Strategic Planning for eServices

A Short Tutorial for the Beginners

Executive Summary [1]

Strategic planning of ICT (Information and Communication Technologies)-based services, abbreviated as *eServices*, is a crucial task for the public as well as private sectors. Given a strategic project (or an initiative), a strategic planning process identifies the main alternatives, the key business/technical issues involved in each alternative, and helps in evaluation and selection of the most viable alternatives *before* initiating the project. To succeed, the strategic planning process must explore a large number of people, process and technology issues and eliminate surprises. This is not easy because the task of eservices planning in the digital age is considerably complicated due to the changing business and technical landscape and an ever-growing body of knowledge. This short tutorial gives a quick overview of the vast body of knowledge that entails a typical strategic ICT planning process and presents a conceptual framework for further exploration of this important area.

1. An Example – eServices for a City

Ms Fran Kuye is mayor of a city with one million inhabitants, located in a developing country.She wants to use the knowledge gained from her MPA (Master of Public Administration) to transform her city to a "Digital City" that heavily relies on eservices to support its citizens. Her overall goal is to develop a 2 year plan that includes the following:

- First year, start with informational services on the web that deliver the information to the citizens over the Internet instead of printing forms and brochures that are mailed to the citizens.
- Second year, start with "transactional services", where some of the services are delivered online (e.g., online registration for licenses).
- Afterwards, start partnering with other cities and government agencies to improve the entire region..

She does not know where to start. She has visited some of the key information sources on digital government shown in Exhibit 1 (a friend told her about these sources). However, she still does not know how to develop a solid plan that covers the management as well as technology issues and can also be successfully executed, monitored and controlled. She knows about some successes and failures and likes the egovernment success and failure model published by www.egov4dev.org[3]. She wants to make sure that she follows the successes and not the failures. Basically, her goal is to significantly grow the city by using eservices in an innovative manner. She needs help in developing an overall IT plan that includes business processes, applications and the enabling IT infrastructure.

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[1] This short tutorial is based on a chapter of a future book "Strategic IT Planning in the Global Digital Age" by A. Umar (target publication: 2014). The tutorial is an abbreviation of a 52 page chapter and is possibly quite un-even. Any suggestions for improvement are welcome. We were hoping to find a short but recent and relevant tutorial on this topic, but could not.

[3] This is a very interesting model that also shows many examples of successes and failures. See (http://www.egov4dev.org/success/evaluation/factormodel.shtml).

2. What is Strategic Planning for eServices and Why is it Needed?

Simply stated, a planning process identifies the main alternatives, the key issues involved in each alternative, and helps in evaluation and selection of the most viable alternatives *before* initiating a task. . Planning can be at strategic (i.e., long range and big picture) or detailed (short range and highly specific) levels. The objective of strategic planning is not to investigate one or two issues in detail but instead to identify the most promising options and minimize surprises.

Current and next generation of public as well as private enterprises (like Fran's City) need to continuously plan a very wide range of *eservices* (ICT-based services that are delivered to the consumers). Examples of common eservices span ehealth, elearning, eprocurement, etransportation, emarketing, and the like. These eservices provide tremendous benefits to the consumers by allowing them to easily access large amounts of information sources around the globe, purchase needed items online, join discussion groups, receive healthcare in remote areas, and learn about the latest developments in different areas of work. However, these eservices rely on a complex ICT (information and communication technology) infrastructure that includes technologies such as Web 2.0, mobile computing platforms, wireless networks, application servers for ecommerce and B2B trade, broadband networks, cloud computing, and systems management platforms. To survive and thrive, modern enterprises need to plan their eservices and the needed ICT infrastructure quickly and correctly. Here are some examples:

- a smart environment protection system that detects high pollution levels quickly, respond to the problem, and learns how to handle it better next time
- an online purchasing goods and services system in an international marketplace
- a telemedicine service for remote villages
- a knowledge portal that could be used internationally
- a web-based emergency response unit to be used by a city government
- health information network between healthcare providers, pharmaceutical firms and insurance companies
- a mobile health clinic for delivering healthcare to remote areas
- a social networking system that can be used in the public sector
- applying for social security benefits online
- applying for passports, tax information and other government documents online
- a cloud computing service for academic users
- an entrepreneurship portal to help startups compete and succeed
- connecting a retail store to an international trading network
- an international supply chain system to be used by manufacturing companies

To develop solid plans for these and other eservices, enterprises need to be guided through the maze of intricate choices that involve multiple policies, procedures, technologies and suppliers. Typical challenges faced by the people involved in the planning process are:

- How to understand the business strategies and to align ICT with the business strategies
- What business processes (BPs) should be automated and re-engineered to compete and succeed
- What type of ICT infrastructure (application packages, computing platforms, and network services) are needed to support the BPs
- How to integrate new applications with the existing (including legacy) systems by using concepts such as SOA (service oriented architectures)

