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Service oriented architecture for government information system
the Electronic Recruitment Organization System (EROS), PSC, Uganda

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Service Oriented Architecture for Government Information System: The Electronic Recruitment Organization System (EROS), PSC, Uganda

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Abstract

In this thesis, we designed and implemented a prototype of a system called EROS. EROS aims to address the current Recruitment and Selection problems of the Public Service Commission (PSC) of the Republic of Uganda. The problems include high cost of recruitment, long throughput time and lack of transparency in recruitment. We used SOA and Grexx’s method for Business and IT Architecture as a basis for the design. Grexx is Business & IT consulting company in the Netherlands. We identified the actors and the domain owner of the system; discussed the problems of the current recruitment and selection system in ambition workshop. We then defined a new domain to address the problems; and chose relevant context for the domain. We went onto describe processes in the new domain on the Grexx Engine. Finally, we built a prototype or demo of the system. This prototype demonstrates how PSC could eventually organize, manage and bring suitable reforms into the current and somewhat chaotic recruitment and selection process. Generally speaking, Grexx’s method for business and IT architecture is easy to learn and apply in projects as we have successfully applied it in this one.
Chapter 1

1 Introduction

1.1 Background

Many Governments across the world have set up web portals or gateways for disseminating government information and delivering service to the citizens and these portals have become an icon of a growing electronic governance model and service delivery. One such service delivered via web portals is employment or job information. An example of such is the US federal government official job site, USAJobs hosted at: http://www.usajobs.opm.gov/).

In Uganda, the government department responsible for recruitment and selection of suitable candidates to be offered jobs in the civil service is the Public Service Commission and currently it is facing problems of high turn up of applicants for the few available jobs. The trouble is, each time job adverts are published, the department literally gets swamped with applications and processing of these applications takes a long period of time. Consequently, job seekers must endure an agonizing long and most of the times fruitless wait. Similarly, employers such as ministries must take a long time before vacant positions can be filled.

The assignment was therefore to streamline some of the issues raised above. Hence, we designed an “Electronic Recruitment Organization System (EROS)” for Public Service Commission (PSC) in Uganda. We used Service Oriented Architecture (SOA) and Grexx’s method for Business and IT Architecture. Grexx is a Business & IT consulting company in the Netherlands. But to understand this project better, it is imperative we first define some key and perhaps unfamiliar phrases in the topic:

(1) Service Oriented Architecture,

(2) Public Service Commission and

(3) Electronic Recruitment Organization System (EROS).

**Service-Oriented Architecture** (SOA) is software architectural concept that defines the use of services to support the requirements of software users. SOA was first proposed by two Gartner analysts, Roy W. Schulte and Yefim V. Natis. They defined SOA as "a style of multitier computing that helps organizations share logic and data among multiple applications and usage modes." SOA is usually based on Web services standards (e.g., using SOAP or REST) that have gained broad industry acceptance. These standards (also referred to as Web service specifications) also provide greater interoperability and some protection from lock-in to proprietary vendor software. However, one can implement SOA using any service-based technology.

Therefore to understand SOA well, we must first define what a service is and discuss the extent of its application beyond the bounds of IT architecture. And a service is defined as “a contractually defined behavior that can be implemented and provided by a component for use by another component.”
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The fact is SOA was originally developed for IT architecture. However, the principles of SOA can and are now being applied elsewhere for example to business organization (network organization) and economies (market economy). We elaborate more on this in chapter 2.

Therefore basically in SOA, we are building systems that comprise components also known as domains as in the business architecture (see section 4.1.3); and each of these domains provides and in turn receives services from one another. The relationship between the domains is binding and governed by contracts and (strict) rules.

Hence from the discussions above, SOA can be summarized as comprising of: loosely coupled service providers, exchanging of service and interoperability. Therefore business enterprises intending to operate with SOA style architecture will need to ensure increased connectivity and interoperability across the enterprise. The advances in IT have made such ambitions within the reach of enterprises, and increasingly, IT is being called upon to support the initiatives.

**Public Service Commission (PSC)** - is government department in Uganda having a mandate to attract, recruit and retain high caliber staff into the public service. Its vision is “to be at the helm of the most competent and well motivated Public Service.”[3] Hence the Public Service Commission (PSC) performs HRM functions for the government of the Republic of Uganda. That means PSC is responsible for appointments, promotions, transfers and termination of appointments, dismissals or carrying out any other disciplinary control over public servants.

Its history dates as far back as 1947 when the Holmes Salaries Revision Commission was set to review the structures and remuneration of the civil servants in East Africa. The 1953/1954 Lidbury Salaries Review Commission report recommended the establishment of the Public Service Commission and on 1st September 1955, the Public Service Commission of Uganda was established.

**Electronic Recruitment Organization System (EROS)** – is an Information System that is to be designed using the concept of SOA as explained above and in Chapter 2; and Grexx methodology which is discussed in Chapter 3 of this report. The ultimate objective of building the system is to institute suitable reforms in the recruitment and selection process in public service in Uganda by promoting transparency and use of IT in business process management. With EROS, it is hoped that more efficiency and flexibility will be achieved in executing recruitment and selection process; PSC will work more closely with supporting services and partners to better satisfy the needs and expectations of applicants, employers (ministries) and employees (public servants), and communities in general.

EROS will therefore be the official, single point of access to government job information in Uganda and a convenient tool for PSC to effectively fulfill its mandate of staff recruitment into the public service of Uganda.

### 1.2 Overview of thesis

In chapter 2, we discuss Service Oriented Architecture in detail. The discussion of SOA is intended to make the reader understand the working of our proposed system because the design and its operation is based on SOA. We discuss the elements of SOA such as service consumer, service provider and service registry or directory. We then analyze how the elements in SOA interact with each other e.g. through publishing or advertising their offerings, finding services, binding, etc.
In Chapter 3, we present Grexx Method for Business and IT Architecture. Our interest is to learn and understand all the steps in the method by heart. We do this for two main reasons:

1. to apply/use it in our project for developing solution to address the model problems.
2. to study the method for its strengths and weaknesses and consequently to make recommendations for improvement.

Each of the seven steps in Grexx methodology will be examined individually and reported about. So in Chapter three we identify these steps, study and try to understand and discuss them.

In Chapter 4, we present and discuss the results which in essence are the deliverables realized by applying the Grexx Method for Business and IT Architecture. These deliverables and most especially the prototype is tipped to be the solution to address the model problems. So at the end of the chapter we document our findings or experiences of using the method. These findings are obtained through six months of practical experience of using the method, literature studies, observation and interviews with prominent users and key proponents of the Grexx method.

Finally in Chapter 5, we draw conclusions and make recommendations. We also present lessons learnt from the assignment. At the end of the report are appendices to provide further insights to certain issues in the document.

1.3 Problem statement (Current situation)

As already noted above, currently, PSC is facing challenges in processing huge numbers of job applications in the face static or dwindling government funding and increasing cost of recruitment process. For example in 2004 alone, the Commission handled 6,058 cases of appointments, promotions and confirmations, 449 disciplinary cases and 143 approvals of study leave. The task of getting the right candidates from a pool of possibly thousands of applicants for the few available jobs is becoming more of a nightmare than an enjoyable routine duty. Because of the soaring numbers, screening the applicants requires more resources and time to support the process. Therefore below we try to give a detailed account of the situation as it currently stands:

- **High cost of recruitment and selection arising from:**
  - High cost of job advertising owing to publishing of adverts in newspapers, Radio/TV, etc. yet newspaper advertising rates in Uganda are high. For example, the leading daily state owned newspaper *The Newvision*, charges about 1,350 EUR for a full page advert and PSC’s job adverts can sometimes span 5-10 pages in a single issue of the paper. Similar adverts are also published in sister or rival papers such as *The Monitor*.
  - High cost of administering aptitude tests arising from costs incurred in hiring of premises for testing, printing of testing materials, payment of allowances for supervisors, invigilators, etc.
  - High cost of printing application materials – e.g. PSC 3 forms. Traditionally, candidates who apply for Public Service jobs in Uganda complete PSC 3 forms and these forms are all in hardcopy and are printed and reproduced at the expense of PSC.

- **Slow, inefficient, manual and error prone recruitment and selection system.**
  - The current recruitment and selection system is basically manual, so manual handling of multiple, repetitive and mundane tasks in the recruitment process takes a lot of time and the process is error prone.
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- Bureaucracy, red tape (excessive regulations), in the recruitment process introduces unnecessary delays which prolong the period of solicitation of the right candidates and filling in of job vacancies.
- Increasing number of applicants coupled with manual system of processing applications results in backlog of work which is a good recipe for delays.
- Sequential execution of business processes introduces delays in the recruitment process as well.
- Delays in finding slots to publish adverts in newspapers are a likely cause of slow recruitment process. In Uganda, 60% of space in newspapers is reserved for news copy hence Newspapers have little space for adverts and therefore dictate the terms to the advertisers. All in all, it could take between 3-6 months to fill vacancy.

- **Lack of transparency in recruitment and selection**
  - Poor feedback and communication mechanism with clients e.g. it is not possible to individually acknowledge receipt of all applications received from candidates.
  - Clients’ inability to individually and independently verify and check progress of their cases is a cause of concern.
  - The fact that candidates take weeks to access their interview results casts a shadow of mistrust in results and puts transparency of the system to question.
  - There is lack of information on PSC recruitment procedures.

- The end result of all the above problems is a growing loss of public confidence, brewing frustration among public servants and job seekers and indifferent employers.

1.4 Objectives

The objectives are to:

1. study and understand Grexx’s method for business and IT architecture;
2. control cost of selection and recruitment;
3. minimize throughput time in processing mundane and repetitive tasks;
4. institute accountability and transparency in selection and recruitment process;

Therefore to design a system to realize the above objectives, we first need to study the theory behind it. Consequently in next two chapters, we discuss the theory and present the method behind our design.
Chapter 2

2 Service Oriented Architecture (SOA)

In business and IT world, SOA has become a household name. However, the irony is not everyone who talks about SOA clearly understands what makes it different from other IT architectures or how its elements interact or work together to more closely link business needs with IT. And to fuel the confusion further, SOA has many dimensions: can be applied in IT and business organization.

This Chapter is dedicated to clearing some of the doubts and discussing SOA in detail. So first we walk you through the four key elements or building blocks of SOA to give you an insight into the concept of SOA. We then discuss some key features of SOA and later on in the chapter we hint on interaction between the elements and we discuss SOA in business organization context. The literature study is therefore intended to help you in evaluating and appreciating how we used SOA principles for designing the Electronic Recruitment and Organization System (EROS).

To start with, we consider a broad definition of SOA and think of it as “a contractual architecture that lets your enterprise offer and consume software as services.”[1] SOA evolved as a consequence of rapidly changing business and IT needs; and because of flexibility that comes with it, it addresses both the difficulties posed by hard coded or tightly coupled systems and the need for constant readiness to change by introduction of loose coupling.

In the traditional client/server Architecture systems for example, the client and the server have static roles i.e. each participant in the architecture has specific roles to play. Either the participant is a client and performs only client’s roles or is a server but not both. Normally a server plays additional roles and is more highly regarded than client. The server also has access to infrastructure services that the client does not. This kind of scenario does not hold in SOA environment. Participants in SOA have more dynamic roles and each is regarded to be equally important for the system’s operation. Therefore SOA is “a peer-to-peer architecture that supports a loosely coupled federation of services connecting consumers with providers.”[1] Hence SOA environment is a “two way traffic” scenario where participants enjoy a kind of symbiotic relationship because at some point, a given service provider may itself become a service consumer and vice versa hence nullifying the principles of client server architecture.

2.1 The building blocks of SOA

Figure 1 below shows the key elements of SOA: the service provider, the service registry, and the service consumer (sometimes known as service requestor). These are all architectural roles in the SOA. There is also the service contract, which is a contract that binds the service consumer with the provider.
2.1.1 *The Service Consumer*

The *service consumer* is a participant that requests or invokes a service through a defined contract by means of a service registry. For example, if a service consumer is in need of a certain service, it searches (also called pull method) through the registry for both the service and its providers. So through appropriate service contracts the service is consumed. And in some cases where the service provider is known to the consumer, may be through a previous transaction, then there is no need to search for services from the directory again. In this case, the consumer may simply contact the provider directly for a service contract.

