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EGYPTIAN CUSTOMS INTERIM MODERNIZATION PHASE IT GAP ANALYSIS

Egypt TAPR-II: Trade Component

February 5, 2006

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EGYPTIAN CUSTOMS INTERIM MODERNIZATION PHASE II GAP ANALYSIS

EGYPT TAPR-II: TRADE COMPONENT

TECHNICAL ASSISTANCE FOR POLICY REFORM II

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1. INTRODUCTION

The Trade Component of the Egypt TAPR-II engagement requires an assessment of where the Egyptian Customs computing environment currently is, and where it needs to go during the Interim Modernization Phase. The goal of the IT Gap Analysis, therefore, is to identify the gaps between the current and interim IT states, document risks associated with the gaps, and identify potential solutions that can resolve the gaps and mitigate risk.

It is important to note that other donors and advisors have worked extensively with Egyptian Customs over the past few years, and the intent of this analysis is not to repeat work that has already been performed. The intent is to identify immediate/critical IT gaps during the Interim Modernization Phase that may be addressed by Egyptian Customs, USAID, the European Union, and other donors.

The Gap Analysis should be considered a living, working document. Over the course of the TAPR-II project, the document will be updated. The current document represents the initial benchmark. More gaps will become apparent with time, and new gaps will develop as the IT function develops.

1.1. Purpose

The purpose of conducting the Interim Modernization Phase IT Gap Analysis for Egyptian Customs is to compare the current IT environment to the desired interim state for customs administration. The gap analysis highlights the key IT changes required within the organization to achieve interim goals. These changes can then be prioritized and addressed by the main parties involved in the modernization program of Egyptian Customs.

To summarize, the main goals of the Interim Modernization Phase are to:

- 1) Standardize the version of the current Customs Commission Automated System to the latest version provided by the vendor.
- 2) Create centralized data processing centers in Cairo and Alexandria, that is, the installation and implementation of the necessary hardware and software, thus eliminating the need in the future for separate databases in all operational locations.
- 3) Upgrade networks as necessary to support centralized data processing.
- 4) Create a central database.
- 5) Address critical security threats.
- 6) Improve management reporting.

Although the purpose of this document is to identify key gaps between the current state and the desired end state after the Interim Modernization Phase, the analysis address longer term issues to the extent possible, keeping in mind the goal of implementing a new Customs Information System.

1.2. Scope

This Gap Analysis covers the IT needs of the entire Egyptian Customs organization and focuses on identifying the key gaps that should be addressed during the Interim Modernization Phase. Issues relating to the implementation of a new Customs Information System are also covered to the extent possible.

The gap analysis does not represent a commitment by the TAPR-II project to address the gaps identified herein. Rather the analysis is designed to identify the key gaps in order to facilitate a discussion on how best to address them.

1.3. Target Audience

This document has been prepared for Egyptian Customs and will be useful for the donor community in general, including USAID and the European Union.

2. DATA GATHERING – CURRENT STATE

This section covers the current state of Egyptian Customs' technical infrastructure, in order to assess where further automation might be introduced as part of TAPR-II to increase operational efficiencies and reduce clearance times.

The information technology infrastructure of Egyptian Customs is partially developed and needs significant improvement to comply with internationally accepted standards. Key deficiencies are apparent with the Customs Commission Automated System, the data processing center in Alexandria, system security, policies and procedures, staffing and training. These and other deficiencies are identified in this section of the document. It should be kept in mind that the gaps identified specifically apply to the Interim Modernization Phase. Nonetheless, the gap analysis will provide insight into the IT requirements for the longer term.

2.1. Enterprise Architecture

The current Customs enterprise architecture is not very robust. It was primarily developed to support the Customs Commission Automated System, which has significant design flaws considering technology that is currently available. Part of the problem has been a lack of investment in information systems and IT infrastructure over the years. The main architectural issue is that the Customs Commission Automated System has been implemented as a distributed system with independent databases running in the main Customs locations. This situation would have made sense when the system was initially developed in 1998 because of the tools available to program the system and poor data communications. The situation, however, is significantly different today. Programming tools and system technologies are now available to develop and implement a much more robust systems architecture, and the Customs wide-area network (WAN) has been upgraded to the point that the current architecture does not effectively utilize its capacity. The Interim Modernization Phase will address some enterprise architecture issues, but much more will need to be done in the future before a new Customs system should be installed and in order to approach international standards.

The table below summarizes the Customs enterprise architecture, including the main components, the technology and/or implementation, and status.

Table 1. Customs Enterprise Architecture

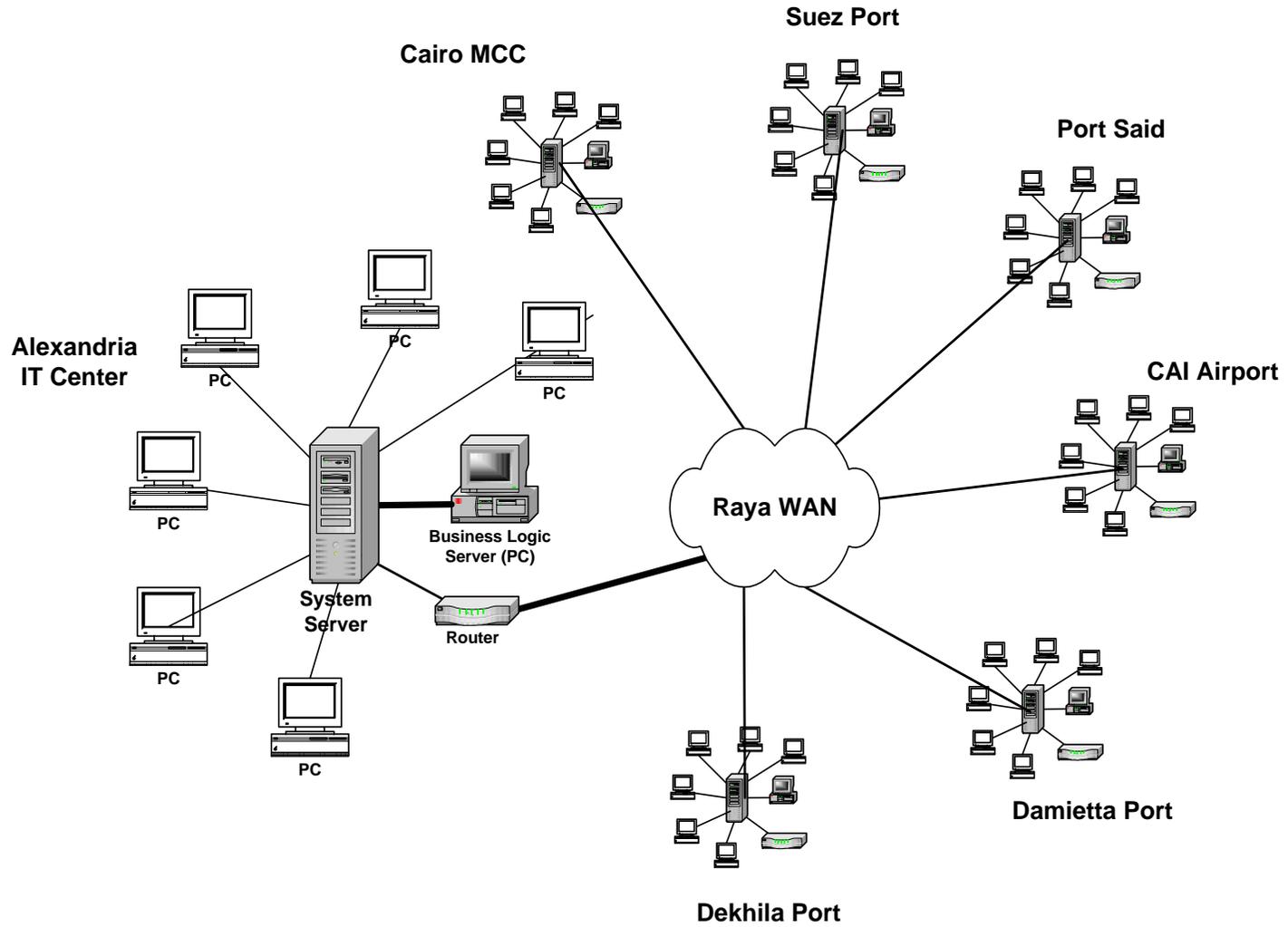
Main Architecture Components	Technology/ Implementation	Status
Customs Commission Automated System	<ul style="list-style-type: none"> ▪ A 3-tier model has been implemented with a database platform, business logic server and a client ▪ Database Management System is Sybase 11.5 ▪ Operating system is Unix NCR MPRAS 4.5 ▪ Xeon Dual Processor Servers with RAID storage support the databases at the 5 main sites ▪ A business logic server has been implemented to reduce the processing load (implemented on PCs) 	<ul style="list-style-type: none"> ▪ Functional upgrades to the system, standardization of versions in all locations, and creation of a central database are underway, but no change is planned for the architecture model ▪ The DBMS is being upgraded to Sybase12.1.5. ▪ The operating system is being upgraded to SUSE Linux Enterprise Version 9 ▪ Clustered servers (2 Xeon Quad Processor Servers) with shared storage will be implemented in Alexandria and Cairo
Customs Commission Automated System User Application	<ul style="list-style-type: none"> ▪ Developed with PowerBuilder6 ▪ Workstations – 412 Pentium II PCs and 500 Pentium IV PCs ▪ Operating systems for PCs running the user application include Windows 95, 98 and XP 	<ul style="list-style-type: none"> ▪ The development environment for the application is being upgraded to PowerBuilder10, which should improve the user interface and functional capabilities of the application
<p>Temporary Admissions System</p> <p>(Financed by the USAID ATR project and development was supervised by the Ministry of Foreign Trade. The Temporary Admissions function is in the process of being transferred to Customs)</p>	<ul style="list-style-type: none"> ▪ The system was implemented on its own servers (Dell PowerEdge 1600) with dedicated PCs ▪ Database management system is Sybase 11.5 ▪ Operating system is Unix NCR MPRAS 4.5 ▪ User application was developed with PowerBuilder6 ▪ Data communications are provided by Nile Online Frame Relay Network Services 	<ul style="list-style-type: none"> ▪ The system is in the process of being transferred to Customs ▪ The DBMS is being upgraded to Sybase12.1.5. ▪ Operating system is being upgraded to SUSE Linux Enterprise Version 9 ▪ Data communications should be transferred to the Raya MPLS network
<p>Electronic Payments System</p> <p>(Tabarak [Masryia] developed the messaging service to share payment information between bank systems and the Customs Commission Automated System)</p>	<ul style="list-style-type: none"> ▪ Implemented as a messaging service between Customs and commercial banks ▪ Database Management System is Sybase 11.5 ▪ Operating system is Unix NCR MPRAS 4.5 	<ul style="list-style-type: none"> ▪ Banks provided equipment and leased lines to support pilots ▪ First stage implemented in Alexandria ▪ The DBMS is being upgraded to Sybase12.1.5. ▪ Operating system is being upgraded to SUSE Linux Enterprise Version 9
Trader Web Services	<ul style="list-style-type: none"> ▪ Traders access basic services for submitting declarations and 	<ul style="list-style-type: none"> ▪ A demilitarized zone needs to be implemented, using a router, as