3. Conceptual Framework and Key Building Blocks

Figure 3-1 shows a conceptual framework, based on well known frameworks such as TOGAF (the Open Group Architectural Framework)[4]. that will help Fran get started. This framework shows the following horizontal layers that represent highly interdependent building blocks of a plan that must be properly planned:

- **Enterprise business processes (BPs)** are a collection of *activities* that are required to achieve a business goal. At a basic level, a BP can be represented as a flowchart that specifies the orchestration of activities needed to complete the goal. For example, for a payroll *service*, several BPs have to be carried out (e.g., pay has to be computed, deductions have to be considered, overtime may need to be calculated, etc).
- **Enterprise business applications** are the computer-based information systems that provide automated support to the business services/processes. These applications are also referred to as enterprise applications, business applications or just as applications in the literature. Whatever the name, these applications are business aware. For example, a patient care application contains business logic and data that is concerned with hospitals, doctors and health insurance.
- **The information technology (IT) infrastructure** is used to build, deploy and operate the business applications. IT infrastructure, also sometimes known as computer-communication platform, consists of computing platforms (e.g., computers, operating systems, utilities) and the networks that interconnect the computing platforms. *This infrastructure enables the applications and is business unaware.* For example, the same type of networks and computers are used in airline reservation systems as well as hotel reservation systems. The best known infrastructure is the network that interconnects remote applications, databases, and users. Internet, wireless, and broadband networks are examples of vital network technologies.

These horizontal layers represent the enterprise business processes/strategies, enterprise applications, platform services and network services as the key building blocks of a plan. These horizontal layers need to be properly secured, integrated, and managed/governed (represented as vertical bars that cut across different horizontal layers of the framework). We will use this framework to establish the interrelationships between different technical and business aspects of modern enterprise and to define some basic terms. We start from the top layer (business strategy and processes) and proceed to lower layers. The discussion then moves to the vertical bars of security, management and architectures that cut across all layers.

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[4] TOGAFF, described in detail at the website (www.togaf.org), is very detailed and complicated. It is easy to get lost in TOGAF documents. We have presented a simplified and conceptual view for the purpose of this tutorial.
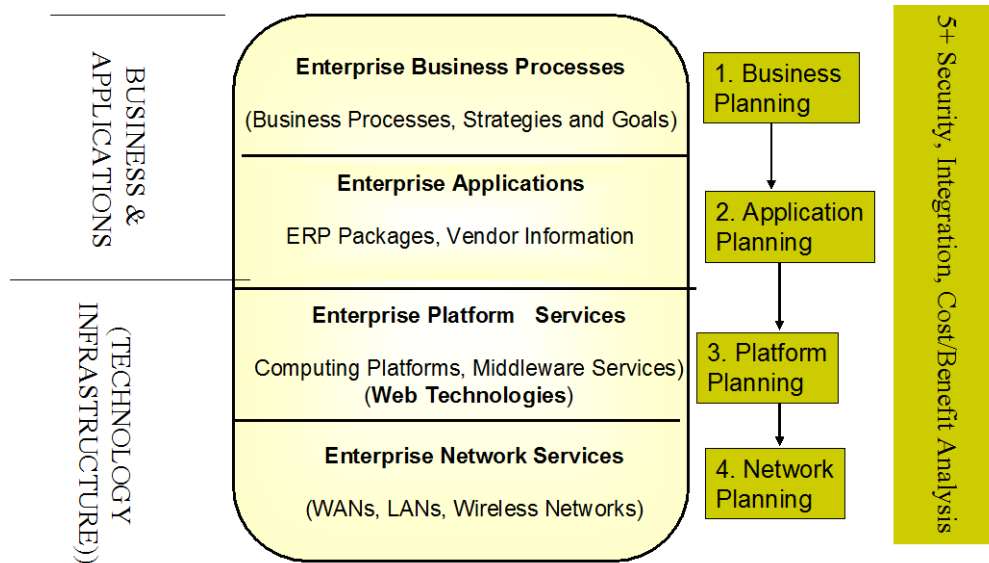
Figure 3-1: A Framework for Discussion

This framework helps us to develop a very simple planning methodology (darker blocks on the right) that consists of the following major stages:

Stage 1: Business planning that concentrates on business and strategic issues
Stage 2: Application planning that establishes the business applications (automated business processes) needed to support the business strategies
Stage 3: Computing platform planning that determines the needed computing hardware/software
Stage 4: Network planning that establishes how all the pieces will communicate remotely with each other
Stage 5+: Security, integration and administration planning that concentrate on how all the layers will be properly secured and administered

Fran can use these simple stages to develop a comprehensive plan for her city. The following discussion uses this planning methodology to get Fran started. .