2.1.2 *The Service Provider*

The *service provider* is a participant that offers services with a defined contract. If a service provider has services to offer, and is looking for consumers, it registers, publishes or advertises the services on the registry so that consumers can find it. In other instances, some service providers maintain their own proprietary service registries which consumers can access directly to see what services are on offer.

2.1.3 *The Service Registry*

The *service registry* also known as *directory services* is a repository for information about services offered by service providers. It also includes information on services being sought by service consumers. New services are published or updated on the registry periodically, and business analysts and software developers can use this registry to easily find and reuse existing services.

Therefore SOA service registry defines standards-based descriptions as well as access and interactions between SOA components. It also provides standard human and automated interfaces to these components. The Universal Description, Discovery and Integration (UDDI) protocol is an example of a service registry.
2.1.4 **The Service Contract**

Finally, the *service contract* is an agreement for offering and consuming service between supplier and consumer represented by software agents within the SOA framework. This contract forms the basis for both the build-time and the run-time agreements between the consumer and the provider of a given software service.

One remarkable difference between SOA contract and other legal contracts such as between people or corporates is SOA contract is based on widely supported industry standards; hence it becomes interoperable across platforms, languages, and transportation protocols. This gives SOA an edge over the other Software Architectures in the sense that services developed on one vendor’s platform can be consumed by another vendor’s product.

An SOA contract comprises packages of assets, which are typically composed of interfaces, conditional elements, and documentation necessary for creating a functional and technical agreement between two parties. Examples of these assets could include business semantics security precautions, and array of potential exception conditions that parties need to adhere to, all describing various aspects of an offered service. Contracts are discussed further in the governance model in section 4.4 of the report.

2.2 **Key features of SOA**

SOA has key features worth noting here.

2.2.1 **Open Standards**

The success of SOA is dependent on the use of open standards and protocols as the services are independent of the platform on which they are executed and also independent of the medium of communication between the service provider and the consumer. This supports the fact that in a market, we have to understand each other; otherwise there will be no transaction.

2.2.2 **Orchestration**

Service Orchestration is mainly about service collaboration within the SOA architecture. Orchestration is an important element of SOA, and particularly important also for our project because it provides smooth business processes which is the tenet of a recruitment and selection process. Industry standard tools such as BPEL can be used for handling orchestration process in the context of SOA.

2.3 **Application of SOA in Business Organizations**

As already noted, SOA was originally a set of concepts described for IT but is now being applied to other systems as well. “The business dimension or application of SOA is an important aspect of SOA that we tend to ignore by hiding SOA in the IT realm.” For example the Grexx method which is applied in this project is based on SOA. Therefore in this section, we discuss the application of SOA in business organizations. We do this by discussing an example and drawing comparison between the classical business organization and network business organizations which essentially refers to those business organizations where SOA principles are used for running businesses.
“A network organization is a collection of autonomous firms or units that behave as a single larger entity, using social mechanisms for coordination and control. The entities that make up a network organization are usually legally independent entities (separate firms) but not always. Some of the entities may be wholly owned subsidiaries. They can even be divisions within the company, but treated as separate companies that sell to outside customers.” The illustration in figure 2 and the discussions that follow show the application of SOA in network business organizations.

Figure 2: Network Business Organization

The example of a network organization we would like to discuss where principles of SOA are being extensively applied is the book industry. In book industry, the participants are author, publisher, bookshop, library and the reader. Each is an autonomous unit of the larger entity (book industry). The author writes manuscripts and gives them to the publisher to publish into books. The publisher pays the author royalties in return. Meanwhile, the publisher can sell the books to libraries or bookshops or even to individual readers and these units in turn pay the publisher. Meanwhile, the author deposits a copy of his book with the library in accordance with the legal deposit act. On the other hand, readers’ taste or reading habits influence what the author writes about. The reader can purchase the authors books from the bookshop or directly from the publisher. Depending on the circumstances, the reader can also visit the library and read the books of a particular author from there. Also, the library can purchase books from the bookshop or directly from the publisher or simply rely on the copy received from the author through legal deposit act. Similarly, the bookshop can sell book to the library or directly to the reader.

So in the example above, we see that almost every participant in the network organization is a service provider and consumer i.e. participants receive and offer services flexibly as prescribed in SOA. Each participant is only interested in the results and it’s not their business to know how and what the supplier uses to deliver the results. They are only interested in the results and
transactions are based on predefined contracts to enforce compliance and conformance to what’s agreed upon.

Therefore having seen the application of SOA in business organization as in the example above, we now go further to draw differences between classical organizations and those organized along the principles of SOA so as to give you a feel of what benefits business organizations that employ SOA reap over others.

<table>
<thead>
<tr>
<th>Classical Business Organization</th>
<th>Network Business Organization (SOA Business Organization)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Economy</strong></td>
<td>Behaves like planned economy – the organization is under comprehensive control and regulation by the technocrats and participants in this type of organization do not have much say in governance or running of affairs than religiously follow stipulated rules – i.e. ‘culture of obedience’ is perpetrated.</td>
</tr>
<tr>
<td><strong>IT</strong></td>
<td>Based on Integrated Architecture, tightly coupled service providers and the total cost of IT is quite high because of lack of service sharing and reusability.</td>
</tr>
<tr>
<td><strong>Business</strong></td>
<td>Operates hierarchic bureaucracy with overlapping functionality within subgroups.</td>
</tr>
<tr>
<td><strong>Process</strong></td>
<td>There exists a coordination hierarchy and this impacts seriously on decision making processes. Processes are therefore rigid such as in classical workflows and are controlled by technocrats. The system is lean and efficient.</td>
</tr>
</tbody>
</table>

From the analysis above, it becomes apparent that though the term SOA was first applied in IT, business organizations have applied the same principles for sometime already.

Now having gained insight into SOA, we can now move onto discuss the Grexx Method for Business and IT Architecture in the next chapter.
Chapter 3

3 Grexx Method for Business and IT Architecture

In chapter 3, we report on Grexx Method for business and IT Architecture. As an important tool for the project, a good understanding of the method was of paramount importance because it was the method that was used for developing EROS. The chapter therefore is based on facts documented in [6] and [12].

But before we can actually start discussing the method, it is important to first observe the extent of its application in the Netherlands. Available information shows the Business Architecture part of the method has been successfully applied in several projects with various Dutch companies and was selected as ING Group Best Practice in 2001 and adopted by ABN AMRO as corporate methodology (CUBA) [5].

Therefore for the more curious reader and indeed for our own benefit of understanding the method, and subsequently using it to develop EROS, below we reproduce and discuss its seven steps as defined in [6]:

1. Conclusion: we need to organize a new domain
2. Definition of the new domain
3. Choice of a relevant context for the domain
4. Agreements with the parties in the context
5. Describe process in the new domain
6. Support human interfaces through the Internet
7. Development/Optimization

Figure 3: Workbench for Domain Realization. [9]

3.1 Conclusion: We need to organize a new domain

Method:
The first step is for Grexx to try to shade light or give the leeway to actors who have a mutual feeling: “we need to organize a new domain.” An actor is actually an individual or group of individuals who take initiative for a project. It could also be a person representing a group of
other persons, with the ultimate consent and objective of “the need to organize a new domain.” And these people identify with or hold positions of responsibility in the enterprise or organization in question. They are also people we could easily refer to as business owners. The actors identify problems, sometimes hold internal discussions, and then take initiative or responsibility to let solution providers such as Grexx to know that there exist problems and these need to be addressed.

Grexx’s discussions with actors center on the problems to be solved using the new domain. In other words, the discussions aim at identifying those problems that may be addressed by the new domain. It also looks at the alternative solutions that were sought before and reasons why the solutions were not considered or did not sufficiently address the problems. The discussions also look into the ways the business owner has instituted for performance measurement in the new domain.

This step then goes further to identify a key person or someone with authority from the customer’s side to act as the Domain Owner. The Domain Owner is someone in position of authority and has the right credentials to take full charge of the new domain.

Deliverables:
Therefore the deliverables from the first step include: archiving of decisions and arguments; finding the actors or initiators and the domain owner; getting concrete ideas on problems to be addressed by the new domain and domain owner’s demonstration of how performance of the new domain will be measured.

3.2 Definition of New Domain

Method:
The second step is to define the new domain. This involves defining the mission and ambition of the domain. From customer’s perspective the aim is to try to look at why the domain exists. Grexx together with the actors or initiators try to analyze the various services the new domain can potentially or possibly offer. For extensive and creative analyses, Grexx offers special Ambition Workshops.

The Ambition Workshop is a meeting between actors and Grexx consultants. The workshops comprise of at most 10 participants. In these sessions, the consultants take on two important roles: the moderator and Secretary. The moderator chairs and guides the session into discussing the current situation and then presenting the “wild dreams” of what the participants want the system to do for them, something the consultants call “the castle in the sky.” i.e. “what the business / the team or customer for that matter would like to achieve if there were no barriers.”

The Secretary’s role is to meticulously take minutes of virtually everything discussed in the meeting and these discussions and subsequently the minutes are compiled into ambition report.

The purpose of the Ambition Workshop and the report is for the team to create a shared dream. And it is for this reason that we consider “outside-in-thinking” method.

- to brainstorm over the current system with a view identifying the problems;
- to present “the castle in the sky.” i.e. context and relevant markets
- to present the customer’s “wild dreams” - what they want the new or improved system to do for them and then select first plateau for realization.
To create change we basically need two things:
1. a perspective: where do we want to go?
2. a plan: how do we get there?

In the fast moving world we are now living in it makes no sense to design a very detailed perspective and spend a lot of time creating an exact and complete plan that shows how we will reach the long term target within specified time and budget constraints. The opposite does not work either. Having no objective and no plan, just responding opportunistically to whatever happens, will result in a reactive organization focusing only on survival.

EROS uses the Castle in the Sky methodology as an (very serious) attempt at providing a workable and inspiring alternative. The two needs are translated in:

1. The perspective is The Castle in the Sky. It is what the business / the team would like to achieve if there were no barriers. The exercise serves to stir up creativity, analyze the potential impact of the ambition, and commit people to a shared dream.
2. The plan is subdivided in plateaus. A plateau represents a coherent set of objectives, getting the business somewhere. Energy, discussion and analysis should focus on the first plateau. The plateau must be well founded in a business case, so there is a clear benefit in realizing it.

After realizing the first plateau there is need for evaluation, see figure 3.

The first plateau is a proposition of the domain to the customer. Propositions refer to services, products, etc. the domain can immediately deliver to the customer when implemented. We thus try to separate what is achievable immediately and in the future. The first plateau therefore narrows down the focus from the ‘wild dreams’ to present only the functionality of the domain to address the initiators’ basic problems i.e. those issues that can be addressed with the available resources. It then goes further to define the set of underlying business processes of the domain i.e. the process through which the domain realizes its value propositions to its clients.

One important aspect of step two is the Proposition Architecture where we try to establish if the first plateau propositions can be componentized i.e. be broken down into main functional units. The Proposition Architecture also forms the basis of contracting components to other domains or outside sources.

**Deliverables:**
A key deliverable of step two is a well documented ambition report. The report gives concrete definition of the mission and ambitions of the new domain, inventory of the broader context and detailed description of the first plateau to be realized.
3.3 Choice of the relevant context for the domain

Method:
In this step, the actor is the domain owner, and the step focuses on creating a top model that shows all the parties that you need in order to basically realize the mission. The step outlines and discusses all the clients whether internal or external of the domain to whom the proposition is delivered. It goes further to discuss the suppliers of the proposition components and resources including other domains within the organization and external suppliers with links to the domain.

One important issue is to try to selectively identify only those parties with whom the domain will interact directly, ignoring others where there may be no direct interaction.

Deliverable:
The end result of this step is the Orchestra. The Orchestra shows the parties are identified with the domain and all the possible interactions between the parties and the proposition architecture is defined and clearly described as well. Ideally after this stage, we’d have a model that provides a larger scope, encompassing the domain and all parties and their associated interactions.

