecture.
Discussion and conclusions
A comprehensive information system plan is critical for development and successful utilization of information systems in organizations. Technological master strategic plan prevents the loss of continuous investments inevitably done for several years in the context of information technology, and deploys these investments purposefully aligned with master and strategic plans of the organization. To do so, the information system planning process has to include a complete set of organizational entire planning efforts.
In this study, the enterprise architecture approach was elaborated as a new attitude through which all supporting activities and technologies are developed in the form of pyramidal hierarchy and in business, information, applied systems, and infrastructure layers. This approach is far beyond the methodology of creating information systems and encompasses all information resources and business processes of an organization. It is mainly used in large organizations with legacy systems where efforts have been made to organize all information resources aligned with the enterprise strategies and master business objectives. The importance of information technology applications in the new era, as well as the enterprise architecture capabilities and advantages, promises a broader perspective and more comprehensiveness of this approach.
References

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