4. Stage 1: Business Planning and Strategic Analysis

The objective is to create a model of the enterprise (in our case a city) to capture the key business services. (in our case government services). Figure 4-1 shows a "business pattern" of a government agency such as Fran's city. This pattern captures a high level view of enterprise functional areas represented as business functions (e.g., corporate management, sales and marketing) and the key interactions between these services. This high level view is very useful for enterprises because it shows the key *business services (BSs)* and can be easily modified to reflect Fran's city by simply deleting or adding new building blocks. It can also help a business develop a BPO (Business Process Outsourcing) strategy, an enterprise application strategy (i.e., what BSs to automate), and an integration strategy. Business patterns provide a powerful tool for representing a wide range of enterprises in different industry segments.

Given a business pattern that has been modified for a specific enterprise, the main task of the enterprise management is to find the best service providers (SPs) that can support the critical BSs shown in Figure 4-1. In addition, a company can expand and transform its business by adding new BSs from new SPs. For example, a wired telephone company can add a wireless service provider, a manufacturing company can add a retail outlet provider, etc. In addition "service bundles" can be created by different SPs to meet user needs and to compete for

user business. For example, Fran may add, delete, change and merge SPs that provide the best services for her city. After identifying the needed business services, Fran needs to make the following decisions:

- Decide which business services/processes take place at each location of the city (we can assume that Fran's city government is in one building).
- Include business outsourcing, i.e., determine which BSs/BPs take place at the outsourced sites.
- Assign employees to sites. The number of employees at each site helps determine the type and "intensity" of work performed at each site. Outsourcing reduces the number of city employees (a political issue for Fran).
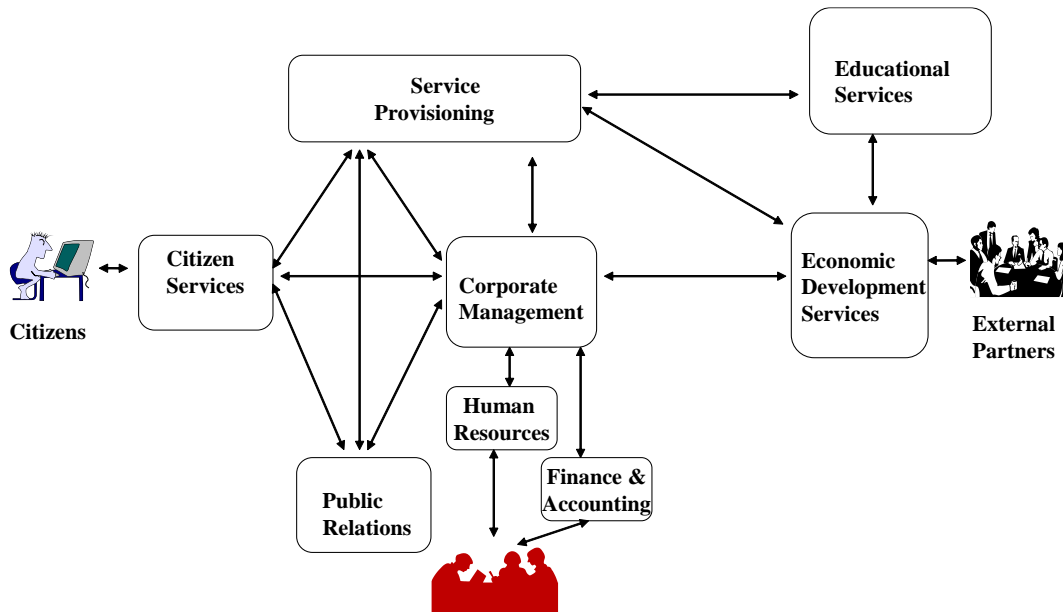

Figure 4-1: Sample Business Pattern

Fran can use this sample business pattern for strategic analysis and to decide which BSs to automate and which ones not to automate. Simply stated, strategy is a game plan to win. There are many different ways of evaluating strategies. These techniques, such as SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis are beyond the scope of this short paper. Let us briefly review a well known cost/benefit model (known as the Portfolio Model) that can be used to quickly evaluate a particular strategy based on broad estimates. This model, shown in Figure 4-2:

- Categorizes each service in terms of costs (low, high) and benefits (low, high)
- Focuses on low cost/high benefit first ("must do" region)
- Explores high cost, high benefits services ("investigate")
- Avoids high cost and low benefit services ("avoid")"