Main Architecture Components	Technology/ Implementation	Status
	<ul style="list-style-type: none"> manifests electronically over the Internet ▪ User authentication has been implemented, but not secure socket layer encryption (SSL) based on digital certificates ▪ Server is hosted at the Electronic Trading Directorate (Misr Station - Alexandria) ▪ A firewall has been implemented with ISA 2004 	<ul style="list-style-type: none"> soon as possible ▪ Public key infrastructure using SSL and digital certificates should be implemented as soon as possible
E-mail	<ul style="list-style-type: none"> ▪ Microsoft Exchange Server ▪ Server implemented at Alexandria IT Center 	<ul style="list-style-type: none"> ▪ Approximately 300 e-mail accounts have been created for Customs Managers ▪ Need to create e-mail accounts for Customs Commission Automated System users ▪ Need to implement a backup e-mail server
Wide Area Network (Supplied by Raya Holding)	<ul style="list-style-type: none"> ▪ 21 Customs Locations are connected ▪ Multi-protocol label switching network with failover ISDN ▪ Cisco 1760 routers 	<ul style="list-style-type: none"> ▪ Two additional connections are planned which will make the total 23
Local Area Networks	<ul style="list-style-type: none"> ▪ Unix NCR MPRAS 4.5 for file server ▪ Implemented primarily with 10/100 Mbps hubs ▪ Capacity of network interface cards ranges from 10 to 100 Mbps ▪ Network speeds are typically 10 Mbps because of implementation with hubs and mix of 10 and 10/100 Mbps network interface cards 	<ul style="list-style-type: none"> ▪ Upgrading to Linux SUSE Enterprise version 9 ▪ No domain server implemented ▪ Need to implement network switches in order for LANs to run at 100 Mbps
Web Server	<ul style="list-style-type: none"> ▪ Windows 2003 Server ▪ Server implemented at Electronic Trader Directorate (Misr Station) 	<ul style="list-style-type: none"> ▪ No changes planned
Electronic Archiving	<ul style="list-style-type: none"> ▪ Documents are scanned for Temporary Admission and images are stored and indexed 	<ul style="list-style-type: none"> ▪ No changes planned
Data backup	<ul style="list-style-type: none"> ▪ Backups stored on server hard disk and on tape—20 GB tapes at main sites ▪ Backups only stored on 4 GB tapes at smaller sites 	<ul style="list-style-type: none"> ▪ Shared storage will be implemented in Alexandria and Cairo, but tape backup should still be used

in Architecture mponents	Technology/ Implementation	Status
Printing Facilities	<ul style="list-style-type: none"> ▪ Network laser printers ▪ Dot matrix printers 	<ul style="list-style-type: none"> ▪ Need to procure new printers for MCCs

The diagram below depicts the systems architecture of the Customs Commission Automated System. The development of the Customs enterprise architecture has been based on the requirements of this system.

Diagram 1. Current Architecture of the Customs Commission Automated System



2.2. System Hardware

Much of the system hardware is old and almost obsolete. To put the situation in perspective, Customs has 37 servers with Pentium II or Pentium Pro processors and 412 PCs with Pentium II processors. Customs will need to replace most of its old hardware and should also consider future hardware needs. As new systems are introduced, more and more hardware will be required to support these new systems. The emphasis will need to be on providing hardware for the main operational systems. The subsections below break down the current allocation of hardware by the key areas of need for Customs operations. There has been a recent procurement of 21 servers and 500 PCs by the Ministry of Communications (See table 2 below for PC allocation). This goes part of the way towards satisfying the needs of Customs, but much more is undoubtedly needed.

In advanced economies, most public sector administrative staff have a PC and access to basic systems and services, such as office productivity tools (that is, word processing, spreadsheet and presentation software), e-mail, shared directories/files and printing services. While this is an obvious point, it should not be overlooked in terms of the long-term view of hardware and software needs.

Table 2. Hardware Allocation for Ministry of Communications Procurement

Location	Hardware
Alexandria	<i>Servers:</i> 2 - IBM eServer xSeries 255 <i>PCs:</i> 200 Pentium IV
Cairo	<i>Servers:</i> 2 - IBM eServer xSeries 255 1 - HP Proliant ML 350 G4 <i>PCs:</i> 130 - Pentium IV
Port Said	<i>Server:</i> 1 - HP Proliant ML 350 G4 <i>PCs:</i> 90 - Pentium IV
Suez	<i>Server:</i> 1 - HP Proliant ML 350 G4 <i>PCs:</i> 80 - Pentium IV
Damietta	<i>Server:</i> 1 - HP Proliant ML 350 G4
Dekhila	<i>Server:</i> 1 - HP Proliant ML 350 G4
Amreya	<i>Server:</i> 1 - HP Proliant ML 350 G4
Saloom	<i>Server:</i> 1 - HP Proliant ML 350 G4
Nozha – Airport	<i>Server:</i> 1 - HP Proliant ML 350 G4
Ismailia	<i>Server:</i> 1 - HP Proliant ML 350 G4
Al-Ooogaa	<i>Server:</i> 1 - HP Proliant ML 350 G4
Safaga	<i>Server:</i> 1 - HP Proliant ML 350 G4
Noeibaa	<i>Server:</i> 1 - HP Proliant ML 350 G4
Adabeya	<i>Server:</i> 1 - HP Proliant ML 350 G4
Arish	<i>Server:</i> 1 - HP Proliant ML 350 G4
Oil	<i>Server:</i> 1 - HP Proliant ML 350 G4
Aswan	<i>Server:</i> 1 - HP Proliant ML 350 G4
Decision Support Center	<i>Server:</i> 1 - HP Proliant ML 350 G4

2.2.1. Data Processing Centers

As Customs upgrades its overall systems architecture and key computer systems, this Gap Analysis anticipates shifting to a centralized n-tier architecture for the core Customs Commission Automated System. This implies creating centralized data processing centers in key locations. For Egyptian Customs, one main data processing center and a backup data processing center at a secondary location are sufficient¹. The most logical site for the main data processing center is Cairo, and Alexandria would make a good backup site. Therefore, this analysis highlights the IT infrastructure at these key locations. The key advantages to

¹ A document prepared by Tom Pine for the European Union (Terms of Reference and Technical Specification for Supply of IT for Risk Management and Post Clearance Controls) estimates the number of customs declarations processed per day to be around 5,000, which can be handled by one main data processing center as long as it has sufficient processing power.

setting up the main data processing center in Cairo include better telecommunications infrastructure, access to a greater number of highly skilled IT professionals, more regular contact with upper management (complementing the creation of the Technology Sector), separation from an operational environment, superior office infrastructure and improved vendor support.

2.2.1.1. Main Site in Cairo

There are preliminary plans to implement the main customs data processing center in Cairo at the Ministry of Finance complex. However, these plans have not been fully funded. So far two IBM eServer xSeries 255 servers (quad Xeon processors) with shared storage have been supplied to this location (See appendix A for specifications). Additional servers, PCs, the LAN, related networking hardware and peripheral devices still need to be procured. The estimated value of the project ranges from 5 to 5.5 million Egyptian Pounds. Completing this project during the Interim Modernization Phase is a high priority because it takes time to install the hardware, identify or hire staff to run the center, and prepare the site for normal operations. The main computing center needs to be operational by the time a new Customs information system is ready to be installed.

2.2.1.2. Backup Site in Alexandria

Alexandria is currently the main IT center and does not need any significant upgrade of systems hardware to become the backup data processing center, besides the two IBM eServer xSeries 255 servers (same as Cairo) it has already received. The old servers currently supporting the Customs Commission Automated Systems will also be available to support other systems as needed, after the new Customs information system is centralized in Cairo.

The table below summarizes the hardware currently supporting the IT Center in Alexandria.

Table 3. Hardware Supporting the IT Center in Alexandria

Hardware	Quantity
Server 4300 - Main Site	5
RAID Disk 6282	2
Server S20 - Far Site	12
Note Book PAC 1590	1
PC 3271 NCR	12

2.2.1.3. Main Customs Locations

The main Customs computing sites are Alexandria, Cairo, Port Said, Suez and Dekhila. These locations and other key Customs locations have received new servers, HP Proliant ML 350 G4 servers (See appendix A for specifications), as part of the recent Ministry of Communications procurement. These servers are enough to support operations in these locations through the Interim Modernization Phase.

2.2.2. Model Customs Centers

Model Customs Centers (MCCs) are in the process of being created throughout Egypt. These centers are designed to reduce the administrative burden on traders and facilitate trade. So far, only the MCC in Alexandria has been outfitted with hardware. The table below

outlines the hardware that is in place and also represents the estimated requirement to support the Alexandria MCC effectively through the Interim Modernization Phase.

Table 4. Current Alexandria MCC Hardware

Type of Hardware	Quantity
PCs	42
Plasma Screens	2
24-port Switches	*2
Network Laser Printers	1
Dot-matrix Printers	23
Photocopier	1
Fax Machine	1

2.2.3. Risk Management

A Customs Risk Management Department has been created. This unit, however, is in its very early stages of development, and only two staff (the planned number of staff is 12) have been assigned to it. These staff only have standard PCs at this time.

2.2.4. Post Clearance Audit

Post Clearance Audit (PCA) is a critical customs function, and developing this function is an important part of the Customs reform program. At this time, no hardware has been specifically allocated for PCA.

2.2.5. National Customs Training Institute

As part of the Customs reform program, a National Customs Training Institute will be created. Although there are currently regional training centers, this institute will be a completely new organization within Customs and will need new hardware and software for both operations and training. The EU TEP-C project will provide the required hardware and software.

2.3. Customs IT Systems

A complement of IT systems is required for a smoothly operating customs organization. Egyptian Customs has logically focused on the core Customs Commission Automated System with additional support modules built into the core system for basic operations, including personnel, purchases, budget, suppliers and payroll modules. The Customs Commission Automated System, however, fails to meet international standards and should either be upgraded or replaced. TAPR-II will analyze the options for upgrading or replacing the Customs Commission Automated System, provide guidance and recommendations on the appropriate steps forward, and assist with implementation of the agreed solution. The other main systems also need to be addressed in order to modernize Egyptian Customs. The subsections below discuss the current situation with the Customs Commission Automated System, as well as single window, data warehouse, human resources and enterprise resource planning systems.

2.3.1. Customs Commission Automated System

NCR won a tender in 1998 to supply a Customs Commission Automated System to Egyptian Customs. NCR provided the hardware for this project and subcontracted the development of the system to a local firm—Tabarak. The original system that was developed and implemented satisfied the basic needs of Customs and started the organization down the path of automation. This system, however, has not been sufficiently supported over the years, due to contractual disputes, and does not meet necessary international requirements, according to analyses conducted by previous advisors. One of the main objectives of TAPR-II is to assist with the upgrade or replacement of the current system to ensure that it meets international standards. This objective is beyond the scope of this document since the gap analysis is focused on the gaps and deficiencies that need to be overcome during the Interim Modernization Phase. Nonetheless, it is important to keep in mind the future direction of the Customs Commission Automated System.