3.4 Agreements with the parties in the context

Method:
This step is concerned with definition of terms, responsibilities and obligations of the parties and the domain pertaining to the established relationship and contribution to each other’s objectives and exchange between partners. It is also concerned with input/output specifications and contract as elaborated in the following paragraphs:

Definitions - In defining and managing the relationships, the domain and the parties enter into agreement whose terms must leave no party aggrieved i.e. the aim of the agreement should be to achieve a win-win situation for all the parties, otherwise if one party feels cheated, the relationship could be badly strained. As a way of managing the relationship, attention is paid to discussing the things to be achieved in the relationship. Because the relationship will likely face challenges from changes in demand, supply or interface, then these changes may threaten to derail it. Hence in managing the relationships, we also need to see in advance how we can address the in-roads brought in by changes in demand, supply or interface. One method for example is to have a clearly defined escalation procedure for conflict resolution.

In this step, Grexx also ensures that the customer is aware of and accepts to take on his roles, responsibilities and obligations in the process. Some of customer roles may include for example placing orders, receiving propositions from the domain, making payment for propositions, etc.

There is also the issue of agreement between suppliers to the domain. At this point the focus is on which suppliers are responsible for supplying which components and this is also where terms are discussed with suppliers for new parts for example.

Input output specifications - The principle used in specifying inputs and outputs is that the supplier supplies all that is needed by the domain for the delivery of the propositions and it is up to the domain to do its tasks and fulfill its obligations including delivery of propositions such as information, and other things needed by the supplier or the customer to continue their processes.
**Chapter Three: Grexx’s Method for Business and IT Architecture**

**Contract** - Contract involves writing of formal agreement between the domain and the parties and may be in four main areas: **subcontracting agreement, data exchange agreement, service levels and contingency plans.**

Subcontracting involves assigning part of an existing contract to a different party. It is carefully done in order to ascertain which component is to be delivered by the party that has been subcontracted. Subcontracting agreement thus involves selecting a subcontractor and establishing commitments with the subcontractor, and tracking and reviewing the subcontractor's performance and results with respect to speed and quality of delivery. These practices involve also management of conditions such as payments for the service and as well as monitoring.

The Service level contract defines the basis of understanding between the domain and suppliers on the one hand and the domain and the customers on the other hand. The agreement should contain clauses that define a specified level or quality of service, options for support, and incentives awards for service levels exceeded and/or penalty provisions for services not provided.

Data Exchange agreement is an important aspect of contract between the domain and the clients. Some of the important issues to be agreed upon pertain to data exchange format (such as .doc, .PDF, etc.) and the medium to be used for data exchange, etc.

Contingency planning supports services provided by the domain such that the domain is able to operate effectively without excessive interruption in cases of problems. This requirement is supported by establishing thorough plans, procedures, and technical measures that can enable the domain to recover quickly and effectively following a service disruption or disaster. Interim measures may include mechanisms for data back up, escalation procedures, alternative supply sources, etc. The main reason for this contract is to ensure business continuity in case of a major disaster.

**Deliverables:**
There are three important deliverables of this step: definitions, specifications and contract. This step leads to realization of a legally-enforceable promise or set of promises made between the domain and the parties to buy or sell specified propositions, detailing the amount and grade, value or quantity of the proposition and terms of payment as well.

### 3.5 Describe processes in the new domain

**Method:**
In step five, the focus is on describing the business processes for the new domain. Business process is a collection of related structural activities such as sending and receiving of messages to produce an output to the domain, and the parties. Grexx does this using appropriate tools such as BPEL, which only has capacity to “instruct execution but not execute execution.” This is the process through which the domain realizes its services to its customers or it is a means of Orchestration of the execution of the proposition. The principle is to separate Orchestration from Execution.

A business process can be part of a larger, encompassing process and can include other business processes that have to be included in its method. However, business process can be viewed at various levels of granularity. For example Grexx presupposes that every domain orchestrates one level of sourcing and the domain has got nothing to do whatsoever with sub sourcing and this is assumed to be the responsibility of the sub-contractor. However, if the domain wishes to have influence in the choice of sub contractors, it has to set some rules in the contract to suggest so. In certain circumstances, it may warrant creation of sub domains if
part of orchestration takes place at a later stage because the sub component is now managed separately. However, the domain and the sub domains may still have the same owner.

The underlying principle behind process description in the new domain is to ensure internal cohesion among the domains, external relevance, monitoring and control. Processes promote the mission and ambitions of the domains and principles to facilitate internal communication and promote internal cohesion. To promote external relevance, every domain must ensure that it delivers services as per contract i.e. as defined in the orchestration. It is also incumbent upon the domains to ensure that the existing relationships work very well.

Deliverables:
The end results of the step are executable orchestration processes and defined web services. Thus the flow of the processes inside and between domains is described using a suitable business language. These flows use business logic for example to determine what and who should participate in an event and this is the ultimate thing to do for this step.

Web services defined in this step presuppose the various components of the architecture are versioned, replaced or augmented. Thus, web services are packaged into ‘profiles’ that act as a pre-configured solution. The bottom line is that web services are used to enable internal applications of the domain to connect and communicate more easily and that a means is provided to connect with the partners of the domain.

3.6 Support Human Interfaces through the Internet

Method:
The main deliverable of this step is to develop very good human user interface to the domain and to improve the user’s experience in using the domain by making interfaces linking the domain to suppliers and customers more consistent, easily learnable, and intuitive. The most important aim of this step is to create a consistent experience across the domain. This means same visual design is applied to create consistent access to and behaviors of common elements of the interface. The interfaces may therefore range from simple ones such as buttons and icons to more complicated ones like dialog boxes.

Networks such as Extranet and Internet form part of one application and are used to facilitate access through the portal to the domain. Extranet is designed to privately and securely share the domain’s propositions, information or operations with customers, partners, suppliers, and vendors or other businesses. Meanwhile Intranet is used by employees of the domain.

The design provides for offering of propositions to parties by the way of groups. Groups are an essential object of maintaining relationship between the domain and the parties because they help the domain in managing user access rights to some resources such that for every proposition, all relevant parties who are a member of a group have access. The issue also simplifies administration of the domain by letting the administrator assign permissions once to the group instead of multiple times to each individual party of the domain.

Deliverable:
The end result is a well designed user interface facilitating total realization of the first plateau.

3.7 Development/optimization

In this step, Grexx’s philosophy for software development emphases on first providing a simple and very basic solution to realize the first plateau.

During optimization, several things are done, not only to optimize the system, but to:
(1) check the quantitative aspects of the solution for example adding more services, more customers, more suppliers etc.)

(2) consider the qualitative aspects of the process orchestration (changing the order of steps using new insights, changing action repertoires in automated flows (action plans) etc.

(3) consider the interfacing to automated services by sending the XML requests to an application instead of to an inbox of a person. This optimization is an endless process of change and improvement.

Optimization of the domain involves examining the domain for aspects of its business, interactions with the parties, and attempts to improve efficiency of the underlying processes. Optimization of the processes falls in two broad categories – Monitoring processes and removal of bottlenecks.

Monitoring encompasses tracking of individual processes so that information on their state can be easily seen and it is also to provide statistics on the performance of one or more processes. An example of tracking is determining the state of a customer order (e.g. order arrived, awaiting delivery, invoice paid) so that problems in its operation can be identified and corrected. In addition, this information can be used to work with customers and suppliers to improve their connected processes. Examples of the statistics are: generation of measures on how quickly a customer order is processed, how many orders were processed in the last month etc. These measures tend to fit into three categories: cycle time, defect rate and productivity.

Deliverable:
Methods and tools employed in Development and Optimization leave more power in the hands of the domain owner, and if he does his work well, it will be (in realization) faster cheaper etc. but the method in itself is only a tool. A tool in the hands of a fool will not lead to good results..... The result compared with traditional automation or organization lies more in shortening time from idea to operations, realizing evolutionary development, empowerment of business management and continuous improvement without ‘big bangs’ of change and without large convergence. Also constant monitoring and logging of processes. (e.g. for SOX compliancy).
Figure 5: The playing field of the new domain [4]
Chapter 4

4 Results and Discussions

In Chapter 4, we present and discuss the results. These results in essence are the deliverables we realized by applying Grexx Method for Business and IT Architecture in the project. And these deliverables are tipped to address the problems presented in chapter 1. At the end of the chapter, we discuss our experiences of using the method.

4.1 Ambition report

We used ambition workshop to present our “wild dreams” and to identify various actors and the domain owner for the project. We indentified the Under Secretary, Commissioner Selection Systems Department, etc. as some of the actors; and the Secretary, PSC as the domain owner. In the same ambition workshop, we also defined the current problems of recruitment and selection as outlined and discussed in section 1.3 of this report. We carefully examined the current recruitment process and modeled the processes in the recruitment process maps in Appendix 2. We defined a new domain as in section 4.3.1; ensuring that our missions and ambitions were clearly stated; chose a relevant context for the domain. Details of these are explicated below:

4.1.1 Summary of the ambitions

Our main ambition was to use Grexx Method for Business and IT Architecture to realise EROS for addressing recruitment and selection problems of PSC. EROS enables PSC to link its internal and external processes more efficiently and flexibly; enables PSC to work more closely with supporting services and partners to better satisfy the needs and expectations of applicants, employees (public servants), and communities in general. To realize EROS, we aim to redesign the business process and to automate most of the steps in the current Recruitment and Selection process of PSC from job requisition, to advertisement, to application handling, selection and all the way to appointment so that at the end of it all, EROS becomes the central theme and the most dominant tool for selection and recruitment at PSC. Therefore, our specific ambitions are to:

1. Develop electronically downloadable or on-line application/job requisition forms;
2. Permit Ministries to securely publish their offerings, search through the available pool of applicants and be able to place job requisition to PSC on-line;
3. Lower advertising costs and increase reach by using EROS for advertising and service offerings;
4. Permit users to securely publish their profiles, search for available jobs and conveniently apply for jobs on-line;
5. Institute a clear and honest recruitment process through giving instant feedback and allowing users to independently check the status of cases and to be kept up to date by the hour;
6. Promote use of a cheaper, faster and better communication via EROS;
7. Institute a mechanism for on-line self-assessment so that the number of applicants PSC physically handles are brought to manageable levels;

8. Make it possible for PSC to select applicants from the available pool of user profiles, match them to a given job vacancy, generate a shortlist, administer interviews and appoint suitable candidates.

4.1.2 The Castle in the Sky

4.1.2.1 Mission

The mission of EROS:

EROS exists to:

- make sure that public service of Uganda gets competent staff and hence to attract, recruit and retain high caliber staff;
- Ensure efficiency and effectiveness in recruitment process thus minimize the cost of recruitment and provide government with the right employees, in right numbers, placed in the right jobs at the right time;
- Facilitate worldwide recruitment and cheapen the process of job application;
- Improve transparency, fairness in public servants recruitment process;
- Handle large numbers of applicants.

4.1.2.2 Context / relevant markets

In the context picture in figure 6 below, we analyse possible service providers and consumers of EROS. Whereas it is practically not possible to give an exhaustive list of all the entities because the list will continue to grow as more stakeholders come aboard, here we present some few of the participants if the system were implemented today.

The picture indicates that EROS is at the centre of our initiative to bring together PSC and all its service providers and consumers so as to amicably dispense and consume services. The premise is that PSC develops EROS and all its service providers and consumers will provide and seek services from PSC using EROS as the platform.
4.1.3 Business Architecture

Business Architecture helps enterprises to formally engineer solutions that directly link to the desired results defined by the enterprise strategy. Below we discuss the Business Architecture of the PSC business enterprise.

The Architecture illustrates the concept of operations (the business objective), describes the context in which the objective is met (what is provided, how it is provided, to whom it is provided, and from what business locations); and illustrates the concept and context within a high-level business model. Domains are the pillars of a business architecture and therefore below we discuss each of the domains that constitute the EROS Business Architecture. The discussion focuses on the mission and responsibility, interactions (at least of the main processes) and the main competencies of each of the domains. Web technology is the preferred technology to support the interaction because of its wide availability and open standards.

4.1.3.1 Domain Description

A business domain is a component of an organization that you want to govern coherently because of its specific positioning and or competence. It acts as an autonomous unit with its own business objectives and interacts with other business domains to realize that objective. We identified three prominent domains for EROS Business Architecture: Job Market, Case Management and Testing Centre. Each of these domains has its core competencies, missions and responsibilities and they are all interrelated and enjoy symbiotic relationship by offering and receiving services from each other as described in theory of SOA.
Below we discuss each of the domains in detail.