This simple model can be used to quickly analyze a large number of projects and identify the ones that need to be pursued and the ones that need to be avoided. For a project with high potential benefits but high cost, an attempt should be made to reduce the cost (say by outsourcing) to move it to the "must-do" zone. On the other hand, a project with low cost but low benefit should be examined for adding some benefits. In other words, important projects that fall in the "Don't Care" and "Investigate" zones should be further examined and studied to move them to the "Must Do" zone. See [9, 10] for additional approaches to cost-benefit analysis.
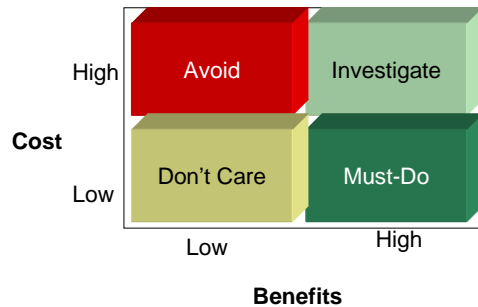
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Figure 4-2: Simple Cost-Benefit Analysis Model

Let us assume that Fran performs cost/benefit analysis of all of the BSs shown in Figure 4-1 and determines that economic development and education are in the "must do" (low cost, high benefit) zone. She thus decides to focus on the educational and economic development areas.

5. Stage 2: Application Planning

The objective of this stage is to identify the applications, A1, A2… An, that are needed to automate the business services BS1… BSn identified in enterprise modeling step. In Fran's case, a set of application packages will be needed to support education and econpmic development services. Once the key applications have been identified, the next main activity is to develop an automation strategy with different options of Buy, Rent, Outsource, Develop in-house, or Extend-re-use **(BRODE).** It is also desirable to determine how the BRODE strategies could be implemented. For example, it is important to select the commercial-off-the-shelf (COTS) application packages that can be bought and identify application service providers for rental and outsourcing. These decisions can be made by using the following steps:

1. For each BS, identify which ones will be done manually and which ones will be automated. In addition, for the automated BSs, determine an automation strategy (buy, outsource development, in-house development, or reuse). For example, if inventory management is to be automated then you can either buy an inventory management application package, or rent an inventory management service from an application service provider (ASP), etc.

 2. For each option, explore the commercially available solutions (e.g. for buying, investigate and select the inventory management application packages available in the marketplace).

 3. Develop a sketch of an application architecture that identifies which of these services will be informational (e.g., just an informational website) and which ones will be transactional (e.g., registering for a course for fee). Figure 5-1 shows a sample result of this stage for Fran's city. This example shows that Fran will not automate corporate management, but will provide citizen services, public relations and economical development as informational services only. Fran already is using automated application packages for human resources and finance & accounting – these are traditional transactional services. She has chosen to support transactional services for education (i.e., the citizens can register and pay for educational services online).

Additional analysis such as the following may influence the decisions made in Figure 5-1 (see [8, 12, 15, 16]):

- Strength, weaknesses, opportunities and threat (SWOT) analysis that determine what type of opportunities and threats are presented by automation of a given service

- Competitive forces models that show how new entrants, substitute technologies, customer attitudes and suppliers may influence automation decisions

- Self assessment approaches based on the capability maturity models that show the gaps between the present and future methods of operation and how best to fill these gaps
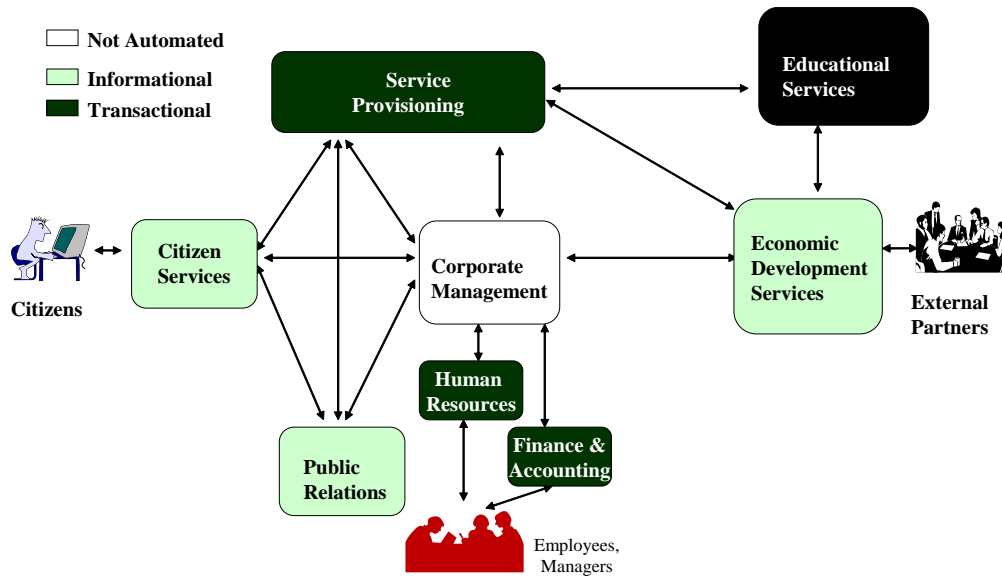
Figure 5-1: Sample Enterprise Application Plan