The current systems architecture for the Customs Commission Automated System is not robust and does not exploit available technologies effectively. The most critical deficiency is that the Customs Commission Automated System has been implemented as a distributed system. This situation would have made sense when the system was first implemented because the initial system was based on the client server model and the quality of data communications was very poor. However, this situation does not make sense now.

Since the initial implementation of the system, the architecture has been changed to a 3-tier architecture and the WAN has been upgraded. The 3-tier architecture uses an intermediate server for processing business logic and calculations. The implementation of the 3-tier architecture has very limited scalability, due to the so-called application server being installed on basic workstations. Therefore, the enterprise architecture still depends on distributed implementations of the system in main Customs locations.

Implementing the Customs Commission Automated System as a distributed system causes problems for management reporting. Even though there is a wide-area network for data transfer, the process of consolidating data and generating reports is not automated, and the main IT center in Alexandria has to aggregate data from the main Customs locations for consolidated reporting. This creates significant reporting problems because it is time-consuming and error prone to consolidate data for management reporting. Other problems, such as operational inefficiencies, multiple systems versions and poor data quality, can also be attributed to a fully distributed systems architecture.

During the Interim Modernization Phase, NCR is addressing two key issues for the Customs Commission Automated System:

- Installing the latest (same) version of the Customs Commission Automated System in all locations and
- Creating and implementing a central database (a precursor to the data warehouse) at the Alexandria IT Center.

Having the latest version of the Customs Commission Automated System installed in all locations will make it easier to support, and a central database is desperately needed to facilitate management reporting. Egyptian Customs took the right step by going ahead with these initiatives, even though the current system needs to be further upgraded or replaced.

2.3.1.1. Database Management System

Sybase 11.5 is currently used as the database management system for the Customs Commission Automated System and will be upgraded to Sybase 12.1.5 during the Interim Modernization Phase.

2.3.1.2. Customs Commission Automated System User Application

The Customs Commission Automated System User Application is one of the main components of the Customs Commission Automated System. During the Interim Modernization Phase, the Customs Commission Automated System User Application will be standardized, so all users will have the latest application installed. The development tool used to create the application was PowerBuilder6, and the development environment is being upgraded to PowerBuilder10.

The application runs on PCs using the Windows operating system, and this is not expected to change. Windows is the easiest PC operating system to support and is the generally accepted standard. The main issues for supporting Windows on PCs are running Windows updates for security patches and regularly scanning for viruses with update virus definitions.

2.3.2. Single Window

The purpose of single window software is to have one electronic customer interface, instead of requiring customers to submit documents online or manually to multiple locations. The single window software then routes the documents to the appropriate organization for processing and approval. In other words, single window software amounts to a document workflow system. Implementing this kind of software should reduce Customs clearance times substantially because documents do not have to be reentered, time is not wasted due to the submission of documents to multiple locations or organizations, documents are automatically routed to other organizations for processing when that is required, and the status of documents and feedback on the process can be obtained online.

Customs clearance times are currently averaging between 10 and 14 days in Egypt, which is unacceptable. Much of this delay is probably dead time during the handoff between organizations involved in the clearance process, specifically Customs and GOIEC. Implementing single window software will help, but cannot resolve all the delays experienced with Customs clearance. Processes need to be reengineered to make them more efficient, risk selection needs to be fully implemented and documents that pass risk assessment should be processed automatically with automatic notification to the customer. The classic example of a successful single window implementation for Customs is TradeNet in Ghana.

Note: TradeNet should not be confused with a Customs Commission Automated System. TradeNet is a single window/document flow system that improves the efficiency of Customs clearance by directing required documentation to the proper authorities. It does not, however, process declarations, include tariff valuation, automate risk selection, account for duties and payments, facilitate transit or perform any of the other basic tasks of a Customs information system.

An interface with GOIEC has been implemented in Ein Sokna. This interface is a step towards a single window system, but does not interface with all control agencies. The system also does not automate the processing of documents: it only shares data between the systems for later processing. Even with the implementation of this system, clearance times in Ein Sokna have not improved substantially.

The USAID ATR project has prepared a tender for the design and implementation of core components of an Automated Inspection System that would interface between the Customs Commission Automated System and the GOIEC system². The completion of these core components is scheduled for June 2006, and the interface will be based on XML. The planned interface does not cover the other control agencies that are involved in Customs clearance and will need to be integrated with the Customs Commission Automated System.

² Other control agencies involved in the Customs clearance process include the Ministry of Interior Affairs, the Ministry of Foreign Affairs, the Ministry of Trade and the Ministry of Industry.

2.3.3. Web Services

Customs has started a pilot project for implementing basic Web services for the current Customs Commission Automated System. The reason for doing this is to allow remote locations to connect to the system and to allow direct trader input from traders' offices. All that will be needed is an Internet connection, although it is preferable to use a secure network for access. Customs needs to keep in mind that implementing Web access over the Internet does add specific security requirements.

2.3.4. Data Warehouse

Customs does not currently have a data warehouse. However, an initial step towards building a data warehouse, the creation of a central database, is in progress.

2.3.4.1. Extract, Transform and Load Tools

Extract, transform and load tools are not required at this time by Customs because no data warehouse has been implemented.

2.3.4.2. Online Analytical Processing Tools

No online analytical processing (OLAP) tools are currently being used by Customs. In the Interim Modernization Phase, it would be useful, however, to purchase a management reporting tool for interrogating the central database that is being created.

2.3.5. Human Resources System

A proper Human Resources System has not been implemented by Customs. There are systems available, however, that help with managing human resources: an old standalone personnel system and the personnel and payroll modules in the Customs Commission Automated System. (Note: the personnel module in the Customs Commission Automated System is not consistently used.) The old personnel system gathers basic data on personnel, and the payroll module, as the name implies, manages staff payroll. These systems are not sufficient for supporting a robust human resources function.

2.3.6. Enterprise Resource Planning

Enterprise resource planning systems have become standard requirements for large, complex enterprises and organizations. These systems are integrated solutions that cover a very wide variety of operational needs. Standard ERP system functionality includes order entry, accounts receivable and payable, general ledger, purchasing, warehousing, inventory, transportation and human resources. Even though ERP systems were initially developed for manufacturers, ERP system implementations are becoming more common in other types of organizations, and most of the key software vendors have customized solutions for the public sector.

Customs has not implemented an enterprise resource planning system, and this is not a priority. However, the Ministry of Finance is in the process of implementing an ERP solution, and at some time in the future, it would make sense to extend this solution to Customs.

2.3.7. Customer Relationship Management

Customs has not implemented a Customer Relationship Management System, and it should not be a priority. For now sufficient information can be gathered from the Customs Commission Automated System to track traders and their activities.

2.3.8. IT Equipment Inventory

No database system is currently used to manage IT equipment inventory. Implementing such a system would be very helpful for IT planning, tracking equipment warranties and repairs, and procurement activities.

2.3.9. Helpdesk

No helpdesk software has been implemented by Customs. This is a serious deficiency that needs to be addressed. Customs needs to track problems users are having with computer systems in order to have them resolved quickly and efficiently. Otherwise, problems that could have been resolved are likely to continue and unnecessarily waste the time of users.

2.4. Statistical Risk Models

Customs has not created any statistical models yet for risk assessment. This is a high priority, and a project has been funded by the EU TEP-C project to create among other things a risk analysis database and initial risk models.

2.5. Networking

The Customs wide-area network (WAN) has been outsourced to Raya Holding, the top IT integrator in Egypt. The WAN is based on multi-protocol label switching (MPLS). This is a network protocol that maximizes performance by monitoring network traffic and routing data packets along the most efficient network path. Purchasing network services from a vendor is cost effective and reliable option, as long as there are capable vendors in the local market. The performance of the network has been satisfactory. However, future demands on the network are likely to lead to greater bandwidth requirements.

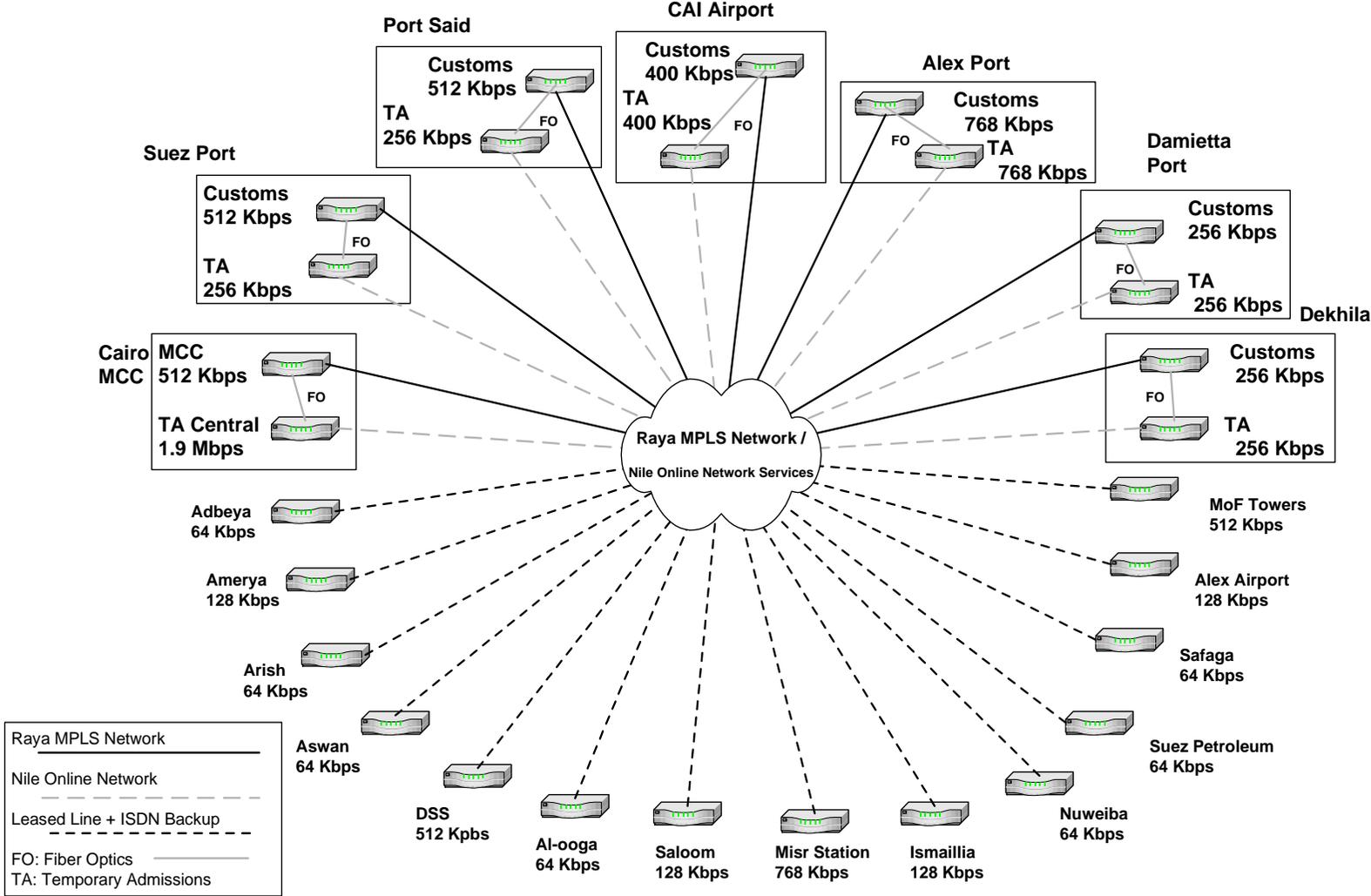
2.5.1. Topology

The WAN supplied by Raya uses MPLS with automatic failover ISDN, and the architecture is a simple star schema. Fiber optic cables provide the data transport medium, and Cisco routers have been implemented for managing network traffic. Currently, there is no redundancy in the WAN.