4.1.3.2 Job Market

The job market also known as the EROS portal is one of the most central domains in the PSC Business Architecture. It is the main interface and channel for communication between PSC and clients. Its core competence is organizing and exploiting a virtual job market and its market is the Ugandan labour market.

The interactions of the Job Market with the other domains is illustrated in the diagram in figure 6. However, below we also try to make remarks on the quality requirements of the system or a few issues that may not have been explicitly presented in the diagram:

- Publishing of offerings on the portal is for the moment a preserve of the government and will become available to other employers at a later time.
- The applicant ‘owns’ the data he/she publishes on the portal and therefore assumes responsibility for correctness of the content.
- The profiles are visible to the applicant himself, case management officials, and officials of the Ministry and head hunters with delegated “read only” permissions from the applicant. Passwords and user IDs are used to control access and enforce information security.
- Though in the initial phases there will be almost no revenues, eventually fixed price model market-making mechanisms may apply when we begin to sell services to clients of the portal possibly through pre negotiated contracts, segment pricing through rebates, etc.
- Agreements: at a later stage, clients such as head hunters, companies, etc will enter into agreement with PSC and sign electronic contracts to publish vacancies on the portal.
4.1.3.3 Case Management

The core competence of Case Management is the management of recruitment process and its market is the ministries. Its ambition is to reduce the the throughput time (i.e. time from when a case is lodged in the Acceptance centre to the time a vacancy is filled) to 5 weeks only (see figure 8). This is a major improvement compared to 3 months as is the case now. The improvement is due to automation, publishing adverts on EROS portal, executing tasks in parallel, eliminating some redundant tasks in the business process, etc.

Case Management focuses on division, coordination, and control of tasks and the flow of information within the recruitment process. It is responsible for scrutinizing job descriptions and for ensuring that standards are adhered to; and that each domain performs its tasks diligently and delivers to the required standards, on schedule and according to plan. Case Manager who in our case is the Secretary, PSC assumes responsibility of the business owner and therefore performs a coordinating role over all the business processes from the time a case is lodged into the system up to when the vacancy is filled.
Figure 8: Case Management Domain

4.1.3.4 The Orchestration process

The Orchestration process in figure 8 shows how Case Management handles a case through the various stages of the recruitment process i.e. from the time a case is received, checked, published, up to the time testing takes place and when appointments are made. The model provides that two different tests are taken: (1) the first test is taken on-line and (2) the second and final interview is taken orally and the applicant attends it in person. This check together with checking of applicants criminal records with the police is intended to respectively minimize fraud and employment of criminals in public service.

Our design does not require PSC to have several specialized boards to handle cases arriving from ministries because having many specialized boards promotes inefficiency and is a huge financial burden to PSC. So essentially the Case Management and Testing Centre takes on the roles of those 5 or so boards that are currently in place.

As opposed to the current system, the model provides that when jobs are published on the portal, applicants respond directly to the adverts without having to first seek for application materials from PSC before applying. This cuts down on the throughput time and also, only a few successful applicants are sent to the Testing Centre for oral testing. This new approach also reduces the burden of dealing with huge numbers of applicants.
Figure 9: Case Management Orchestration Process

In the interest of promoting transparency in the recruitment process, Case Management is obliged to give periodic progress reports to ministries and applicants by posting information on their personalized sections on the job market. The postings respectively give information on job requisitions and status of applications. A sample progress report posting in the Ministry of Finance personalized section of the portal would be like in Table 1. The phases ABCDE represent the steps of execution of a case. The code F100 in the vacancy ID column for example stands for Database Administrator position in the Ministry of Finance.

Table 1: Candidate Search Progress Report

<table>
<thead>
<tr>
<th>Vacancy ID</th>
<th>Date</th>
<th>Name</th>
<th>PHASES</th>
<th>Officer in charge</th>
<th>PHASES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F100</td>
<td>10th May, 2006</td>
<td>Database administrator</td>
<td>Mary</td>
<td>Θ Θ Θ β</td>
<td>17/06/06</td>
</tr>
<tr>
<td>F101</td>
<td>09 May, 2006</td>
<td>Personnel Officer</td>
<td>Peter</td>
<td>Θ Θ β</td>
<td>16/06/06</td>
</tr>
<tr>
<td>F102</td>
<td>02 March, 2006</td>
<td>Senior Accountant</td>
<td>John</td>
<td>Θ Θ Θ ■</td>
<td>?</td>
</tr>
<tr>
<td>F103</td>
<td>02 March, 2006</td>
<td>Network Administrator</td>
<td>Mary</td>
<td>∞</td>
<td>?</td>
</tr>
<tr>
<td>F104</td>
<td>13 May, 2006</td>
<td>Secretary</td>
<td>David</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>F105</td>
<td>13 May, 2006</td>
<td>Receptionist</td>
<td>James</td>
<td>R</td>
<td></td>
</tr>
</tbody>
</table>

**KEY**
- EDC* expected Date of Commencement of duty
- Θ successfully executed
- β case currently under consideration
- ■ to be re-advertised because no suitable candidate found
- ∞ vacancy not approved due to lack of funds
- ? date of commencement uncertain
- R case received (acknowledgement)
4.1.3.5 Testing Centre

The core competence of the Testing centre is to administer on-line and oral tests. The centre is responsible for preparing test instruments, communicating with the candidates and Case Management on matters relating to test administration. The Testing Center’s future ambition is to become an autonomous and self-governing entity. This means at a later stage, it could develop capacity to offer testing services to a much broader client base and operate outside the domain of the mainstream public service. Owing to the anticipated independence of this domain, we have opted not to discuss the details of the internal processes of the Testing Centre. However, from the diagram in figure 8, it is clear that 6 days are needed to conduct both on-line and oral tests. But given that testing processes are almost executed simultaneously with the verification of police records, it is assumed that to complete both processes, 2 weeks are requires since it takes up to two weeks to verify police records.

![Testing Centre Domain Diagram](image)

**Figure 10: Testing Centre Domain**

4.1.4 Community processes

Community processes are features of the system we wish to build to support community participation and contribution in decision making in the recruitment process. An example is to involve communities in discussions on topical issues for example the Ugandan labour market.
Chapter Four: Results and Discussions

The job market is the domain tipped to support community processes. It will host a discussion forum on which communities share and exchange ideas. For example, if PSC wanted to make some major reforms and take important administrative decisions concerning recruitment which obviously is of interest to communities, such topical issues would be posted on the forum so as to get reactions from the participants. The reactions would then become input for decision making and eventually, a sense of virtual community will develop around this forum with regular users being professional groups, trade unions, local governments all discussing issues of common interest and governance in general.

4.1.5 Management and supporting processes

Besides focusing on the core business functions of EROS, there is need to also focus on the quality aspects of the system and also need for a concrete management plan to support its operation. In this section therefore we discuss marketing of the portal, information management, helpdesk services, etc.

4.1.5.1 Marketing the portal

PSC will employ all forms of online marketing including advertising the job market on search engine, use of email advert campaigns and online questionnaires as well as advertisement campaigns in the local media. When the system goes live and finally opens upto the world, branding, public relations, account management, etc. will be used to realize and maintain the partner network. In the initial stages, promotion will be organized for advertisers to post adverts free of charge. We could say for example the advertiser pays nothing for the first five adverts.

4.1.5.2 Information Management

Design and implementation of exquisite database and management plus analysis & reporting services is important for information management to support management processes of the job market place. The database holds information on available jobs and the profiles of job seekers. Security mechanism will be instituted to guard against unauthorized access and privacy of information. Users will use access credentials such as user ID and password authentication to gain access to their profiles. Further enforcement of information security will require enlisting services of the platform, IT suppliers, and the ISP to scan e-mails leaving and coming into the PSC system for spam and viruses protection.

4.1.5.3 Helpdesk

A helpdesk will be set up to provide information and assistance to staff and clients; and to help them in troubleshooting problems they encounter in using the system. The helpdesk will comprise a FAQ section possibly published on the web, a toll-free number, website address and/or e-mail address. Eventually, peer help mechanism will be set up on the job market place through which customers can help themselves, make inquiries or contact the systems administration for assistance at all times.

4.1.5.4 Webmaster / cybrarian

A webmaster’s skills are required to organize and ensure real time update of content on the job market, to create and maintain links and to ensure continuous development and evolution of the job market place. They will be responsible for signing, developing, marketing, or maintaining the site and as well as for all aspects of the job market’s presence on the World Wide Web.

4.1.6 Entry strategy

We will use a phased approach to introduce EROS to all the stakeholders. In the first instance, EROS will run alongside the existing manual system. Hence in the first few months, we are not really looking at EROS being a total replacement of the manual system but rather a first step towards automation of the current chaotic recruitment system. However in a space of 90 days, EROS should
be able to stand its ground and replace the current manual system; and at the bear minimum, we should come up with the first plateau of the system that addresses the basic business needs of PSC. In arriving at the first plateau, we looked at the most critical business needs of PSC. And also, what can and cannot be realized in the first plateau is dictated upon by availability of resources and technological opportunities to realize the system functionality.

In in the first plateau, we are also concerned that as soon as possible, advertisers start paying for the services EROS offers so that the initiative can get independence from sponsors and become a profitable business venture as soon as possible. We therefore choose to implement services that bring money early on in the first plateau.

Therefore at the bare minimum:
- applicants and employers (ministries) should be able to register and publish their profiles on the job market.
- All government job vacancies should be published on-line as opposed to newspapers.
- Managing trust:
  - Authentication should be done during the oral interviews.
- Search & Match: basic mechanisms for search and match to be in place.
- Market mechanisms could come later.
- Agreements also come later when we start selling EROS services to private companies and other clients.
- Billing & payment functionality will be implemented as soon as someone has to pay for publishing a vacancy.
- Community processes could be considered later and not at least in the first plateau.
- Orchestration is necessary for recruitment process and will be operational from day one.
- Reporting: some basic reporting will be there from day one (1).
- Facilitating processes such as marketing the portal, information management, Helpdesk services will all be kick started from the first day EROS goes live.

Depending on sponsors, there may be extra requirements for the first plateau but for now, the above system functionalities must be realized at all costs right from the beginning.

### 4.2 Business case

An accomplished writer and columnist in *CIO update* Jeff Monteforte, asserts that “it is with a business case that the various project ideas can be compared in an apples-to-apples fashion.” From Monteforte’s assertion, it becomes clear that business cases are meant to back up decisions of whether or not to build or buy a system or product and when to implement it and whether the project is feasible within the constraints of the available resources.

Basing on the above, this business case therefore provides: (1) the financial justification for investing in EROS and (2) evaluates the project’s idea on other perspectives important to PSC. For example, how does the EROS project align with PSC’s goals or how does it comply with PSC’s defined technical architecture? These are some of the issues we hope to address in this section.
Inevitably, the audience of the business case is the board or senior management of PSC and its purpose is to inform them of the timescales (as in Appendix 1), benefits, and justification of benefits, costs and risks associated with the EROS project. In a way, we are selling the ideas of the project to the top management of PSC.

4.2.1 Benefits

EROS will deliver benefits through improved access to job information, increased coordination of recruitment process, enabling employers to provide better quality service to their prospective employees and ease the hassle of applying for jobs. We discuss the benefits in detail below:

4.2.1.1 Tangible Benefits

Include:
- Controlled cost of selection and recruitment;
- Transparent & technology aided recruitment and selection process;
- Reduced throughput time;
- Appointment of high caliber/skilled public officers because of a wider candidate base;
- Efficient execution of business processes and minimization of work backlog;
- Reduction in the number of staffs and consequently wage bill;
- Increased staff productivity.

4.2.1.2 Intangible Benefits

Include:
- Better working environment and motivated public servants;
- Robust, automated and hassle free candidate screening services;
- Less manual execution of tasks hence errors are minimized;
- Improved Management control and reporting.

4.2.1.3 Potential Benefits

- Being a pioneer virtual job market, EROS has the potential to grow and become the national vacancy database for Uganda.
- EROS may eventually open up to companies and become a source of income for the government of Uganda.
- EROS services could eventually be decentralized in the spirit of taking service to the people in the grassroots and
- The Testing Centre has the potential to become independent and self governing/self sustaining entity and therefore will not only offer services to the government but to the private sector as well for a fee. This way, it may become more efficient, more transparent and more accountable.