Application Planning -- A Closer Look

The objective of this stage is to identify the applications A1, A2… An that are needed to automate the business processes BP1… BPn identified in enterprise modeling. To identify the complete set of business processes (BPs), the following approach may be used:

- List all BPs that support the B2C, B2B, B2E, and other business interactions
- Keep the focus at enterprise level activities that are vital to the business. Consulting firms use "Heat Maps" to identify vital services. Heat maps are based on the ***Critical Success Factors [Rockart 1982]*** methodology. CSF instructs the managers to focus on those processes that are *critical to the success of the business*.
- Reduce duplication by clustering similar BPs into one. For example, if the same BP is used for customers as well as business partners, then it is better to cluster the two BPs into one.
- It is highly desirable to question, eliminate, and restructure business processes/services to improve organizational efficiency.

In reality, one or many applications may be needed to support a given business process. and a given business process may need multiple applications. For example, a customer information system may support many business processes such as purchasing, marketing, and payment. Similarly, purchasing business process needs support of many applications such as order processing, inventory management, shipping/receiving, and payment packages. The result of this step is a table that may resemble Table 1-3. Tables of this nature can be extremely revealing and are used in some IS planning methodologies such as IBM's Business System Planning [IBM 1978]. For example, the following table indicates the following:

- Application 2 does not support any business processes. This may mean that an application was developed without any business reason or it supports an outdated business processes
- Business process 2 is not supported by any application. This may indicate that this business process can be directly supported by the IT infrastructure or that this BP is being ignored.
- Application 5 supports 3 BPs. Thus replacement/enhancement of this application should be done very carefully.

Table 5-1: Applications to Support Business Processes

	Business Process1	Business Process2	Business Process3	Business Process4
Application 1	X			
Application 2				
Application 3			X	
Application 4			X	X
Application 5		X	X	X

Once the key applications have been identified, the next main activity is to develop an automation strategy with different options of buy, rent, outsource develop in-house, or extend-re-use (BRODE). It is also desirable to determine how the BRODE strategies could be implemented. For example, it is important to select the COTS (commercial-off-the-shelf) application packages that can be bought and identify application service providers (e.g., Corio and SAP) for rental and outsourcing. Finally, it is highly desirable to sketch an SOA-based architecture. These decisions are based on the following steps:

1. For each BP, identify which ones will be done manually and which ones will be automated. In addition, for the automated BPs, determine an automation strategy (buy, outsource development, in-house development, or reuse). For example, if inventory management is to be automated then you can either buy an inventory management application package, or rent an inventory management service from an application service provider (ASP), etc.

2. For each option, explore the commercially available solutions (e.g. for buying, investigate and select the inventory management application packages available in the marketplace).

3. Develop sketch of an application plan

The result of this process is an application plan as shown in Figure 5-1 previously.

6. Stage 3 and 4: IT Infrastructure Planning

IT infrastructure (platform) planning is concerned with determining the most appropriate technologies needed to *enable* the enterprise application plan developed previously. Examples of such enabling technologies are the Web technologies (including Web 2.0 and Web Services) used in corporate intranets, computing platforms on which the applications will reside, wireless and wired networks which connect all the computing platforms in an Intranet, and "Extranets" which connect many businesses for B2B trade. IT infrastructure planning can be subdivided into two broad stages; *computing platform planning (stage 3)* that supports the applications and *network planning (stage 4)* that interconnects these platforms with each other and the end-users. Computing platform planning consists of the following steps:

- Determine the middleware and Web services needed to interconnect the widely dispersed applications, users and databases,
- Identify the computer platforms, including servers, that will support the automation strategy and the application plan determined in the application planning stage.
- Decide which applications and databases will reside at which computing platforms at each site.
- Handle the software/hardware interdependencies (e.g., can a Windows application run on Linux platform, can an IIS server be installed on an XP machine, etc.)

Figure 6-1 shows a sample computing platform for Fran's city. The applications have been allocated to different computing platforms -- each computing platform consists of computer hardware (e.g., processor, disk drives), an operating system (e.g., Linux), some system software (e.g., MS Access), and middleware (e.g., Internet Explorer or Microsoft .NET Framework). The figure shows that the City Portal will reside on a city owned server and the various services will reside on other internal machines (some of these applications may reside on the Portal