Redundancy could be provided through the network along primary and secondary network connections. At the Cairo MCC, Cairo Airport, Alexandria, Suez, Port Said, Damietta and Dekhila, for example, Customs offices are currently connected to the Raya MPLS network, Temporary Admissions offices are connected to a Nile Online service and these offices at each location are connected by fiber optic cable. Customs and Temporary Admissions, however, have been separate organizations (Customs reporting to the Ministry of Finance and Temporary Admissions reporting to GOIEC), and the fiber optic connections between these organizations have not been exploited to provide network redundancy. Apparently, Temporary Admissions will shift under Customs, and if this happens, the Temporary Admissions offices should be connected to the Raya MPLS network. This may present a good opportunity to introduce redundancy into the network in the short run with primary and secondary network connections. Other options for network redundancy also need to be investigated.

The diagram below depicts the network topology.

Diagram 2. Customs Wide-area Network Supplied by Raya



2.5.2. Internet Access

According to a questionnaire submitted to the Customs IT Department for the gap analysis, only Alexandria has Internet access, and this is on a pilot basis. Internet access, however, is almost impossible to control in this environment. Any office could set up an informal connection to the Internet, specifically through a dialup or ADSL connection. This poses a significant security risk to Customs IT systems. A policy needs to be established to discourage unauthorized access to the Internet.

2.5.3. Network Management Software

Customs is not currently using network management software to manage or monitor the wide-area network (WAN). The two main concerns are that bandwidth may not be used efficiently, causing bottlenecks, and there is no way to check if the service level agreement with Raya is being satisfied. The Operational Manager of the Alexandria IT Center is of the view that WAN performance was satisfactory, and if there is a problem, the IT staff call Raya's call center to get the problem resolved. As long as performance is satisfactory, Customs does not really need to have network management software. The whole point of outsourcing network services is not to have to worry about these kinds of issues. For Customs having its own network management software is primarily an issue of maintaining a minimum comfortable level that the network is operating and being managed properly.

2.5.4. LANs

Customs LANs in most locations are in poor shape. The main problem is that hubs are still predominantly in use. While many hubs are capable of running at 10 or 100 Mbps, they can only run at the speed of the slowest network card attached to the LAN. Since Customs has over 400 old PCs with 10 Mbps network cards, this presents a significant problem. Either a large number of PCs cannot be connected to the LANs, or the LANs will only be able to run at 10 Mbps. The latter is the case throughout Customs. The solution is to replace the hubs with switches, particularly in the main Customs locations. The price of switches has come down tremendously over the last five to ten years, so this is not a very expensive proposition, and it will significantly improve the performance of the LANs.

Network domains need to be set up, and users need to be assigned logins and passwords. Establishing domains will help protect the Customs Commission Automated System because users will have to log into their domain before they can gain access to the system. When asked why this has not already been done, the IT staff at the Alexandria IT Center said there was only one person to set up all of the user accounts necessary, and this person did not have enough time. Clearly, more staff need to be trained in network administration in order to establish and maintain network domains.

2.6. System Security

Virtually no system security exists within the Customs network. This situation needs to be addressed immediately. The gap analysis highlights the initial problems that need addressing, but a full system security review needs to be conducted to bring Customs up to acceptable standards.

2.6.1. Antivirus Software

No antivirus software has been implemented by Customs. This is a critical issue that must be addressed as soon as possible. Viruses, trojan horses, worms, spyware and adware can infect Customs computer systems and cause considerable damage—including deleting and erasing data on hard drives. While the design of Microsoft Windows makes it more vulnerable than either Linux or Unix and it is also a favorite target of hackers and virus writers, Customs still needs antivirus software to protect systems running on UNIX and Linux. In addition PCs running on Windows are obviously vulnerable. Customs needs to address this issue as soon as possible and implement a comprehensive antivirus solution.

2.6.2. Proxy Servers and Firewalls

Proxy servers and firewalls provide the first line of defense against cyber attacks. Customs has two firewalls set up in Alexandria: one for Web Services and the other for normal Internet access. The firewall software used is part of Microsoft's Internet Security and Acceleration Server 2004. Since these firewalls cover the only official Internet connections, Customs appears to be sufficiently protected. However, a thorough IT audit of all Customs locations should be conducted to determine if there are any unauthorized Internet connections that have been established, which open up Customs to malicious attacks. Ein Sokna, as a private port for example, may have set up an Internet connection that exposes the entire network to Internet security threats without the knowledge of Customs IT.

2.6.3. Network Intrusion Software

No network intrusion software of any kind has been implemented by Customs. As long as there are connections to the Internet, this situation leaves Customs very vulnerable. Customs must monitor their networks for unauthorized intrusions. Hackers may be interested in crashing systems, deleting and/or manipulating data, and stealing data. All of which could have a very negative impact on Customs.

2.6.4. Virtual Private Network

Standard virtual private network (VPN) software establishes connections (a tunnel) between two network points and encrypts data that is sent between the points, using the IP Security Protocol (IPsec). Customs is not using VPN software to create secure connections for data transfer. In theory Customs does not need to at this time because it is using a private MPLS network supplied by Raya. However, clarification needs to be provided by Raya on how the WAN has been configured. (Raya has not yet responded to requests for this information). The network should be implemented as a trusted VPN using the level 2 or 3 network layers.

2.6.5. Software Licensing

Software licensing is another important issue because unlicensed software (besides usually being buggy) poses a serious security threat. Unlicensed software is difficult to update, and if there is a security issue, Customs may not be able to install the appropriate security update necessary to fix the problem, leaving computers with unlicensed software vulnerable to security threats. Customs has numerous machines running unlicensed software. Typically, these machines were ad hoc purchases. Only computers with properly licensed and updated software should be connected to the Customs network. Customs needs to address the issue of software licensing immediately.

2.7. Administration

Computer automation dramatically increases the productivity of administrative staff. However, Customs has had limited funds over the years to invest in computer hardware and software for administrative staff. The majority of the PCs in place are for using the Customs Commission Automated System. A significant investment in PCs and basic office software needs to be made for administrative staff.

2.7.1. Hardware

Most of the PCs in place were purchased in two large procurements of computer equipment. The first included approximately 400 PCs, and the second included 500 PCs. These PCs were purchased to support the Customs Commission Automated System. Purchases of PCs for administrative purposes have been done largely on an ad hoc basis. Additional PCs are clearly needed for basic administrative purposes.

2.7.2. Office Productivity Tools

Most Customs administrative staff need basic office productivity tools. Office productivity tools include software, such as MS Word, Excel, PowerPoint and Outlook. These types of tools are currently used by the small number of administrative staff that have computers. These computers, however, were typically purchased on an ad hoc basis and do not have licensed versions of the software. Licensed versions of office productivity software need to be acquired because unlicensed software is a security risk. Additional licenses will also need to be purchased as more computers are purchased for administrative staff.

2.7.3. E-mail

Customs has installed an e-mail server and setup e-mail accounts for about 300 staff—primarily managers. This situation is not surprising. E-mail would not have been a high priority, and it also places significant demands on networks. Consequently, many employees are using the free services, such as Yahoo or Hotmail, available over the Internet. As an interim solution, this works. However, e-mail is a very important tool that improves overall organizational efficiency, and accounts should be set up for all professional staff. In addition government organizations need to maintain records of official correspondence using e-mail. The only way to do this is to set up e-mail accounts for professionals involved in official correspondence and make sure that the e-mail server is properly backed up. Customs needs to keep in mind that correspondence using the free services is lost.

2.8. Website

The Customs website (www.customs.gov.eg) needs to be completely revamped. Basic conventions for good website design have not been used. The most obvious issues are that it is too flashy and takes too long to load. This is not appropriate for an official government website. The main objective of the website is to provide information to the public on Customs regulations and procedures. Due to this objective, the site should be simple³, load quickly, have the right content and be easy to navigate. Customs should look at the Customs sites of other governments for comparison, for example, the U.S. Customs Service (www.customs.ustreas.gov), UK's Customs and Excise Department (www.hmrc.gov.uk) and the Canada Border Services Agency (www.cbsa-asfc.gc.ca). Graphics in general need to be minimized because they take a significant amount of time to load when users do not have a good Internet connection and are also a distraction from the main purpose of providing information. In particular it does not make sense for users to have to sit through or bypass animated graphics before conducting their business every time they visit the site. Egyptian Customs and the EU have already agreed that the EU will fund and manage the redesign and hosting of a new Customs website.

2.9. Data Backup and Recovery

Data backup and recovery is a critical function to ensure that data is not lost if there is a system failure and that systems can be restored after a disaster. Data backups are performed inconsistently ranging from daily to once a week. Although the fact that data backups are performed is a positive sign, Customs must backup databases daily, or data is likely to be lost when there are system failures. In the main Customs locations, data backups are stored on the main server and also on 20 GB tape, which is placed in a safe. For the smaller locations, the servers do not have enough disk space, so backups are only stored on 4 GB tapes and stored in a safe. To ensure daily backup, backups need to be automated and scheduled on the system servers. Clear policies and procedures also need to be

³ Professional websites usually have a lot of white space. Excessively colorful or flashy websites are usually created by developers that want to experiment with technology and test the capabilities of development software. Web developers, however, need to keep in mind the main purpose of the website they are creating and not get carried away with their work.

created for data backup and recovery, and compliance audits should be performed periodically.

2.10. Technical Support

The value of proper technical support should not be underestimated. Many IT projects fail during the implementation phase, and two of the main causes are poor training and technical support. When a user has a problem with a new system, technical support is the main resource for solving that problem. If the technical support team cannot fix the user's problem or explain how the problem should be dealt with, then the user is likely to revert back to the old way of doing business or do nothing at all. These outcomes are even more likely in an organization, such as Egyptian Customs, that does not have sophisticated computer users. Therefore, the technical support function needs to be very well developed before Customs embarks on any major new systems implementations.

In environments such as the one found at Egyptian Customs, technical support is often provided on an informal basis. Users tend to contact IT staff directly, usually based on personal relationships. This is counterproductive because there is no consistency to the support provided and queries from users can be very disruptive to the work of the IT staff—particularly during the rollout of new systems. Technical support needs to be carefully managed in order to ensure that it is provided properly and does not unduly disrupt the work of IT. Five key points for providing suitable technical support are:

- Sufficient staff must be assigned to the technical support function,
- Technical support staff must be suitably trained to provide high quality support,
- Technical support should be divided between four key areas—applications, hardware, software and networking—since most technical support staff will not have the skills to provide support in all areas,
- Onsite technical support should be available for troubleshooting basic problems, and
- A helpdesk function needs to be developed and appropriate software must be implemented to track reported problems and their resolution.