4.2.2 Justification

4.2.2.1 Labour market in Uganda

By way of empirical figures and illustrations, we justify the benefits discussed in section 4.2.1 above. But before we zero onto that, it is important to first make some assumptions and present some facts on demographics and the Ugandan labour market in support of arguments for EROS. For the interested reader, detailed employment and demographic facts on Uganda are documented in [11].
Assumptions:

- Currently, public service is the single largest employer in Uganda, and the central government workforce is about 240,000 people.
- The official overall unemployment rate is 3.5%. The rate among graduates is 17.4%. This official unemployment rate implies that approximately 332,951 economically active persons are without a formal or informal employment opportunity (Total lack of work), in other words without any form of income opportunity at all.
- Unemployment is more prevalent in urban areas than in rural areas, with a 12.2/1.9 per cent distribution between urban and rural areas.
- There is an inverse relationship between education and unemployment i.e. there is less unemployment among the uneducated than among the educated.
- Most educated people live in urban areas.
- Newspaper adverts are the main source of job information. Job adverts mainly target those living within the country and even then within the country, it targets those living in urban areas because newspaper penetration to remote rural areas is limited. Thus by implication, adverts hardly reach Ugandans living abroad and those in remote rural areas.
- Many jobs are obtained through ‘connections,’ friends or family relations.
- Currently there is no prominent virtual job market in the country.

Deductions:

1. Unemployment rate of 17.4% among graduates implies jobs are in short supply, hence graduates will go the extra mile to search for job information regardless of where it is posted, be it on the Internet (EROS) or otherwise. Therefore if PSC substitutes newspaper advertising by advertising on EROS as the official government job portal; then job seekers will make every effort to use EROS to find a job.
2. It makes sense to note at this point, EROS will not target the uneducated rural folks where unemployment rate is low and where its productive use would otherwise be hindered by infrastructural bottlenecks any way. But rather will target and be used by the educated urban dwellers where unemployment is higher and the infrastructure to some degree supports its productive use. It should also be noted that public service expects to recruit high caliber skilled laborers who have formal education; and EROS would help meet this business objective. Therefore if we are unable to deliver EROS to the villages right from the start, we won’t be crucified right from the begining.
3. The fact that there is currently no prominent virtual job market in place, yet the need for jobs is apparent, and further that the public service is the single largest employer at this point in time, would imply easy acceptance of EROS. PSC would enjoy monopoly status for running a virtual job market for a long period of time as there seems to be general reluctance in IT investments in the country. However, even if other job sites eventually came into play, it will not be easy to dislodge an already established giant and EROS will continue to enjoy unrivaled advantage as the only official government job portal.

4.2.2.2 Reduction in Cost

To justify claims that costs will be reduced and financial gains will be registered when PSC advertises on EROS instead of newspapers, we discuss two examples: (1) how cost of advertising will be reduced when adverts are posted on EROS and (2) how PSC will make savings on wage bill when EROS takes over from the manual system. To facilitate the discussions, we present some facts and make some assumptions on the newspaper industry and Internet usage in the country and then make deductions.
Assumptions:
- Uganda has two major daily newspapers (*The Newvision* and *the Monitor*) where PSC publishes job adverts.
- The government owned newspaper, *The Newvision* charges 3,172,000 UGX (approximately 1,351.249 EUR) for a full page advert and the paper has a daily print run of 40,000 copies and readership of 300,000 people.
- *The Monitor*, the second major and privately owned rival newspaper charges about the same rate as above and has a print run of 25,000 copies and readership of 200,000 people.
- Both newspapers have a presence in most urban centres in the country; however, their presence in the rural areas is limited though.
- PSC posts job adverts almost quarterly in the newspapers and adverts can run between 5-10 pages on an issue of the two major newspapers.
- With the necessary computation, we can deduce that under the current system, PSC spends something in the region of 40,537.47 EUR annually on job advertising.
- Internet in Uganda is accessible to 0.7% of a population of about 28 million people and this translates to about 200,000 people who have Internet access.
- The print run of Internet could be infinity, but access is hampered by the lack of infrastructure and low level of development.
- We assume that at this point the initial installation cost has been met already and that the system is up and running so we only need money for meeting the running costs.
- Quarterly maintenance cost of EROS is estimated to be in the region of 7,000 EUR and 10,000 EUR at worst.
- Hence in the worst case scenario, 30,000 EUR is spent annually on maintaining EROS which is a better deal than spending 40,537.47 EUR on adverts in the newspapers.

Reducing the cost of Advertising

For ease of analysis, the facts above have been presented in table 1 below:

<table>
<thead>
<tr>
<th>Advertising Medium</th>
<th>Approx. Advert Rate/annum</th>
<th>Number of copies</th>
<th>Readership/day</th>
<th>Advert space/issue</th>
<th>Job Publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newvision</td>
<td>20K</td>
<td>40K</td>
<td>300K</td>
<td>30%</td>
<td>Quarterly</td>
</tr>
<tr>
<td>Monitor</td>
<td>20K</td>
<td>25K</td>
<td>200K</td>
<td>20%</td>
<td>Quarterly</td>
</tr>
<tr>
<td>Internet (EROS)</td>
<td>30K*</td>
<td>200K*</td>
<td>200K*</td>
<td>Unlimited</td>
<td>Daily updates</td>
</tr>
</tbody>
</table>

Table 2: Newspaper Readership and Internet Usage

* Worst case scenario * could be unlimited

*Deductions:*
1. As shown in table 2, even in the worst case scenario, we have an annual financial gain of 10K EUR if we advertise on EROS as opposed to the two major newspapers.
2. EROS print runs can possibly be unlimited.
3. EROS readership is the same as that of *the Monitor* and could potentially be much more than for the two newspapers combined.
4. EROS advertising space depends on the size in GB allocated by the ISP on the server, but could possibly be unlimited.
5. In this case, PSC is at liberty to post adverts at anytime they wish and newspapers will not dictate the terms. Further it costs less money to buy advertising space from an ISP than from a newspaper.
Reducing the Wage Bill
In Table 1 below, we analyze the direct impact of EROS on the PSC’s current staffing situation and subsequently the effect on the wage bill and savings made thereafter.

Assumptions:
- Currently PSC has 9 board chairpersons. In the post EROS era, we cut the number to a single Case Manager who takes on the roles of all the 9 board chairpersons.
- Some roles will change or get redefined; and some positions e.g. Assistant Commissioner, Personnel Officer, Information Scientist is re-designated. Holders will effectively require new skills and training to handle new tasks in the business process. In some cases, the number of positions is either stepped up or brought down depending on the workload.
- Telephone operators, messengers and pool drivers will become redundant and be redeployed elsewhere within the government.
- Figures quoted in the table are estimated monthly wages in EURO.

<table>
<thead>
<tr>
<th>Position</th>
<th>CURRENT SYSTEM</th>
<th></th>
<th>Position</th>
<th>EROS</th>
<th>SAVINGS (EURO)/Month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Wage bill /month</td>
<td></td>
<td>Number</td>
<td>Wage bill /month</td>
</tr>
<tr>
<td>Board Chairperson</td>
<td>9</td>
<td>5782</td>
<td></td>
<td>1</td>
<td>1000</td>
</tr>
<tr>
<td>Asst. Commissioner</td>
<td>3</td>
<td>1541</td>
<td></td>
<td>3</td>
<td>2287</td>
</tr>
<tr>
<td>Personnel Officer</td>
<td>12</td>
<td>4627</td>
<td></td>
<td>5</td>
<td>3812</td>
</tr>
<tr>
<td>Secretary</td>
<td>6</td>
<td>1016</td>
<td></td>
<td>2</td>
<td>1000</td>
</tr>
<tr>
<td>Information Scientist</td>
<td>2</td>
<td>169</td>
<td></td>
<td>3</td>
<td>2287</td>
</tr>
<tr>
<td>Telephone Operator</td>
<td>2</td>
<td>169</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Messengers</td>
<td>3</td>
<td>254</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Pool Drivers</td>
<td>2</td>
<td>169</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>13727</td>
<td></td>
<td>10386</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Comparison of Wages

Deductions:
Though the monthly savings as reflected in the Table 3 is a paltry 3,341 EURO, there are lots of other benefits:

- The staff in the post EROS era gets better remuneration and is motivated.
- Staffing levels are reduced and PSC is able to make savings on wage bill.
- Use of IT helps the few remaining core staff to take on many more roles and become more productive and efficient.
- Personnel Officers are re-designated as Examiners and the examiners or the whole of Testing Center domain becomes semi autonomous and has opportunity to become entirely independent in the post EROS era.
- Positions such as Messengers, pool drivers and telephone operators will be scrapped off from the establishment forever because IT will perform most of their roles.

4.2.2.3 Reduction in Throughput Time
To justify claims of reduction in throughput time, we first look at the causes of the delays in the current system. We identified government bureaucracy, difficulty in finding slots for placing adverts in newspapers, manual and sequential execution of business processes, etc.
We then suggested that some steps be automated to speed things up and to set them free of error. And also due to introduction of parallelism in execution of tasks, the Case Management Orchestration process cuts down the throughput time as illustrated and discussed below.

![Comparing the Throughput time of the Current Recruitment System and EROS](image)

**Figure 11: Throughput time comparison**

Aware that 70 percent of *the Newvision* is news copy and approximately 30 percent is reserved for advertising; and also that 80 percent of an average issue of *the Monitor*, is news copy, and the remaining 20 percent is for adverts, then we know why sometimes it takes up to three weeks to place adverts in the papers as in figure 11 above. The gist of the matter is that PSC has to compete with other advertisers for the 30% advertising space in the newspapers and the newspapers dictate the terms. In other words, PSC has no control over when the advert should be published. In the post EROS era, such an issue should not arise and PSC will have the liberty to publish adverts at will without any further hiccups. Consequently, we estimate one week will be sufficient for publishing adverts on EROS.

In the post EROS era, applicants’ profiles are stored in the database and as they submit applications for jobs using on-line mechanism, less time will be wasted in the applications process. Therefore we assume 1 week will be sufficient for receiving and handling applications.

In the post EROS era, selection process is automated hence applicants sit on-line tests and get instant results. The system does screening of applicants so that in the next round of interviews, PSC only handles a few successful applicants after the first test. Therefore the bulk of the job is done by the system. Because of automation, selection process should be done in a space of two weeks.

Considering all the arguments above, we can unequivocally deduce that EROS will cut down throughput time from 12 to just 5 weeks.

### 4.2.2.4 Transparency

Though it is rather difficult to justify transparency of the system quantitatively, we can assume the system to be transparent when there are fewer complaints or appeals than is in the current
system. This will be facilitated through applicants determining their destiny by taking aptitude test on-line, getting instant results, and having more confidence in the results. At a later stage perhaps, the system will even generate solutions to test questions if the applicant so wishes to compare his answers with the solutions just incase they were interested in knowing where things could have gone wrong. For that matter, PSC will save money and time on handling appeals and this is also a very important step towards redemption of its public image.

4.2.3 Sources of funding

As evidenced by experiences with other e-government projects overseas, the private sector is likely to invest in EROS only after a proven business case for the private sector has emerged. Consequently, government needs to take leadership role for implementation of EROS on a national scale, particularly with respect to standards and infrastructure development.

Therefore the assumption at this point is that majority of funding in the early years would be provided by the public sector and more precisely the government of Uganda. Notwithstanding this, the implementation plan needs to allow for subsequent private sector involvement possibly through public private partnership models.

However, if the government is unable to finance the project from recurrent development budget, we could turn attention to our development partners. In mind we have institutions such as African Development Bank, IMF, Bill and Melinda Gates Foundation and of course also the invaluable support from Grexx.

4.2.4 Risks

We identify two broad types of risks that are likely to occur in this project: Force Field Analysis and risks during transformation and implementation. Force Field Analysis refers to those negative social forces that block a program from moving to its goal.

4.2.4.1 Force Field Analysis

In most societies there are people who oppose change even if it is for the better, and the Ugandan society is no stranger to this phenomenon. Some people will feel technology or a project such as this will strip them of their powers and authority; others think it will render them unemployed and hence deny them of their livelihoods, etc. Culture and tradition also play a part in a situation like this because they tend to tie people to doing things in certain particular ways. For example, in Uganda, since time immemorial, public service jobs have been advertised in the newspapers. PSC staffs, Jobseekers and employers have gotten so used to the system that newspapers are their only genuine source of job information. Bringing in reforms might destabilize them and be met with stiff resistance.