Server. In addition, the city portal is connected to some other portals that reside on the public network (external portal) and on the partner network (partner portal). These computing platforms are interconnected through a network that is defined later.
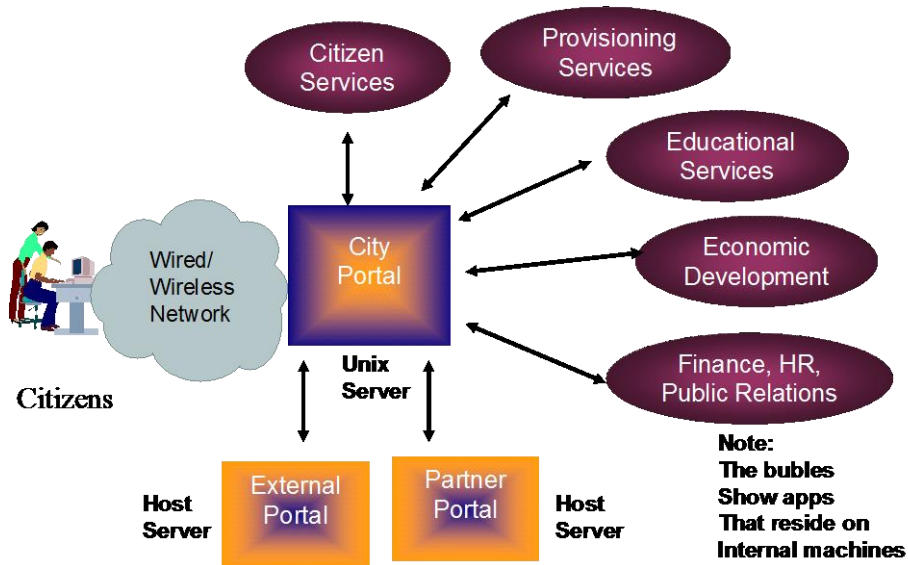

Figure 6-1: A Sample Computing Platform Plan

Network planning develops a network configuration that interconnects the computing platforms by using wireless as well as wired network elements. Figure 6-2 shows a sample network plan for this city. Network planning involves three major tasks. First, determine the workload at each site based on the work activities at each site. Second, develop a network configuration and estimate the bandwidth needed by using queuing network models. This involves, for example, network capacity planning for the internal plus external networks depending on the type of connection (wired/wireless) and the network traffic patterns. Finally, the type of connections and the commercially available solutions need to be developed.
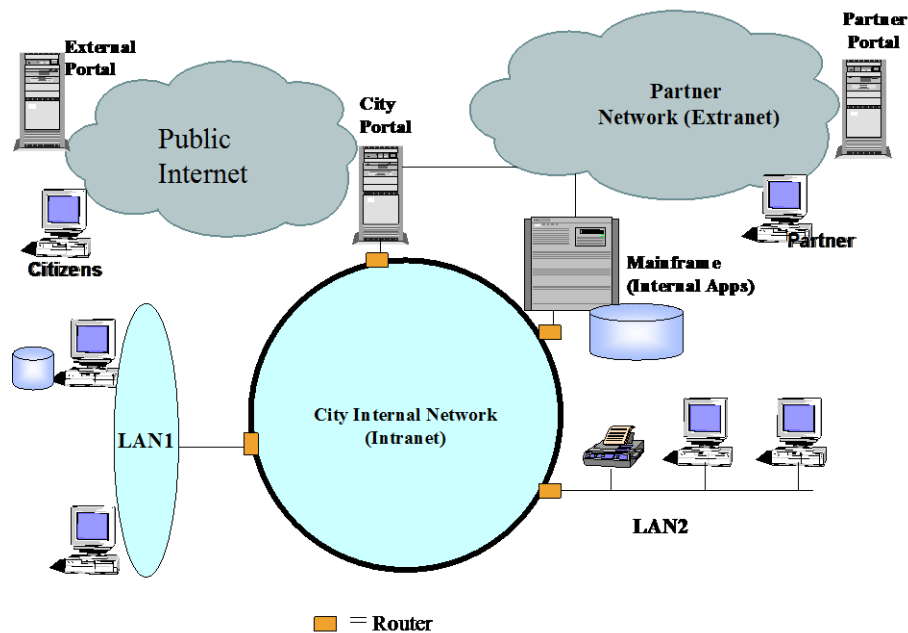

Figure 6-2: Sample Network Configuration

The network "pattern" shown in Figure 6-2, is a very good starting point for detailed network planning. This pattern represents a typical enterprise network with an Intranet for internal use, an Extranet for business partners, multiple wired/wireless LANs connected to the Intranet backbone and a Public Internet connection for the customers. This pattern has been customized and expanded for Fran's City and can be further specialized if needed.

7. Stage 5: Administrative Issues (Security, Governance and Project Management)

Modern enterprises heavily rely on IT to deliver automated services in an agile manner for its customers, suppliers, and employees. In particular, there is an increased use of wireless networks such as 802.11, Bluetooth, cellular networks, satellite networks, wireless local loops (WiMax) and wireless sensor networks. The main management task is to properly secure and administer the corporate assets and technology components.