Technical support is a critical function for ensuring system sustainability. Providing proper technical support will increase Customs operational efficiency by reducing user downtime and also reinforce the implementation of new systems. The subsections below discuss the four main areas of technical support that should be provided, including Customs applications, hardware, software and networking.

In general technical support has been outsourced to vendors through maintenance contracts. This is a logical approach since there are not enough qualified staff to cover all technical support needs internally and also because the Customs Commission Automated System was developed by a vendor. Customs IT staff are only providing frontline technical support or first aid.

2.10.1. Customs Applications

Customs applications as a group cover the main Customs Commission Automated System and the other operational systems, such as the human resources and accounting systems. Users need technical support for these applications to answer their questions on system functionality (how to use the system) and to address any system failures or errors. Technical support for these applications is provided either through support contracts or on an informal basis by colleagues and IT staff.

Formal technical support for the Customs Commission Automated System is not being sufficiently provided. The reason is due primarily to contractual disputes over the years with the vendor. This is a very dire situation. Proper technical support must be provided by the vendor supplying the Customs Commission Automated System, since this is the core system for Customs operations.

2.10.2. Hardware

Providing technical support for hardware is straightforward, but nonetheless, needs to be properly managed. Customs has maintenance contracts through vendors for large procurements, and frontline support is provided by IT staff. Hardware support appears to be sufficiently provided. However, maintenance contracts with vendors need to be reviewed for consistency and cost effectiveness.

2.10.3. Software

Technical support for software is generally provided under maintenance contracts, including the Customs Commission Automated System's database management system and the main network and PC operating systems implemented at Customs. The level of support provided and overall cost for this technical support needs to be reviewed.

2.10.4. Networking

Raya Holding is supplying the WAN with technical support. A service-level agreement (SLA) dictates the performance requirements for the WAN, and Raya is responsible for maintaining the required level of service. If Customs experiences a problem with the WAN, Customs calls Raya to get it resolved. Customs, however, does not have any network management software to monitor WAN performance to know if the SLA is being met. If significant network problems develop, Customs should consider implementing network management software. This should not be an issue during the Interim Modernization Phase, but would be a prudent step before the implementation of a new Customs information system, since a new system will definitely increase network traffic.

For LANs, Customs needs proper technical support. Organizing technical support for LANs is easy and should be provided internally. The key point is to make sure technical support staff responsible for the LANs are properly trained.

2.11. IT Planning and Support Services

IT planning and support services are neither provided nor managed in a coherent fashion. Numerous players are involved in IT planning, including MoF advisors, donors, the Ministry of Communications, the Customs Reform Unit, as well as the Customs IT managers. This is a very difficult situation to manage effectively. Even though the MoF advisors help coordinate IT projects, more detailed planning is still required to ensure the best return on IT investments—which partially explains why an IT Planning and Support Services Department has been proposed as part of the Technology Sector. Support services, on the other hand, are managed primarily by Customs IT managers. The main support services tasks include technology asset management, procurement, contract management, liaison with other government agencies, and development of IT policies and procedures. The key issue here is a lack of qualified staff. The Manager of IT Operations at Alexandria and a few key staff at his disposal cannot effectively perform all of the support services required for smooth running IT operations, in addition to their responsibilities for day-to-day operations.

2.12. Environmental Controls

Environment controls are in reasonably good shape and in general are improving. The main issues to consider are air conditioning, electrical systems and physical security. Air conditioning is a critical issue in major computing centers, due to the climate. All the main computing centers have proper air conditioning. Some of the front office locations (for trader

input) and remote locations, however, do not have proper air conditioning. The reliability of electrical systems is another important issue. It has been well addressed at the main Customs locations, but is still an issue in remote locations. Last, physical security needs to be improved in most locations. Some improvements are being made with port upgrades, but tighter physical security will be needed in the future—in particular access to main computing centers. Overall, the environment for computers is in reasonably good shape, and in some locations, the situation has improved substantially because of recent upgrades at the locations.

2.12.1. Electrical Systems

Computer equipment requires reliable and stable electrical power to run properly and avoid damaging the equipment. The electrical systems in buildings where computer equipment is used should be evaluated, unless a building has recently been or is soon to be renovated. The main issues to investigate include:

- Power stability,
- Confirmation that all three electrical phases are working properly,
- Appropriate use of circuit breakers,
- Grounding, and
- Quality of wiring.

A professional electrician needs to evaluate these issues. Based on a professional evaluation, appropriate repairs and upgrades can be made.

According to staff interviewed at Customs, the electrical systems in the main Customs locations are in good shape. The electrical systems operate properly, are in a good state of repair and have a backup diesel generator. The only issue noted is that some of these locations are being renovated, which may cause power disruptions.

In lieu of a proper electrical environment, electrical equipment can be used to ensure a reliable power source and/or protect computer equipment. The normal equipment used includes: generators, UPSs and surge protectors, and voltage regulators.

2.12.1.1. Generators

Diesel generators are needed in four locations because of unstable electrical power. These four locations are Cairo (MCC), Dekhila, Atteba and Rafa. These locations justify having a generator because the current (or anticipated) number of declarations processed is substantial.

2.12.1.2. UPSs

UPSs are needed to protect equipment from power outages and avoid data loss or corruption. Computer equipment needs to be shutdown properly when there is a power failure, and UPSs can either shutdown a computer automatically or give a computer user time to shutdown a computer manually, depending on the type of UPS. Shutting down computers properly prevents data from being lost or corrupted. This is of particular importance for servers, but is also important for PCs. According to the Operational Manager of the IT Department, UPSs in remote locations are old and should be replaced.

2.12.1.3. Voltage Regulators

UPSs provide some protection against current fluctuations, but are not designed with this primarily in mind. UPSs switch over to the battery when power drops too low and also protect against power spikes. Frequent voltage fluctuations, however, are not good for a UPSs, and using a voltage regulator, in addition to a UPS, may be advisable, when power supplies fluctuate too much. Voltage regulators may also be needed for electronic

equipment, such as photocopiers, that do not need a UPS, but may be damaged by power fluctuations.

2.12.2. Air Conditioning

Air conditioning is needed to protect computer equipment from extreme heat and also to reduce the amount of dust in an office, which can also damage computer equipment. The main Customs locations are well equipped where the servers are located, but the front offices where traders submit and print declarations are generally in poor shape. New locations, such as Atteba and Rafa, will need air conditioning installed, not to mention remote locations that may also need it. The rule of thumb at a minimum should be that all Customs locations with servers should have air conditioning.

2.12.3. Physical Security

Physical security should be approached by Customs in the context of existing building conditions, funding and the need to interact with traders in order to facilitate trade. A balance needs to be struck between the goals of trade facilitation, environmental conditions, limited funds and the need for security. Physical security issues that should be addressed immediately include door locks, window bars, smoke detectors, fire extinguishers, security guards and control procedures for moving IT equipment from buildings.

In the main Customs locations these issues should already be addressed or will be addressed during port renovations. Remote locations, however, will need to be upgraded to meet minimum physical security standards. The main processing centers in Cairo and Alexandria will also require special consideration, due to their ultra-secure requirements.

2.13. Staffing

According to the Booz-Allen-Hamilton IT Assessment, there are 750 IT staff (mostly data entry), and only 17 are considered IT professionals. This corresponds, more or less, with the comments made by Mr. Abdel Radwan, Head of the IT and Trade Facilitation Department, that there are about 900 IT staff, 5 can be considered professionals, and 2 or 3 can program. On the other hand, anecdotal evidence has been provided of IT staff making changes to the Customs Commission Automated System, which is unlikely if IT skills are so low. Therefore, this gap analysis takes at face value the numbers of IT professionals outlined in the Booz-Allen-Hamilton assessment, and those figures are summarized below.

Table 5. Customs IT Professionals

Position Description	Number
System Architect	1
Programmer / Analyst	5
PC Hardware Engineer	5
Database Administrator	3
Systems Administrator	3

Besides the incredibly low number of IT professionals in general, there is a lack of IT technical support staff, which needs to be addressed. Good technical support is critical to maintaining proper operation of IT systems. If users do not know how to use systems properly or systems generate errors, resources must be available to help the users. Otherwise, a significant amount of time will be wasted by users, leading to operational

inefficiencies, and data quality will also probably suffer because data is not entered or is entered incorrectly.

While outsourcing technical support is an option and is currently done, Customs needs to make sure that the first line of technical support is properly implemented and managed. IT problems need to be reported to a central helpdesk, basic problems should be resolved by Customs technical support staff, and the resolution of problems needs to be tracked. Creating a helpdesk function is a key priority because it will increase the efficiency of technical support. But more importantly, it will track the types of problems users are experiencing in order to have a more coordinated approach to resolving IT problems. Development of the technical support function will take time, and in addition to creating a central helpdesk, IT staff need to be identified, assigned and trained to provide basic IT technical support to users.

2.14. Policies and Procedures

IT policies and procedures have only been superficially developed. Formalizing IT policies and procedures will clarify responsibilities, ensure greater consistency of system implementations, reduce problems experienced by users, improve reliability of systems, minimize inappropriate or unauthorized use of systems, protect systems against security threats and enhance the capability for disaster recovery. Some thought has been put into policies and procedures—for example, data backups are performed and a couple of firewalls have been implemented. However, much more needs to be done to formalize policies and procedures. Good IT policies and procedures are the backbone of sound IT management, and having them in place will help IT staff focus on more complex and important issues.

2.15. Training

IT staff have expressed to both the Booz-Allen-Hamilton team and the TAPR-II IT advisor the need for extensive IT training. Training provided in the past has neither been considered sufficient nor of professional quality. It is usually contracted out or provided internally by the Customs training center. One key example highlighted in Booz-Allen-Hamilton's IT assessment is that database administrators have only been provided with one week of Sybase administration training, and the training provider was not a certified/authorized Sybase training provider.

Training is the cornerstone of the IT function. Without proper training, IT staff will not be able to perform their jobs properly. Internal and on-the-job training are beneficial, but are not a replacement for professional training courses provided by certified/authorized training providers. TAPR-II recommends using certified/authorized training providers to the extent possible. This will ensure high quality training, and Customs IT staff will benefit because these courses will help them in the pursuit of professional certifications.

According to Booz-Allen-Hamilton, Customs requested in 2004/2005 that the following IT courses be funded by USAID.

- Cisco: Interconnecting Cisco Networking Devices (Preparation for Cisco Certified Network Associate)
- Certified Information Systems Security Professional
- Sybase (2 Courses): Sybase Database Administrator and Sybase Development
- Linux (3 Courses): Linux Fundamentals, Linux System Administration and Linux Network Administration
- Microsoft Certified Solutions Developer (MCSD) for Microsoft .Net (Includes 11 courses)
- Microsoft Certified Systems Engineer Windows 2003 (Includes 8 courses)

The courses for Cisco, information system security, Sybase (with the exception of Sybase development) and Linux are priorities at this time. The Microsoft courses, on the other hand, are not. Microsoft products are not extensively used by Customs beyond PC operating systems, and furthermore Customs should not be training IT staff as developers because Customs should not be in the business of developing its own software⁴. Customs needs to make sure that the training provided to IT staff fits in with the overall IT strategy and architectural plans of Customs. Even if donors provide funding for training, there are still limited resources for training, and Customs should also keep in mind that time spent in training courses is time away from the job.