Also in such organizations, there could be people exploiting the weaknesses of the system to their advantage and such people will resist a project like this at all costs for the fear that changes might tighten the existing loopholes or even at worse expose them.

The solution is not to bow down to opposition and to let events take on their course, but rather to approach the situation with courage, persistence and persuasion. Hence, we need to plan for a careful change management program and sensitization to educate the people that technology is there to promote efficiency, make them more productive and improve their method of work.

Electronic Recruitment Organization System
However, all arguments of opponents should be analyzed and taken seriously. Before we even use authority, the first step is to prepare the people to accept change and to educate them so as to take away their arguments and to find new factors to convince them to change their mind.

4.2.4.2 Fraud
Some people are concerned that implementation of EROS is likely to escalate fraud in public service appointments especially as regards taking of on-line tests. The worry is that it will become much more easier for candidates to get assistance from other people while sitting on-line tests by way of impersonation, hiring ‘mercenaries’ to sit tests, etc.

Whereas there is no point in disputing those genuine concerns, first of all, we need to note that the current system is not totally free of fraud. Fraud does exist there as well. And whereas it is our dream to improve the system and totally route fraud, the issue in the post EROS era becomes as complex as controlling of the Internet itself.

However, before we loose sleep over this issue, we have got to note that on-line testing is just a way of reducing the huge number of applicants to manageable levels; and passing of the first test (on-line test) is just a passport to the second and the all important oral test which requires candidates’ physical presence. In the second interview, there is a chance to identity and verify the candidate against available information in the national ID database for example.

According to the plan, eventually the Testing Centre will become autonomous and we see test centres being set up at district levels. So if there is a realization that fraud is becoming uncontrollable, then everyone who takes tests will have to do it under local supervision at a designated place and time in the district.

Further, if anyone is found engaging in fraud, he will be administered severe punishment to act as deterrence to any future offenders. It must also be noted that EROS works closely with the Police Department, and is committed to getting rid of criminal activity in the Public Service by enlisting the support of the Police Department and ensuring that all people appointed into the service have clean criminal records. So if a candidate is caught engaging in fraud, he will be banned from seeking appointment in the Public Service for a period not less than five years. We also address fraud through Trust Management and ensure that applicants authenticate themselves to use the system and to ensure that they are who they claim to be.
4.3 Process Description

4.3.1 Architecture of the Grexx Engine

4.3.1.1 The model

We started the process description by modeling the new and proposed business process in Microsoft Visio as in figure 13 below. This is normally done to make the Customer and Business Analysts get a feel or impression of the behavior of the system that will be implemented. The model offers a level platform or playing field for the Customer, Business Analysts and Process Analysts to understand, brainstorm over the system and to improve it so as to attain the desired functionalities and to warrant approval for implementation in the Grexx Engine.
Figure 13: Ms. Visio Business Process Model

After the model was drawn, discussed and approved, it was then configured in the Grexx Engine.

### 4.3.1.2 Configuration

Configuration involves:

- Implementing tasks in the Visio model in the Grexx engine as they were represented in the model.
- Linking and ‘decorating’ the tasks in the Grexx engine by adding split, join or no conditions at all to them. By ‘decorating’ the tasks with splits we were simply giving instructions that once a given task has been executed, then, its succeeding task could be one or more tasks. On the other hand by putting joins on a task, we were simply also instructing the task that it could be executed through completion of one or more preceding tasks - see tasks check and publish respectively in figure 13 below for illustration of splits and joins.
- Adding data items to the tasks and mapping them to task variables.
- Creating, modifying and setting of permissions for user accounts and passwords for resources that need to use the system. Examples of user accounts created include Permanent Secretary, Commission Secretary, Applicant, Examiner, and one administrator account jimmy having administrative privileges to virtually handle any task in the system.
4.3.2 Philosophy of process description

Traditional workflow systems build tightly coupled systems i.e. whatever the case; there is always a fixed order in which things get done. Grexx process description thrives from the concept of SOA and is focused on building loosely coupled systems. The methodology tries to minimize tight coupling in modeling and developing business processes as much as possible; and promote flexibility and ease of optimization.

Loosely coupled systems can mean there is a case manager to flexibly determine which tasks should be executed and which ones should not be executed at a particular time. In other words there is no definite or fixed order in which tasks are executed as is the case in traditional workflows.

Both concepts have their strengths and weaknesses. For example loosely coupled systems in high production environment require a lot of human (Case Manager) intervention and the whole concept could turn to be rather expensive in terms of human effort and time spent in handing cases. On the other hand, traditional workflows result in building of inflexible systems.

Owing to these important facts, the implementation of business process models in Grexx engine takes into account concepts from both the traditional workflows as well as from SOA, though the SOA
principle has much more flavor in the implementations hence Grexx systems are flexible yet not requiring too much human intervention.

4.3.3 Observations

The version of Grexx engine used in implementing this demo does not have support for automatic retrieval of data for example from the job description to the job application interface such that if an applicant finds a suitable job and wants to apply, he has to manually feed in job information into the application interface. Though this is mainly usability issue, applicants could find the task a bit tedious and time wasting.

However, this problem could be solved, but then a newer version of the engine is required and for it to be operational would require some time and programming effort from the developers. Since the project has to be concluded in six months which is due in a month’s time anyway, we are in no way able to proceed with that line of action in the implementation of the demo. It therefore remains an assignment for another day and in any case our level of detail in developing the demo was on building user interface for the employers (Ministries) and PSC staff but not the applicant. Hence the demo doesn’t adequately address usability requirements for the applicant. Applicant usability issues will be addressed when we go into actual implementation.

Grexx uses Microsoft Visio for modeling business processes. Though Visio does the job sufficiently well, there is need to standardize and extend the way of modeling processes and services because we are not sure if business processes modeled in Visio can actually be validated. Whether validation of the business processes takes place in the engine or not is also not clear at this point. Consequently, this puts to question the quality of the implementation vis the models.

In the Grexx engine, business processes are coded or configured by the Process Analyst. Though the concept of coding makes the Process Analyst to be more analytical in the development effort, they admit having Graphical User Interface (GUI) with all its associated benefits would be a preferred option to the current way of configuring systems on the Grexx engine.

4.4 Governance plan, rules & contracts

The governance plan proposed here addresses the major components of PSC Information System. Therefore apart from the administrative structure and the executive arm of PSC we model the governance structure having in mind service providers such as IT suppliers and consumers such as applicants, ministries, etc. We discuss the rules, contracts and relationships among these players as well.

4.4.1 Players in the governance model

The players in the IT Governance model are depicted in figure 15 below. The management structure comprises three (3) action levels namely: (1) Teams, (2) Operation Group and (3) the Executive Group. The structure therefore provides a framework through which actions are taken and reporting occurs.
4.4.1.1 Teams
We formed Teams around PSC’s business units and business processes. They include Job Market, Case Management and the Testing Centre. One of the collective roles of Teams is to review emerging business needs and service delivery and to work together to meet the PSC targets for processing cases of appointments, promotions, disciplinary actions, etc. annually.

4.4.1.2 Operations Group
The Operations Group comprises the senior IT leadership of PSC or simply e-PSC management as represented in figure 15. The e-PSC Management acts as a liaison between Teams and PSC management and works closely with Teams to successfully implement approved IT initiatives and service delivery. They also work hand in hand with the Teams to ensure that PSC’s strategic objectives are met. The e-PSC management in conjunction with the Team leaders may suggest changes in IT strategy but the decision to effect the changes remains a preserve of the PSC top management though.

4.4.1.3 The Executive Group
The Executive Group comprises the top PSC management and is responsible for regulatory framework, mission statement and approval of IT directions and initiatives. At the executive level, the Secretary PSC assumes the role of the business owner. His responsibilities include: ensuring that PSC’s strategic objectives are met, approving IT strategy and standards ensuring that it is aligned with the PSC’s overall business priorities and he is ultimately accountable for any successes or failures of PSC.

4.4.2 Rules and Contracts
Contracts are promises or agreements that each player in the governance model makes to the other to deliver services. Contracts exist to measure performance of players to ensure compliance to the strategic objectives of the company. The contracts may be hierarchical (stewardship contracts) or horizontal (service contracts). Detailed explanation follows:
**4.4.2.1 Stewardship contracts**

Stewardship contract is a hierarchical contract in which terms are set to institute controls and measure performance of actors in a contract and also to ensure compliance to the overall objectives of the organization. An example is a contract between PSC management and e-PSC management, the two parties agree on what e-PSC management will have to achieve in order to be assessed as being successful or not. In this section therefore, we present the terms to assess the performance of the actors and to ensure compliance to the overall strategic objectives of PSC. Examples of stewardship contracts between PSC and e-PSC management, e-PSC & Job Market, Case Management & Testing Centre are discussed below:

**PSC & e-PSC contracts**

**PSC**
1. Shall provide 99% of funds required by e-PSC for meeting operational costs, to process cases and to realize proposed IT solutions.
2. Shall approve all major IT project proposals, quarterly review pricing changes, changes to service levels and major IT directional changes upon notification by e-PSC.
4. Shall handle and decide on a minimum of 6,000 cases of appointments, promotions and confirmations annually.

**e-PSC**
1. Shall reduce the annual cost of recruitment by 50% within the initial year of installation of EROS.
2. Shall cut down throughput time of selection and recruitment process from three (3) months to five (5) weeks only.
3. Shall work towards realizing 80% transparency in selection and recruitment process of PSC.
4. Shall ensure 99% of job vacancies advertised are filled by the most suitable candidates in the very fast instance of advertising.
5. Shall ensure that at least 10% of annual staff recruits into the public service are Ugandans living abroad.

**e-PSC & Job Market, Case Management & Testing Centre**

**e-PSC**
1. Shall prepare annual well structured user manuals, and informative error messages, help facilities and consistent interfaces to enhance usability of the system.
2. Shall monthly approve and channel budgetary facilitation to the Teams.
3. Shall quarterly review IT policy issues, provide guidance, and monitor performance of Team leaders on daily basis and give annual appraisal reports.

**Job market, Case management & testing centre**

1. Job market shall publish 99% of job vacancies on the Internet.
2. Job market shall within 2 days of testing publish test scores and inform e-PSC.
3. Job market shall by e-mail give feedback to at least 99% of job applicants.
4. Job market shall be available and accessible about 99% of the time.
5. Job market, Case Management and Testing Centre shall each produce weekly performance and management reports.
6. Case management shall subject all applicants to both on-line testing and oral testing and give case by case performance report to e-PSC.
7. Case management shall handle a minimum of 6,000 cases annually.
8. Testing centre shall administer oral test to all successful candidates after the first test and give a case by case report.
9. Testing centre shall release results of interviews within 2 days of oral testing.

4.4.2.2 Service contracts
Here we discuss service (horizontal) contracts among the players in the governance model in figure 15 above - Job Market, Case Management, Testing Centre and the platform.

Case Management & Testing Centre
1. Testing centre shall take charge of all testing requirements of Case Management and shall provide test scores within 2 days of the date of testing.
2. Testing centre shall on weekly basis provide situational and statistical reports.

Case Management & Job Market
1. Case Management shall on daily basis and at all times provide content for publication on Job market.
2. Case Management shall 99% of time use the Job market as a medium for publishing content.
3. Job Market shall publish the content in real time and keep job vacancies published on the Job market for atleast 2 weeks.

Job Market & Testing Centre
1. Job market shall at all times provide the Testing centre with statistics, a list and grades of successful candidates after the first interview.
2. Job market shall provide instant results to Testing Centre and candidates who take the first test.
3. Testing centre shall at all times provide the test questions and test scores for publication on Job market.
4. Publication of test scores on the Job Market shall not exceed two days after taking of the oral test.

Testing Centre, Case Management, Job Market with the platform
The recommended platform is the Grexx platform for business and IT Architecture. The User group, Operations group and the executive will ensure strict adherence to Grexx platform for the time being.