For security, new technologies such as wireless need special attention. Wireless components have known weaknesses that have been covered widely in the literature. While progress is being made in individual components, more attention needs to be paid to developing comprehensive security planning approaches that maintain overall system security despite weaknesses in individual components of the system. A large number of security tools are commercially available that analyze the security of a system *after* it has been implemented. However, these tools do not help in security planning because planning requires analyzing and determining security *before* implementing a system. Security planning consists of the following steps:

- Modeling of a system. The models may represent different scenarios and situations for contingency planning and what-if analysis.
- Determination of system weaknesses. Although many techniques exist, attack trees is one of the most effective techniques for detecting weaknesses.
- Determination of countermeasures. The recent work in security patterns can be of significant help in this area.

In addition to security planning, several administrative decisions need to be made. These decisions are concerned with project planning, policies, procedures and governance issues. A large number of governance standards (e.g., CMM, CobIT, ITIL, SPICE, ISO2000, and SOX) are currently being used by modern enterprises. However, it is best to start with the PMI (Project Management Institute) guidelines and best practices as a basis for project management and governance. PMI uses the Project Management Book of Knowledge (PMBOK) as best practices that specify the following main PMBOK activities shown in Figure 7-1:

- Initiation
- Planning
- Execution
- Monitoring and Control
- Closing

These activities are also known as Project Life Cycle. The **Project Life Cycle** refers to a logical sequence of activities to accomplish the project's goals or objectives. All projects go through a series of phases – independent of size and complexity. In the Initiation phase, the outputs and critical success factors are defined. This is followed by a Planning phase, characterized by decomposing the project into smaller tasks, and an Execution phase, in which the project plan is executed. The Monitoring and Control phase ensures that the project activities are properly executed and controlled, and is followed by the Closing phase that marks the completion of the project. Project activities are typically grouped into these phases so that the project manager and the core team can efficiently plan and organize resources for each activity, and also objectively measure achievement of goals.

Figure 7-1; The Project Management Book of Knowledge (PMBOK)

8. Stage 6: Integrated Architecture Planning

The main objective of integrated architecture planning is to assure that all pieces fit together to form a working solution within the performance, security, and cost constraints. To illustrate the main issues addressed, let us consider the following situation for Fran's city. To improve services, the city needs a very flexible online user registration and purchasing application that is based on service oriented architecture (SOA)[5]. The pattern shown in Figure 8-1 provides a good starting point. This pattern assumes that the application consists of N large grained components that are arranged in several tiers: front-end integration, business logic, backend integration, back-end apps, and external (B2B) apps. This architecture pattern also includes the following integration components:

- BCs (Business Components) are the software modules that imbed the business logic of the application and provide business services.
- FICs (Front-end Integration Components) are the adapters that allow different types of user devices (e.g., mobile, handheld) to invoke the BCs.
- BICs (Back-end Integration Components) are the adapters that BCs use to interact with different back-end and external applications.

Determination of these integration components depends on several other factors such as hosting options and integration strategies used for internal and external (B2B) applications. Detailed discussion of these topics is beyond the scope of this tutorial. See [20] for more details.

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[5] Service-oriented architectures (SOAs) rely on services and the components that provide the services as the fundamental elements for developing applications. The main idea of service oriented architectures is that the applications should be thought of in terms of the services they provide and the individual components that actually deliver the services. The services can be combined into aggregate services and similar components can be combined into applications. Thus a bank, for example, provides a set of services (e.g., deposits, withdrawals, fund transfers) and these services are provided through components that can be combined into banking applications.
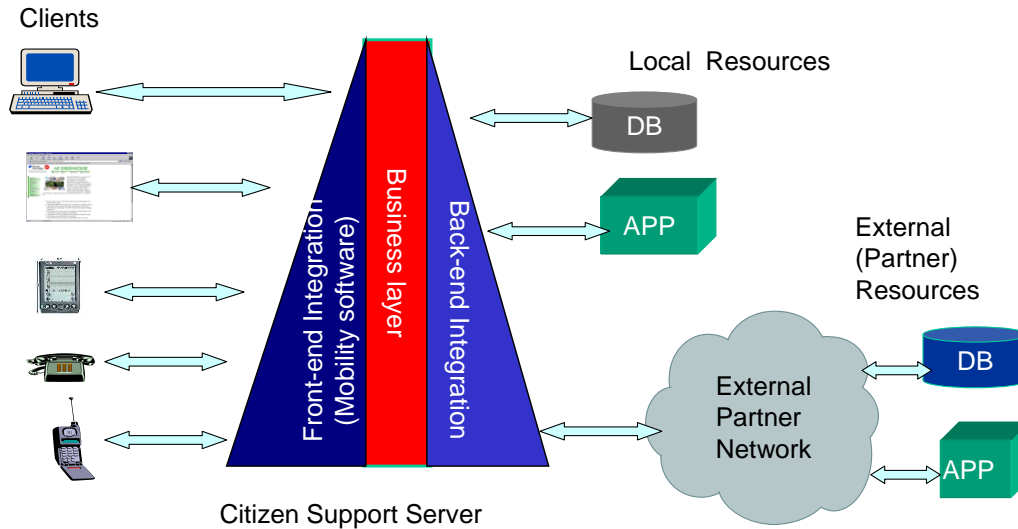
Figure 8-1: SOA-based Architecture Pattern