In response to a questionnaire submitted to Customs for the Gap Analysis, the Customs IT Department also suggested that training is required for the following.

- System Analysis
- Database Design
- Web Design
- Windows 2003 Server
- ISA 2004
- SQL
- PowerBuilder
- Adobe Photoshop
- Front Page
- Macromedia Flash
- XML
- Microsoft .Net Framework

Many of these courses are not needed and would be a distraction away from the core technologies that need to be supported. Training must be focused on the technologies that are currently in use in Customs or will be needed in the near future.

⁴ Many of the courses requested in the past for donor funding also would not have been needed to support Customs IT operations.

3. IT GAPS – FUTURE ACTIONS

This section lays out the desired future state for Customs IT, focusing primarily on the Interim Modernization Phase and providing guidance on potential future actions. A significant amount of planning has been done for the Interim Modernization Phase, and many of the key projects are in progress. The main project is the upgrade by NCR of the Customs Commission Automated System, which includes among other things new and improved system modules, standardizing the system in all Customs locations on the same version and the creation of a central database. This project is underway, and the anticipated completion date is August 2006. For some of the other projects that are planned as part of the Interim Modernization Phase, funding has not been found yet. Based on the current state, the Interim Modernization Phase (including in-progress or funded projects) and anticipated future state, major IT gaps that need to be addressed before the implementation of a new Customs information system have been identified.

3.1. Enterprise Architecture

The Interim Modernization Phase only addresses basic enterprise architecture issues, such as creating central data processing centers in Cairo and Alexandria and implementing a central database for the Customs Commission Automated System. The whole enterprise architecture for Customs, however, will need to be changed, specifically including the implementation of a new Customs information system based on the n-tier architecture model. The reason this is not being addressed during the interim phase is that a new Customs information system has not been identified yet. The interim plans for enhancing the Customs enterprise architecture make sense, but much more will need to be done when a new Customs information system is implemented.

The table below summarizes the actions planned for the Interim Modernization Phase and those that are expected for future phases.

Table 6. Customs Enterprise Architecture Interim Changes and Future Enhancements

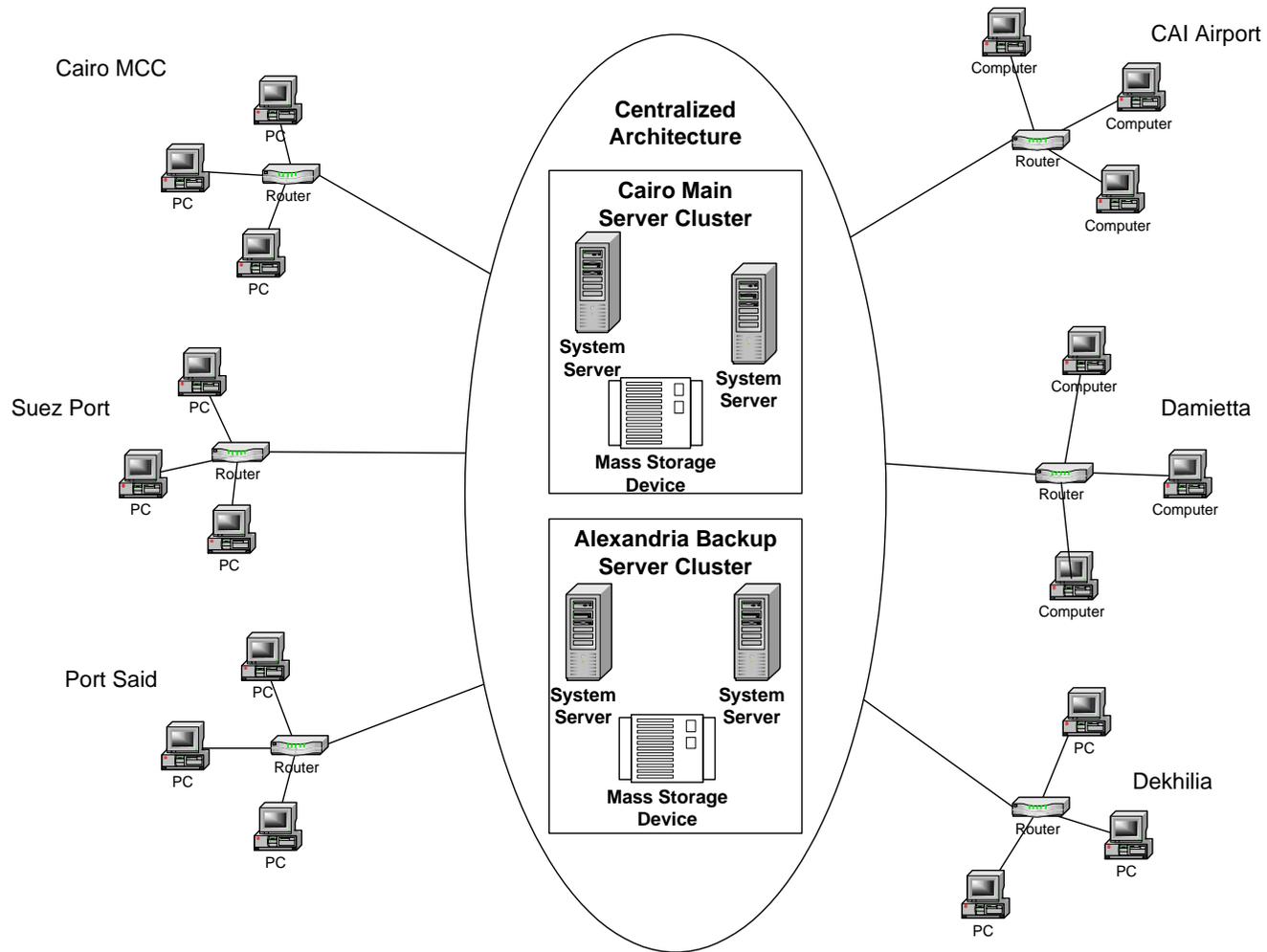
Main Architecture Components	Interim Modernization Phase	Future Actions
Customs Commission Automated System	<ul style="list-style-type: none"> ▪ Functional upgrades to the system, standardization of versions in all locations, and creation of central database are underway, but no change planned for architecture model ▪ The DBMS is being upgraded to Sybase12. 1.5. ▪ Operating system is being upgraded to SUSE Linux Enterprise Version 9 ▪ Clustered servers (2 Xeon Quad Processor Servers) with shared storage will be implemented in Alexandria and Cairo ▪ The central database currently being developed should be implemented at the main Cairo Data Processing Center 	<ul style="list-style-type: none"> ▪ Procure a new Customs Information System ▪ Centralize system at main processing center in Cairo and Alexandria ▪ Implement proper n-tier infrastructure with an application server ▪ Migrate to Oracle or Microsoft SQL Server

Main Architecture Components	Interim Modernization Phase	Future Actions
Customs Commission Automated System User Application	<ul style="list-style-type: none"> ▪ The development environment for the application is being upgraded to PowerBuilder10, which should improve the user interface and functional capabilities of the application 	<ul style="list-style-type: none"> ▪ Implement new Customs Information System Application ▪ Procure and Install additional PCs and peripherals as needed ▪ Standardize PC software configuration on one hard drive image
Temporary Admissions System	<ul style="list-style-type: none"> ▪ The DBMS is being upgraded to Sybase12.1.5. ▪ Operating system is being upgraded to SUSE Linux Enterprise Version 9 	<ul style="list-style-type: none"> ▪ The Temporary Admissions System should be part of the new Customs Information System that will be procured. ▪ The secondary Nile Online network services will no longer be needed
Electronic Payments System	<ul style="list-style-type: none"> ▪ Complete system pilots ▪ Rollout system to all main Customs locations 	<ul style="list-style-type: none"> ▪ Upgrade the system to be compatible with the new Customs information system
Single Window	<ul style="list-style-type: none"> ▪ The USAID ATR project plans to implement core components of an Automated Inspection System that would interface between the Customs Commission Automated System and the GOIEC systems 	<ul style="list-style-type: none"> ▪ Customs will need to implement Single Window software to manage effectively the interaction among Customs, other control agencies and the GOIEC system
Trader Web Services	<ul style="list-style-type: none"> ▪ A demilitarized zone needs to be implemented, using a router, as soon as possible ▪ Public key infrastructure using SSL and digital certificates should be implemented as soon as possible 	<ul style="list-style-type: none"> ▪ The website where Trader Web Services are accessed will be upgraded
E-mail Server	<ul style="list-style-type: none"> ▪ Create e-mail accounts for Customs Commission Automated System users ▪ Implement a backup e-mail server 	<ul style="list-style-type: none"> ▪ Extend e-mail to all Customs administrative staff
Wide Area Network (Supplied by Raya Holding)	<ul style="list-style-type: none"> ▪ Two additional connections are planned which will make the total 23 	<ul style="list-style-type: none"> ▪ Upgrade communication links for Cairo and Alexandria to 2 Mbps ▪ Introduce redundancy into the network and upgrade communication links as necessary
Local Area Networks	<ul style="list-style-type: none"> ▪ Upgrade LANs at main Customs locations ▪ Upgrading to Linux SUSE Enterprise version 9 ▪ Implement domains for LANs 	<ul style="list-style-type: none"> ▪ Implement LANs and domains in remaining Customs locations as appropriate
Web Server	<ul style="list-style-type: none"> ▪ No changes planned 	<ul style="list-style-type: none"> ▪ The Web server should be upgraded to a proper server ▪ A backup server should be procured as well
Electronic Archiving	<ul style="list-style-type: none"> ▪ No changes planned 	<ul style="list-style-type: none"> ▪ Electronic archiving system needs review because as

in Architecture mponents	Interim Modernization Phase	Future Actions
		implemented it provides minimal value
Data backup	<ul style="list-style-type: none"> ▪ Shared storage will be implemented in Alexandria and Cairo ▪ Data backup policies and procedures should be developed and implemented 	<ul style="list-style-type: none"> ▪ Implement data backup and recovery for centralized databases in Cairo and Alexandria and the data warehouse
Printing Facilities	<ul style="list-style-type: none"> ▪ Procure new printers for MCCs 	<ul style="list-style-type: none"> ▪ Customs has a large number of printers, but these are old and a large number should be replaced,

The diagram below depicts the conceptual architecture for the new Customs information system. The key points are centralizing the system, creating primary and secondary data processing centers in Cairo and Alexandria respectively, and implementing a scalable n-tier solution.

Diagram 3. Conceptual Architecture of the New Customs Information System



3.2. System Hardware

A whole array of hardware is needed to support the current and future Customs information system, as well as other operational systems. The latest lot of equipment—21 servers and 500 PCs, supplied by the Ministry of Communications—will satisfy the needs of the Interim Modernization Phase. However, implementation of a new Customs information system and further Customs reforms will require substantially more hardware. The subsections below highlight hardware gaps that need to be addressed this year with guidance on future hardware needs.