1. Availability - Platform shall be available 99.8% of time for use by the user group.
2. Performance - The platform’s response time to user query shall not exceed 3 seconds.
3. The platform shall support at least 250 candidates concurrently taking tests.
4. Security - The platform shall employ userID and password authentication mechanism to provide secure access to information.
5. Platform shall provide secure storage and data back-up every 24 hours and back-ups shall be stored in off site storage facility.
6. Modifiability – systems upgrade and planned maintenance shall only be done during off peak periods and on weekends and with 24 hours prior notice.
7. Robustness – time to restart the platform after failure shall not exceed 3 minutes.
4.4.2.3 PSC, clients and contractors

1. PSC undertakes to ensure EROS is accessible to clients globally 99% of the time.
2. PSC shall by 30th of June every year have published annual performance reports.

3. Consultants and IT suppliers shall participate and offer advisory services in every new IT project.
4. IT suppliers shall be offered relief from penalties if for some reason PSC is believed to be responsible for their none or under performance and vice versa.
5. System upgrade and maintenance shall be done only at scheduled times.
6. Usability – time taken for clients to learn 80% of the facilities on the system shall be 1 day and number of errors made by users in a period of 1 hour shall not exceed 5.
7. All external communication between PSC and clients outside shall be encrypted.
8. PSC shall publish well structured user manuals, and informative error messages, help facilities and consistent interfaces to enhance usability.
9. PSC shall handle a minimum of 6,000 cases annually.
10. Clients such as companies, head hunters, etc. shall pay their duties well in advance before using the system.
11. Clients shall not abuse the PSC system and any one found orchestrating fraud will be banned from using the system for a period of not less than 5 years.
12. Clients shall give critical reviews of PSC systems and operations on annual basis.

4.4.2.4 Choice of platform

A management team comprising 2-6 people shall be responsible for choosing IT platform and for negotiating conditions for IT. And a decision to acquire a platform shall be made by two-thirds majority.

However, Management shall at all times choose a platform in consultation with e-PSC management and Team leaders.

At all times, advisory services from a specialist IT Advisory board comprising consultants (some of whom may be ‘virtual members’) shall be enlisted; and of course the application provider and an external client of the application provider shall be engaged to give an independent assessment and opinion of the proposed platform.
Figure 16: Communication Protocol in Choosing Platform

The choice of a new platform shall be driven by emerging business needs and management shall act to meet those needs by setting up specific agenda for the platform. For example business requires more capacity for information storage, or more processing power is needed because of growth related issues; or it could also be that there is need for better security policy, etc. The Management Team shall present a proposal to an Application Service Provider for consideration and negotiation. But before management can make a decision, independent opinion and advice of clients of the Applications Service Provider shall at all times be sought to aid in proper decision making.

4.4.3 Financial Governance

We discuss two possible forms of financial governance for our plan: Integrated and Fully Networked Organization.
4.4.3.1 Integrated Organization

In an integrated organization financial governance model in figure 17 above, all the team leaders collaborate with the e-PSC to prepare a joint e-PSC budget which is then tabled to the PSC management for approval and disbursement of funds. The budgets are prepared for a whole financial year giving estimates of how many cases are expected to be handled in a given year and the amount of money required for handling the cases.

PSC releases funds to the e-PSC management per vacancy as proposed in the budget and the funds trickle down to the Team leaders through the e-PSC management.

On monthly basis, the Team leaders make accountability to e-PSC management on the money spent and the e-PSC management uses the various reports as inputs for his own accountability to PSC management. This is done on quarterly basis.

4.4.3.2 Fully Networked Organization

In a Fully Networked Organization, privatization takes a centre stage and Case Management provides the critical coordination effort required for the operations. The Job market, Testing Centre or the Platform become independent and handle their own budgets directly without going through a third party. The Team leaders hence receive funds and account for funds directly also. This set up reduces unnecessary delays resulting from bureaucracy and red tape in decision making and funds disbursement.

Figure 17: Integrated Organization Financial Governance Model

In an integrated organization financial governance model in figure 17 above, all the team leaders collaborate with the e-PSC to prepare a joint e-PSC budget which is then tabled to the PSC management for approval and disbursement of funds. The budgets are prepared for a whole financial year giving estimates of how many cases are expected to be handled in a given year and the amount of money required for handling the cases.

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Chapter Four: Results and Discussions

Figure 18: Fully Networked Organization Financial Governance Model

The fully networked Organization presupposes that:
(a) e-PSC disburses funds to Case Management per vacancy
(b) Case Management pays suppliers per service
(c) Case Management pays Job market per vacancy posted and per applicant or CV selected.
(d) Case Management pays platform per service
(e) Job Market pays platform per service
(f) Platform pays suppliers per service
(g) Testing Centre pays platform per service
(h) Case Management pays Testing Centre per test or per candidate tested
(i) Case Management pays newspapers or head hunters per advert posted.

However, given the circumstances, at the moment, a Fully Networked Organization is not appropriate for PSC yet, perhaps may be realized in the future. What seems more feasible at the moment though is an Integrated Organization Financial model.
4.5 Implementation plan

The implementation plan consists of two phases. Phase one consists of planning, installation, configuration, testing and staff training. Phase two consists of handling user migration from the manual system to EROS.

To complete the transition from the manual system to EROS is projected to take 8 months (32 weeks). Thus twenty six (26) weeks are required for completing Phase 1 and 6 weeks are required for Phase 2. Phase 2 however includes a 90 day period for concurrent use of the old manual system with EROS. This is to ensure business continuity and uninterrupted service delivery just in case EROS encounters problems in the first few months it goes live. So the two systems run side by side until EROS is fully established.

4.5.1 Phase 1

- **Planning**
  - Agree upon implementation methodology
  - Document key objectives
  - Appoint project managers
  - Amend or draw project plan
  - Suppliers carry demos and final selection of IT supplier is carried out
  - Supplier identified and way for the launching of the Project Team is paved

- **Constitute EROS Project Team**
  - The Project Team is officially constituted and drawn from:
    - PSC Technical staff e.g. Manager, e-PSC
    - IT supplier – to install, configure, test EROS components documentation
    - Consultants (Grexx) – for platform, overall guidance & project management including consultancy services.
  - Information gathering and updates

- **Installation and configuration**
  - Acquire, setup and configure EROS system based on Grexx platform and hardware
  - Installation and configuration of Servers, PCs or workstations and the necessary software
  - Setting up the LAN and WAN.

- **Testing**
  - EROS system pilot testing is carried out by the Project Team
  - Test runs are conducted and include typical business transactions such as submission of job requisition, advertising on EROS, submission of application, taking on-line test, etc.
  - Writing test transition scripts or reports
  - Fine tuning/customizing the system to the specific user requirements.

- **End user training**
  - Technical staff training – Helpdesk staff training including training of Systems Administrators in routine and preventive maintenance tasks
Training of general PSC staff or users of the system. User training focuses on the use of EROS for performing their respective duties.

### 4.5.2 Phase 2

- **Prepare to go live**
  - Create user notification plan
  - Notify users of pending migration from manual system to EROS
  - Data entry into EROS
  - Use of software routines to import existing data into EROS
  - Users test system to ensure their specific requirements are met.

- **Running live**
  - Formally hand over system to PSC Management
  - Perform full support and system maintenance
  - Commence after care services.

- **Post implementation Review**
  - Undertake comprehensive review of the project
  - Review includes gathering feedback from users and project team
  - Agree on necessary changes to the system and fine tune the system.

### 4.6 Prototype (demo)

The demo we implemented is hosted at: [http://demo.grexx.net/jimmy2/person/my_tasks.jsp](http://demo.grexx.net/jimmy2/person/my_tasks.jsp) and the access credentials below maybe used to log onto the system. Implementation details are discussed in Section 4.3.1.1 (configuration). However, below we present an example scenario where the Permanent Secretary of the Ministry of Finance for example submits job requisition for the post of Account Manager, then Personnel Officer at PSC checks it and finds it to be ok, and then Secretary PSC publishes the job on EROS, Applicants respond to advert, take on-line test, then the examiner organizes oral interview, and a suitable candidate is found and appointed.
Chapter Four: Results and Discussions

Electronic Recruitment Organization System

Figure 19: EROS Prototype Screen Shot

Permanent Secretary: PS/PS
Commission Secretary: CS/CS
Personnel Officer: PO/PO
Applicant: nojob
Examiner: PE/PE
Jimmy: jimmy/jimmy (account with administrative rights).
The above are the access credentials to the system (e.g. PS/PS is userID and password for the Permanent Secretary).

Figure 20: Job Requisition User Interface
The screenshots above pay more attention to the use of the system from the perspective of the PSC staff user than the applicant or client for that matter. The system is designed in such a way that when you log on with a particular user credentials, then you will only see and execute tasks that are specific to you. For example if you logon as Permanent Secretary, you won’t see and execute the tasks of the examiner because those tasks are not for you and will not show in your profile. However, the last access credential in the list above has administrative privileges and some one who logs on using it has total control over business processes and the system at large.

4.7 Discussions

Our experiences are divided into two parts: (1) where we compliment the method and (2) where we raise some issues of concern.

4.7.1 Compliments

To this point, we have gained a good understanding of the Grexx Method for Business and IT Architecture and found out that the method is actually simple to learn and easy to use and apply. Consequently with the guide of mentors, we were able to use and apply it in this project.

Since the method is based on SOA principles, it promotes building of loosely coupled systems. Loosely coupled systems promote flexibility and re-usability of system components. In the the Business Architecture for example, somehow unconsciously, you realize you are developing user requirements for the system you want to build and what’s so amazing is the process is entirely based on the concept of SOA – so you are basically looking at the domains of a system and studying their interdependencies (what they offer and receive) to derive the user requirements from that.

By using Ambition Workshops to define the mission and ambitions of a system, the method takes you to another level. It makes the developer to fit into the ‘shoes’ of the user and look into problems from the users’ perspective. For this reason, ambition workshops deserve special mention and credit. This is so because using the information generated through these workshops to develop systems has a remarkable effect on the end product. To a large extent, the system developed using this method will address the specific requirements of the very user for whom it is intended. Studies show user requirements specification is one of the problematic, yet cornerstones of a successful IT project. And many studies have also shown that many business and IT projects fail because they lack proper user requirements specification. In our opinion, one of the strengths of Grexx method lies in this area.

Further, by creating a shared dream during ambition workshops also ensures that users and domain owners’ get involved and start participating in the project right from the beginning. This philosophy not only promotes a total sense of ownership of the system before even it is realized or right from the time of inception but also makes it pretty easy to ‘sell’ the project to the rest of the stakeholders and promotes easy acceptability as well.

We have also noted that in the Grexx method, Business Architecture is the main building block or a blueprint of a system. While working on the business architecture, SOA principle is extensively applied. The three domains we came up with (Market Place, Case Management and the Testing Centre) can each act as service provider(s) and service consumer(s) as defined in SOA (see chapter 2). Each of the domains has its core competencies or services it provides and sets of inputs or services it receives. Relationships, interdependencies or interactions take place between the domains, and the domains are synonymous with elements in SOA. In most cases, such relationships are established through contracts. Each domain is aware of its service providers and consumers and directory services
also exist where domains can publish their offerings and search for services to consume. For example the Case Management uses the Job market as a directory service for publishing its offerings. Similarly, service consumers such as applicants also use the job market for publishing their profiles. Employers can also search the job market for suitable candidate profiles for their vacancies.

Therefore when we look at domains such as Job Market, Case Management and Testing Centre as the main building blocks of our system; and we study the interdependencies (the services they offer and receive) for developing user requirements gives an edge to this methodology. Grexx can therefore formally engineer solutions that directly link to the desired results defined by the enterprise strategy of their clients.

The “outside-in-thinking” approach is a concept that is proprietary to Grexx and used for elicitation of problems that exist in a current system, presentation of the “castle in the sky” and selection of the first plateau for realization. By using the “outside-in-thinking” approach for presenting the “castle in the sky”, the customer’s ambitions are stretched ‘over the top’ and they can see things they could never think of when they only walked the rational path of perceived achievable goals. That is why looking at a more global picture in the “castle in the sky” and making the customer to describe the wildest dreams and the first plateau, describing the achievable goals they want to reach within the first planning period makes a lot of sense. Management is often afraid to discuss their dreams, because they fear to fail their targets.