9. Concluding Comments and Next Steps

Strategic planning of ICT-based systems (i.e., eServices) is a crucial but challenging task for the public as well as private sector. The objective of strategic planning is to identify the key opportunities and the issues before initiating a project. To succeed, the strategic planning process must explore a large number of people, process and technology issues and eliminate surprises. This short tutorial has given a quick overview of the vast body of knowledge that entails a typical strategic planning process. The objective is to emphasize the key concepts without technical details. The following steps are suggested for further studies:

- Please work through the exercise suggested in the next section
- Use the methodology suggested in this tutorial on a few other examples in your environment
- Try to find some computer aided planning tools to help you develop the plans quickly
- Get more detailed views from sources listed in Exhibit 2

10. Suggested Exercise: Develop an IT Plan of Your Choice

This exercise will help you develop a sketch of your own plan by using the methodology presented above. Your tasks are:

- Please select an eservice problem of interest to you. It may be an eservice in healthcare, transportation, public safety or any other area that you are interested in.
- Develop a sketch of a plan for this eservice by using the methodology presented in this tutorial.
- Surf the Internet to find a computer aided planning tool that can help you to develop this plan quickly.
- Use the SPACE planning tool to develop this plan. The materials on the SPACE site will get you started. Then compare/contrast results from your own sketch and the other planning tools with the outputs produced by SPACE.

Additional Information

Note: many of these references are old but are considered "classics"

[1]   Blokdijk, A. and Blokdijk, P., "Planning and Design of Information Systems", Academic Press, 1987.
[2]   Boar, B., "The Art of Strategic Planning for Information Technology", Second Edition, John Wiley, 2001.

[3]   Bradford, R., "Simplified Strategic Planning: The No-Nonsense Guide for Busy People Who Want Results Fast", Chandler House Press, 2001

[4]   Davydov, M., "Corporate Portals and e-business Integration", McGraw-Hill Professional Publishing; 2001.

[5]   Henderson, J. and Venkatraman, "Strategic Alignment: Leveraging Information Technology for Transforming Organizations", IBM Systems Journal, Vol. 32, No. 1, 1993, pp. 4-16.

[6]   IBM Corporation, "Business Systems Planning", GE20-0527.

[7]   Kalakota, R. and Robinson, M., "e-Business 2.0: Roadmaap for Success", Addison Wesley, 2000.

[8]   Laudon, K and Laudon, J., "Management Information Systems, Managing the Digital Firm", Prentice-Hall, (latest edition)

[9]   Lederer, A., and Prasad, J., "Nine Management Guidelines for Better Cost Estimation", Comm. of ACM, Feb. 1992, pp. 34-49.

[10] Lim, W., "Cost-Benefit Analysis of component-Software", eAI Magazine, April 16, 2003

[11] Linthicum, D., "Distributed Objects Get New Plumbing", Internet Systems, January 1997, pp. 4-5.

[12] Luftman, J., "Competing in the Information Age: Strategic Alignment in Practice", Oxford University Press, 1996.

[13] McNurlin, B., and Sprague, H., "Information Systems Management in Practice", Prentice Hall, Fifth Edition, 2002.

[14] Nolan, R., "Managing the Computer Resource: A Stage Hypothesis",Communications of the ACM, Vol. 16, No. 7, pp. 399-405, July 1973.

[15] Porter, M., "Competitive Strategy", New York Free Press, 1980

[16] Porter, M., "Competitive Advantage", New York Free Press, 1985

[17] Sneed, H., "Planning the Re-engineering of Legacy Systems", IEEE Software, January 1995, pp. 24-34.

[18] Turban, E., et al, "Electronic Commerce: A Managerial Perspective", Prentice-Hall, 2000.

[19] Umar, A., "Strategic Planning of ICT in the Digital Age", NGE Solutions, target: December, 2014

[20] Umar, A., "Enterprise Architecture and Integration Using SOA", NGE Solutions, 2010

[21] Umar, A., and Zordan, A., "Enterprise Ontologies for Planning and Integration of eBusiness*", IEEE Transactions on Engineering Management*, May 2009, Vol. 56, No. 2, pp. 352-371.

[22] Umar, A. and Zordan, A., "Integration Versus Migration Issues in Service-Oriented Architectures", *Journal of Systems and Software*, Vol. 82, pp: 448-462 , Feb. 2009

[23] Ward, J., and Griffiths, P., "Strategic Planning for Information Systems", Wiley Information Systems Series, 1996.