3.2.1. Data Processing Centers

Although the long-term IT strategy probably includes the procurement and implementation of a new Customs Commission Automated System, this should not delay developing the proper IT infrastructure in Cairo and Alexandria for data processing centers. Customs should go ahead with acquiring, setting up and implementing the basic hardware for the Cairo Data Processing Center and upgrading as necessary the Alexandria site as the future backup data processing center. The main issue is not to be overzealous at the early stages. A conservative approach is appropriate because the exact hardware needs will not be apparent until a new Customs information system has been selected. Nonetheless, it is important to install basic infrastructure, recruit staff and establish these centers as soon as possible. These centers need to be well established before the implementation of a new system.

3.2.1.1. Main Site in Cairo

The two recently supplied quad processor servers (part of the large procurement by the Ministry of Communications) are the first major step in setting up the main data processing site in Cairo. Clearly, however, additional hardware is needed, and a project to supply this hardware was planned by Customs at an estimated cost of 3.5 to 4 million LE. Funding for this project is still being sought. The key point to keep in mind is that the main processing center must be set up before implementing a new Customs information system.

3.2.1.2. Backup Site in Alexandria

The IT Center in Alexandria is currently the main data processing site. With the additional equipment supplied by the Ministry of Communications, the Alexandria site does not need any additional hardware for the Interim Modernization Phase. Furthermore, no significant amount of additional hardware should be required in the foreseeable future unless hardware from Alexandria is to be transferred to the main site being set up in Cairo.

3.2.2. Model Customs Centers

Since the MCC program is an important part of the Customs reform effort, MCCs in other key locations in addition to Alexandria should be established and outfitted with hardware relatively quickly. The MCCs are a potential area for the TAPR-II (USAID) and TEP-C (EU) projects to fill the gap. The table below outlines the suggested requirements for the remaining MCC locations (in addition to Alexandria), based on responses to a questionnaire submitted to the Customs Reform Unit. These MCCs should have similar but scaled back hardware requirements in comparison to Alexandria. This analysis anticipates that other MCCs will be established at Cairo (Nasr City), Dekhila, Port Said, Suez, Damietta and Ein Sokna. However, Damietta and Ein Sokna have been excluded. Damietta will not need hardware because this port has been recently upgraded including IT hardware, and Ein Sokna is a private port that is already well fitted with IT equipment.

Table 7. Estimated Hardware Requirements for New MCCs

Location	Type of Hardware	Quantity
Cairo (Nasr City)	PCs	30
	Plasma Screens	2
	24-port Switches	2
	Network Laser Printers	1
	Dot-matrix Printers	18
	Photocopier	1
	Fax Machine	1
Dakhalia	PCs	30
	Plasma Screens	2
	24-port Switches	2
	Network Laser Printers	1
	Dot-matrix Printers	18
	Photocopier	1
	Fax Machine	1
Port Said	PCs	20
	Plasma Screens	2
	24-port Switches	1
	Network Laser Printers	1
	Dot-matrix Printers	12
	Photocopier	1
	Fax Machine	1
Suez	PCs	20
	Plasma Screens	2
	24-port Switches	1
	Network Laser Printers	1
	Dot-matrix Printers	12
	Photocopier	1
	Fax Machine	1

3.2.3. Risk Management

Although only two staff have been assigned to the Risk Management Department, the current plan is for the staffing to increase to twelve. The main IT requirements will be a data analysis server, PCs, and econometrics and data mining software. (It should be highlighted as well that the Risk Management Department will be a user of the planned data warehouse when it is implemented.) TAPR-II recommends SPSS (Statistical Package for the Social Sciences) for the econometrics and data mining software. The table below estimates IT requirements based on a staff of twelve.

Table 8. Risk Management Department Hardware and Software Requirements

IT Requirement	Quantity
Hardware	
Data Analysis Server (Low-end Dual Processor Server with extra RAM and hard disk space)	1
Smart UPS	1
PCs (extra memory – at least 2GB RAM)	12
Network Laser Printer	1
Software	
Econometrics Software	12 licenses
Database Management System	12 licenses
Data Mining Software	12 licenses
Server Operating System	1 license
Microsoft Office	12 licenses
PC Operating System	12 licenses

3.2.4. Post Clearance Audit

Although no hardware has been specifically allocated to Post Clearance Audit (PCA), the Customs IT Department included PCs for PCA in its estimates for the MCCs. Since approximately 60 staff will initially work in PCA, it is assumed that this number is sufficient for the Interim Modernization Phase. In addition, a procurement of 50,000 Euro worth of laptops has been planned by the EU TEP-C project.

3.2.5. National Customs Training Institute

The EU TEP-C project will supply IT equipment to support the National Customs Training Institute. This equipment will cover classroom and administrative needs, including a language laboratory. The table below lists the IT equipment requirements as proposed by the EU TEP-C project (Tom Pine prepared the requirements presented below).

Table 9. IT Equipment for the National Customs Training Institute

Room(s)	Equipment per Room	Quantity
Standard Classroom (X4)	▪ Tower-like server with data-show connection and CD player	1
	▪ Data projector	1
	▪ 19" Monitor	1
	▪ Speakers with amplifier	1set
	▪ Computer table with facility for data projector	1

Room(s)	Equipment per Room	Quantity
	<ul style="list-style-type: none"> ▪ Windows software ▪ Microsoft Office Software or equivalent ▪ Printer ▪ Scanner 	1 1 1 1
Computer Laboratory	Same as for the standard classroom plus: <ul style="list-style-type: none"> ▪ Workstations with cameras and head sets ▪ Net meeting software 	30 1
Language Laboratory	Same as for the standard classroom plus: <ul style="list-style-type: none"> ▪ Workstations with head sets and microphones ▪ Net meeting software ▪ Language software 	15 1 1
Portable	<ul style="list-style-type: none"> ▪ Lap-top computers 	3
Workshop Room	Same as for standard classroom	NA
Administrative Offices	<ul style="list-style-type: none"> ▪ Tower-like server with UPS ▪ Workstations ▪ Printer (large Laser) ▪ Printer (ink jet) ▪ MS Office software (or equivalent) ▪ Net Meeting software ▪ Specialized training administration package ▪ HR Software for managing and monitoring training 	1 10 1 1 10 users license
Trainers Room (x1)	<ul style="list-style-type: none"> ▪ Tower-like Server ▪ PCs with flash memory and CD RW drives ▪ Laser printer ▪ MS Office software or equivalent 	1 4 1 4
Library	<ul style="list-style-type: none"> ▪ Tower-like server with data-show connection and CD player ▪ Speakers with amplifier ▪ Computer table with facility for data projector ▪ Windows and Microsoft Office Software or equivalent ▪ Printer ▪ Scanner ▪ Workstations ▪ Laser Printer ▪ Library management software 	1 1set 1 5 1 1 5 1 10 users license

Room(s)	Equipment per Room	Quantity
Museum	▪ Tower-like server with data-show connection and CD player	1
	▪ Speakers with amplifier	1 set
	▪ Computer table with facility for data projection	1
	▪ Windows 2000 software Licenses	5
	▪ Workstations	5
	▪ Printer	1
	▪ MS Office software or equivalent	5
Internet	▪ Tower-like server	1
	▪ AS-Exchange Server	1
	▪ Windows 2003 Web Server with IIS	1

3.3. Customs IT Systems

This section of the report focuses on gaps, as they relate to specific IT systems. Gaps identified include systems themselves, system functionality for existing systems, and of course hardware and software.

3.3.1. Customs Commission Automated System

According to numerous consultant reports and the Head of the IT Department, Mr. Abdel Radwan, the Customs Commission Automated System does not meet international standards for either system functionality or its data model. There are also lingering architectural and technical problems with the system, such as the three-tier implementation and continuing deadlocks. Due to these issues, Customs is investigating options for replacing the current system. The USAID TAPR-II project has also allocated funding for the procurement and implementation of a new Customs information system.

One of the key problems with the Customs Commission Automated System is that it has been implemented as a distributed system. A distributed systems architecture does not avail itself of the data communications capabilities of the current WAN. Application server technologies should be employed to centralize the system, creating a scalable solution that properly utilizes the WAN. Customs should upgrade the Customs system to a web-based n-tier model, based on proper application server technology, such as TomCat (open source), Orion (Oracle), or Java-based application servers, and centralize hosting of the system at primary and backup locations. This, however, is beyond the planned scope for the Interim Modernization Phase.

3.3.1.1. Database Management System

For the Interim Modernization Phase, NCR will be upgrading Sybase to version 12.1.5. Therefore, there is no immediate gap to be concerned about. However, in the longer run, Sybase is not a good database platform for the new Customs Information System.

The Sybase database management system was a reasonable choice in the 90s, but no longer makes sense. There are significant concerns about Sybase's long-term viability. Sybase continues to lose market share to the main database players—Oracle, IBM and Microsoft—and is confined primarily to the financial services industry. Besides the long-term viability of the product, finding qualified Sybase professionals is a challenge and highlights the need to shift to a more appropriate database management system. Although no change should be made for the Interim Modernization Phase, upgrading or replacing the current Customs Commission Automated System will undoubtedly entail changing to a more

appropriate database management system. Either Oracle or Microsoft SQL Server would be a better long-term option.

3.3.1.2. Customs Commission Automated System User Application

The development tool used to create the user application, PowerBuilder, is a product that is part of the Sybase family. Using this tool made sense, since the original Customs Commission Automated System was based on a Sybase database management system. If the database management system is changed for the Customs Commission Automated System, as this document suggests, then the application development tool should also be changed to a more appropriate tool.

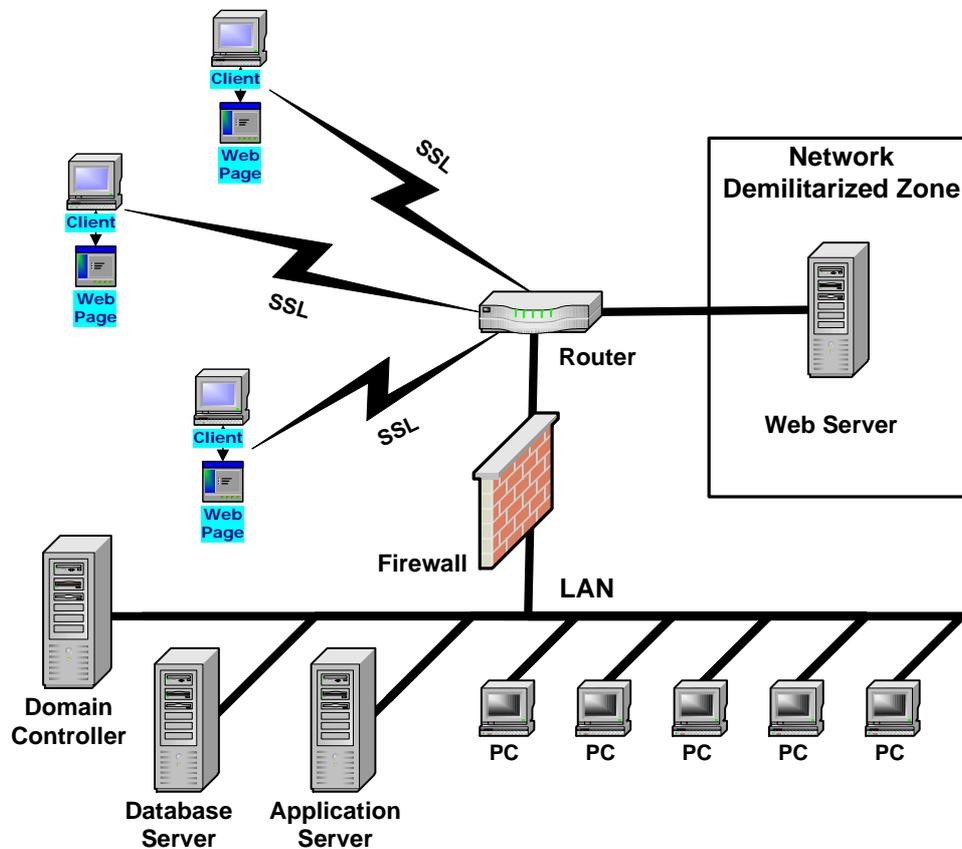
3.3.2. Single Window

During the Interim Modernization Phase, GOIEC plans to implement core components of an Automated Inspection System that will interface between the Customs Commission Automated System and the GOIEC system. This will allow the exchange of information to improve the efficiency of customs clearance. Customs, however, will still need to implement single window software to manage more efficiently its own processes and the interaction among Customs, other control agencies and GOIEC. Single window systems for customs, such as TradeNet, should be further investigated. The new Customs information system must include single window capabilities as part of the overall solution.