4.7.2 Issues of concern

The different steps in the Grexx Method are executed by different sets of consultants having different but very relevant backgrounds for the steps they execute. For example steps 1-4 are executed by Business Analysts, step 5 by Process Analyst and step 6 by Systems Developers. The methodology also requires steps 1-4 be iteratively executed. A group of consultants with particular background execute particular step or steps and after successfully performing the tasks and realizing deliverables for the given step or steps; passes on the project to the next step for their other colleagues to take on. For example, steps 1-4 are executed iteratively by consultants with a strong bias in business consulting and project management, while 5 and 6 are executed by those with strong technical IT background and business process modeling. Step 7 calls for input from virtually all depending on the step(s) that need to be reworked in order to optimize the system.

Whereas it is a good idea that people involved in the project only do what they are trained to do and that they only do what they are good at, quite evidently, this methodology is abit rigid in that the method becomes difficult to successfully employ elsewhere outside the Grexx production environment. We think it is so because for the successful application of the methodology, you need to the human resources and special skills Grexx has and at the same time you need to use the Grexx engine and production environment for implementation. But perhaps not every admirer of the method is endowed with the resources that Grexx has so its application elsewhere is bound to meet challenges.

In our opinion, there is no clear distinction between Business Case and Sales Presentation. We think the two are being interchangeably used to address the same situation and that it is just a question of semantics. However, the difference perhaps is that an extra step is included for defining the detailed business case in a (financial) business plan if required. Other than that, we believe the description of the business case (high level) can be used for selling the ideas to the
stakeholders. Therefore, it is probably not a good idea to use different terms to explain the case to the business and to achieve a solution. “One lexicon, one set of definitions helps to bridge the gap between the worlds of the domain owners and the solution providers.”

From the workbench for domain realization in figure 3, we note that in steps 5 and 6, the project reaches a “state of no return.” By this, we implore the absence of arrows pointing backwards to suggest iterative development between steps 4, 5 and 6. In this case if the developers discovered problems that should have been addressed in the earlier steps does the development go ahead even in the face of problems that have been discovered? If so, what would be the quality of the final product? Some clearance is required to put this doubt to rest.

The version of Grexx engine used in implementing this demo does not have support for automatic retrieval of data for example from the job description to the job application interface such that if an applicant finds a suitable job and wants to apply, he has to manually feed in job information into the application interface. Though this is mainly usability issue, the task could be tedious.

We are aware that this problem could be solved, but then a newer version of the engine is required. For it to be operational would require some time and programming effort from the Developers. Since the project has to be concluded in six months which is due in a month’s time anyway, yet our focus was on the design, then we are in no way able to proceed with that line of action in the implementation of the demo. It therefore remains an assignment for another day and in any case our demo was mainly focused on building a user interface for Ministry and PSC staff but not the applicant. Hence the demo doesn’t adequately address usability requirements for the applicant. Applicant usability issues can be addressed when we go into implementation full blast.

Grexx uses Microsoft Visio for modeling business processes. However, we are not sure if business processes modelled in Visio are or can actually be validated. Whether validation of the business processes takes place in the engine or not is also not clear at this point. Consequently, this puts to question the quality of the implementation vis the models because a model is a blue print of the implementation and hence an implementation should be consistent with a model that is tested and verified.

In the Grexx engine, business processes are coded or configured by the Process Analyst. Though the concept of coding makes the Process Analyst to be more analytical in the development effort, they admit a Graphical Unit Interface (GUI) with all its associated benefits would be a preferred option.
Chapter 5

5 Conclusions and Recommendations

5.1 Conclusions

In this thesis, we used the principles of SOA and Grexx’s Method for Business and IT Architecture to design Electronic Recruitment Organisation System to address the current recruitment and selection challenges of the Public Service Commission in Uganda. SOA is software architectural framework for building loosely coupled systems while Grexx Method for Business and IT Architecture is a proprietary method proposed by Grexx for building systems. Grexx is a Business & IT consulting company in the Netherlands.

We used the method to identify the actors and the domain owner of EROS and discussed the problems of the current recruitment and selection system in ambition workshops. We then defined a new domain to address the problems; and chose relevant context for the domain; described processes in the new domain on the Grexx engine and finally, built a prototype of the system. The prototype demonstrates how PSC can organize, manage and bring suitable reforms into the current chaotic scenes in recruitment and selection process.

Therefore concerning our experiences with the method, we can conclude that:

- Grexx method was easy to learn and apply in the project. Therefore using the method, we managed to develop EROS which can cut down costs of recruitment, reduce throughput time and enforce transparency in recruitment and selection at PSC. The use of ambition workshops and SOA principles made us to formally engineer a solution that will directly link to the desired results defined by the PSC enterprise strategy and therefore to develop a solution that addresses the specific needs of the user.
- The Business Architecture forms a very important part of the system and is infact the blue print of systems developed using the Grexx method. By using the Business Architecture, we specified user requirements with relative ease.
- The “outside-in-thinking” concept is unique to Grexx and should be commended for its versatility in elicitation of user requirements and identification of problems that exist in the current recruitment system, presentation of the “castle in the sky” and selection of the first plateau for realization.

However, it would be an understatement to say that everything was ok with the method because in our opinion, there are some points of debate:

- Since the method is Grexx’s own creation and requires use of the Grexx portal and the production environment for successful implementation, one could easily say it is proprietary and this raises questions about its universal applicability across the industry.
- As you walk through the method, you realize almost there exists no clear distinction between Business Case and Sales Presentation. Our opinion is that the two are being
interchangeably used to describe the same thing. We believe a business case can also be used to sell a project and there should be little if any distinction between the two.

5.2 Recommendations

- Since the method is almost proprietary, Grexx should attempt to make it more generic to command universal acceptability and usability across the industry. It would also be a good idea to either make it open source or patent it perhaps, in recognition of Grexx’s intellectual efforts in contributing to the world of knowledge. Depending on what is appropriate, for wider industrial use, we think making it open source would be a good contribution.
- Clear distinction needs to be made between Business Case and Sales presentation. Using the two terms interchangeably to almost explain the same thing is a little bit confusing.
- Instead of using Microsoft Visio, ‘Grexx Editor’ could be developed for modeling business processes, validating the models and exporting them to Grexx engine for enactment. This saves development time and effort, makes models to be consistent with implementation, and Grexx can engineer systems that precisely address user needs.
- Validation of business process models should be improved. It would be important to employ some other industry standard tools for modeling business processes other than Visio. Important lessons could be learnt from a tool like YAWL.
- To improve usability aspects of EROS, a newer version of Grexx engine should be developed to support automatic job information retrieval from job description in support of the application process.
- The server should be upgraded to improve on the response time during coding or configuration of business processes on the engine. A server response of less than 3 seconds per query would be very ideal for the Grexx Engine.
- A GUI should be developed to get rid of manual coding and make configuration more easy and fun.
- Implementation of EROS should take place in Uganda as planned and as demonstrated in the business case. Despite the difficulties, EROS can still be a feasible project and that these ideas are not misguided or merely driven by the desire to complete a graduation project, but to note that “where there is the will, there is the way”.

5.3 Lessons learned

We have learnt that:

- If you specify user requirements by considering domains as the main building blocks of a system and studying their interdependencies, then your tasks as a software architect get simplified and you are on track into developing solutions that meet the clients specific requirements.
- For an IT project to succeed, there is need for participation from all stakeholders. Hence, users and domain owners need to be involved right from the beginning. IT projects where users don’t feel part and partial will face resistance because the project must first receive the users’ blessing or ownership, otherwise it will be fought to the very end. As a matter of fact, in the near future if we happen to run IT projects, we need to borrow a leaf from Grexx and bring all stakeholders on board through ambition workshops.
- A lot has been learnt from the concept of “outside-in-thinking” that can not be ignored. The concept underscores the philosophy that it is not possible to predict what part of our wildest dreams can be achieved and what can not be achieved. Apart from that as Niels Klinkenberg put it: “when we stretch our ambitions ‘over the top’ we can see things we could never think of when we only walked the rational path of perceived achievable
goals.” That is why we need both: the castle in the sky, describing our wildest dreams and the first plateau, describing the achievable goal we want to reach within the first planning period.

- Projects are executed in phases or steps. In the Grexx method for example, each step has its own methods and deliverables and each deliverable is in itself an output of a particular step and input for another step. Each step and deliverable in a project is therefore very critical and if not properly executed could delay or derail the entire project. Therefore using Grexx method means producing tangible results after each and every step.

- We learnt that IT projects are not always realized with the most ambitious of budgets. In some cases, the will or the desire to make the project succeed is more important than the money itself. There are other things we have got to worry about other than finances. It is therefore important to note at this point that, we have got some convincing to do for EROS project to be accepted and for people to have faith in it as discussed in the business case. When we first convince the ‘people who matter’, then we can finally ask them to look for funding, but the reverse is always going to be difficult.

In a nutshell, if the desire to implement EROS in Uganda is there, the way for implementation will open. So with EROS we can be sure to control PSC’s cost of recruitment & selection, achieve transparency and reduce throughput time tremendously.
References


Appendices

Appendix 1

Action planning – Gantt Chart

Phase I

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Appendix 2

PSC Recruitment Process Map

PSC SELECTION AND RECRUITMENT: JOB CREATION AND ADVERTISMENT PROCESS

The Line Manager identifies a job vacancy and determines new staff is needed. He discusses and submits request for new employee to Personnel Officer. The Personnel Officer prepares job description and submits request for approval.

Records Clerk receives and registers the request. He then forwards the request to the Secretary, PSC. The Secretary assigns case to the Board responsible for the Ministry. And the Board examines job description for the job request.

The Board finds job description is either OK or NOK. If it is NOK, the Board tries to correct it in consultation with the Ministry, otherwise Board proceeds to find out whether the job is new or not.

If it’s a new job, the Board consults the Ministry of Public Service on availability of funds for recruitment. The Commissioner SSD advertises the job.

The Commissioner for Personnel in the Ministry of Public Service considers the case for availability of funds. Case is either approved or not. If it’s approved, then it is passed on to the Commissioner SSD to advertise. Otherwise the Board puts it on hold pending funds and informs the Ministry in question.

The line Manager submits a job vacancy and determines new staff is needed. He discusses and submits request for new employee to Personnel Officer. The Personnel Officer prepares job description and submits request for approval.
The Commissioner, SSD determines whether to carry out internal or external recruitment.

In case of external recruitment, the Commissioner SSD sends the case to the responsible Board to prepare a professional HR advert.

However, for internal recruitment, the Commissioner, SSD plans for internal posting of the advert.

The Commissioner, SSD determines whether funds are needed for posting adverts or not.

The Commissioner, SSD decides whether funds are needed for posting adverts or not. And the Senior Accountant processes payment for the AD.

The Commissioner, SSD decides whether funds are needed for posting adverts or not. And the representative places adverts in the papers.

And the representative places adverts in the papers.

And applicants respond to AD.

The Records Clerks and the receptionists handle request for information, application forms and documentation required for applications. They receive and register posted or hand delivered applications and the process progresses to selection stage.
Appendices

### PSC SELECTION AND RECRUITMENT: SELECTION SUB-PROCESS

<table>
<thead>
<tr>
<th>Process steps</th>
<th>Applicants</th>
<th>Line Manager</th>
<th>Personnel Officer</th>
<th>Secretary, PSC</th>
<th>Board Chairperson/ PPO</th>
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### PSC SELECTION AND RECRUITMENT: SELECTION AND APPOINTMENTS SUB-PROCESS

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Electronic Recruitment Organization System
Appendix 3

Key Milestones

Key milestones and time estimates for major tasks are presented in Appendix 3.

- Project Plan created
- IT supplier(s) identified
- Project Team formed and launched
- Hardware and platform acquired
- Hardware installed and configured
- PCs acquired and installed
- LAN and WAN setup and system configured
- System tested and fine tuned
- End users trained
- Users notified of transition from manual system to EROS
- Data entered and imported to system
- System tested by users and fine tuned to meet user expectations
- Review of project undertaken

Time Estimates for Major Tasks

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<td>Agreeing on implementation strategy</td>
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<td>Document key objectives</td>
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<td>Appoint project Managers</td>
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<td>Amend or draw project plan</td>
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<td>Carry out demos</td>
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<td>Identify supplier</td>
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<td><strong>Constitute EROS Project Team</strong></td>
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<td>PSC Technical staff</td>
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<td><strong>Installation &amp; configuration</strong></td>
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<td>Purchase, set-up and configure Server hardware</td>
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<td>Install &amp; configure server software</td>
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<td>Perform full support/maintenance</td>
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