3.3.3. Web Services

Implementing proper security is the main concern with web-based systems. Users, of course, will need to have a login and password to be authenticated, and users should belong to classes that control their access to data and different parts of the system. For Customs employees accessing the system through the WAN, no additional security should be required. However, for employees and traders accessing the system through the Internet, a demilitarized zone needs to be set up to isolate the Web server from the system servers, and encryption should be used to protect data transmitted between Customs and users over the Internet. The diagram below depicts the standard implementation of a demilitarized zone. To implement Web Services with a proper demilitarized zone and SSL encryption, Customs will need a router and a certified digital certificate.

Diagram 4. Web Server Demilitarized Zone



Secure socket layer (SSL) is the standard encryption technology for securing user sessions with browser-based systems. This is the same technology used for online banking, and it is based on public key infrastructure and digital certificates. Customs should also consider using virtual private network (VPN) software to add an additional level of security for users accessing the system through the Internet. Both traders and Customs employees in remote locations are potential users who would access the system from the Internet.

In the future, the new Customs Commission Automated System envisioned should be a web-based application. All authorized users should be able to log into the new Customs Commission Automated System through a web browser. The main benefits of a web-based system include:

- No application software needs to be installed, and therefore, there is no need for managing the installation of new versions of the user application (in other words, no version control).
- Web-based systems are highly scalable, using clustered application and system servers to manage user connections and store and retrieve data from the system. Servers can be added to the clusters depending on system demands.
- Technical support requirements are significantly reduced because users only need a working (and compliant) web-browser to access the system—in other words, there should not be any system failures on the client side. This means the technical support staff at Customs points will only need to provide basic PC technical support.

Most commercial customs packages are web-based, reflecting the trend in Customs organizations throughout the world towards adopting this technology.

3.3.4. Data Warehouse

Egyptian Customs is not ready to implement a proper data warehouse. The two key problems are that there is not a centralized database and the quality of data in the Customs Commission Automated System is reported to be very poor. Since a data warehouse amounts to a consolidated database and related tools for management reporting and data analysis, the lack of a central database prohibits the creation of a data warehouse at this time. Poor data quality from the Customs Commission Automated System will also drastically reduce or even eliminate any value in creating a data warehouse. This can be summarized as the garbage-in-garbage-out problem.

Egyptian Customs needs to focus first on creating a central database (which is in progress) and addressing the issues that contribute to poor data quality. There maybe some problems with the design of the Customs Commission Automated System, but most of the data quality problems are probably caused by manually consolidating data (which is error prone) at the Alexandria IT Center and poor or inconsistently applied data entry procedures. Implementing a centralized database and a new Customs information system will not necessarily solve all of the data quality problems, and a complete reevaluation of data entry procedures needs to be part of the Customs reform process before a data warehouse is implemented.

Creation of a central database is a good initial step towards the creation of a data warehouse, and consolidating all operational data in a central location will also improve the efficiency of generating management reports. Egyptian Customs should acquire a management reporting tool, such as Crystal Reports, to facilitate and automate the creation and distribution of standard and ad hoc management reports. Customs should also train IT staff on basic data warehouse techniques and technologies that can be applied as soon as the central database is created. Specifically, multidimensional data marts can be created by trained IT professionals, and these data marts can be used for robust, flexible management reporting.

Even with the data quality problems highlighted above, Customs should go ahead immediately with the procurement process for services to build and implement a data warehouse. The procurement process will take many months, and building and implementing a data warehouse is at least a 6-month project if not more. This will give Customs satisfactory time to finish creating the central database and resolve the main data quality problems. The key point is to start resolving the data quality problems now. Building a data warehouse is also necessary to support the development of proper risk models (data for the risk models will come from the data warehouse), and therefore, the procurement process needs to start as soon as possible to support this activity. The hardware and software required to support a data warehouse include the following.

Table 10. Data Warehouse Hardware and Software

Equipment	Quantity
Hardware	
Data Warehouse Server: Quad Xeon Processor Server	1
OLAP Server: Dual Xeon Processor Server	1
Smart UPS	1
External Mass Storage	1
High-end PCs	2
Software	
Data Warehouse Software and Tools	1
Database Management System (preferably Oracle or Microsoft SQL Server)	6 processor licenses or equivalent
Server Operating Systems (Linux)	2
PC Operating Systems	2

3.3.4.1. Extract, Transform and Load

Data warehouse software solutions usually include tools that help manage and automate the process of extracting data from operational databases, transforming the data (to make it more intelligible or to eliminate inconsistencies) and loading data into the data warehouse. Customs does not currently have any extract, transform and load (ETL) tools and does not need them at this time, since there is no data warehouse. Basic reporting tools are all that is needed during the Interim Modernization Phase until the data quality issues are satisfactorily addressed and a data warehouse is created. ETL tools should be part of the data warehouse procurement.

3.3.4.2. Online Analytical Processing Tools

Reporting tools can be considered online analytical processing (OLAP) tools, but normally OLAP tools are a more advanced set of tools that create multidimensional data cubes and allow users to generate ad hoc customized reports easily. During the Interim Modernization Phase, it does not make sense to invest in this kind of tool. OLAP tools, however, should be part of the procurement for a data warehouse. Basic reporting tools will be sufficient for the interim phase.

There are also business intelligence tools that are related, but often considered a separate family of tools. These tools are much too sophisticated for serious consideration at this time. Intermediate OLAP tools are available that will provide significant benefit, can be realistically implemented and supported, and are significantly cheaper than these advanced tools.

3.3.5. Human Resources System

A full-fledged human resources system would help Customs manage human resources better, particularly in terms of monitoring performance, ensuring employee compliance, tracking training and facilitating career development. The two main questions, however, that need to be answered in relation to a human resources system are: 1) What level of functionality is required and can be effectively used by Egyptian Customs, and 2) How does the implementation of a new human resources system fit in with the other IT priorities of the organization? Previous experience in other countries indicates that a fairly robust solution is

probably available from a local vendor that would satisfy the requirements of Customs, could be implemented and supported properly, and would not cost too much. This option should be kept in mind when the time comes to implement a new human resources system.

3.3.6. Enterprise Resource Planning

For Egyptian Customs, implementing an ERP solution is a low priority. An integrated system is not needed across the key operational functions at this time. ERP implementations are also very complex, often are delayed or fail, and are very costly. A better approach would be to implement robust operational systems for key functions, such as accounting and human resources. Egyptian Customs needs to focus on key objectives and should not get bogged down in a complex, risky and costly ERP system implementation.

3.3.7. Customer Relationship Management

Customer relationship software has become popular as organizations try to provide superior levels of service to large numbers of customers. For Customs, however, the focus should be on facilitating trade for a relatively small number of traders. Therefore, Customs should not consider implementing a customer relationship management system until the other more important systems discussed above are adequately addressed.

3.3.8. IT Equipment Inventory

An IT equipment inventory database needs to be implemented with standard management reports. Managing this database should be part of the technical support function.

3.3.9. Helpdesk

Helpdesk software is often overlooked when an organization is attempting to modernize. This oversight reduces the probability of successfully implementing new systems. The reason is that the technical problems of users are neither tracked nor properly analyzed, and therefore, not adequately addressed. Without reliable information, technical problems tend to linger, users become discouraged and system implementations are jeopardized. One of the key ways to ensuring a smooth system implementation is to track technical problems and correct them as quickly as possible. All system implementations suffer from technical problems or setbacks, but quick action will minimize the impact and avoid disenfranchisement by users. Many IT projects end up failing because user problems are not adequately addressed, and this situation should be avoided by Egyptian Customs. Regardless of the approach taken to upgrading Customs systems (that is, build, buy or outsource), Customs needs to make sure helpdesk software is being used to track and properly address user technical problems.

3.4. Statistical Risk Models

The Risk Management Department will be tasked with identifying risk criteria that will be fed into the Customs information system to automate selection of shipments for inspection. Since Customs does not have any experience with automated risk management, the EU TEP-C project, through a selected vendor, will provide technical assistance to build the initial risk analysis database and statistical risk models. The risk models will be used to determine the appropriate criteria and weightings for risk selection.

3.5. Networking

The Customs networks are neither robust nor well managed. During the Interim Modernization Phase, there are some key networking issues that need to be addressed:

- *Upgrading Network Connections* – Some network connections to the main Customs locations, specifically to the MoF towers and the Alexandria port, should be upgraded.

- *Implementing Proxy Server and Firewall Software* – As new Customs locations are connected to the Internet, which has been proposed, proxy server and firewall software needs to be properly installed and configured.
- *Upgrading Hubs to Switches for LANs* – Hubs need to be replaced with switches in order to increase data transfer speeds to 100 Mbps for PCs with 10/100 network interface cards.
- *Implementing Domains* – Domains need to be implemented for all LANs in order to restrict access to authorized users.

Addressing these issues will improve network performance and security. These and other networking issues are discussed in more detail below.

3.5.1. Topology

In the future, Customs should look at increasing the redundancy in the WAN. The main options are adding redundant network connections to each main Customs location, connecting each location to the primary and secondary data processing centers, or direct network connections between the main Customs points. Arguably the best option is direct network connections between Customs locations. This option would substantially increase the potential paths for routing data traffic and would much more effectively utilize the capabilities of MPLS, but it may not be feasible due to the telecommunications infrastructure. Determining whether to increase redundancy would depend on current network performance and reliability and the cost of upgrading the network. A thorough evaluation of the options needs to be conducted.

In addition, the network connections for the MoF towers and the Alexandria Port should be upgraded to support the future centralization of the Customs Commission Automated System. These two connections should be upgraded to 1.9 Mbps each. Other locations should be upgraded only if there are performance issues. A project to provide secure Internet access and upgrade WAN speeds to four main offices has been proposed at an estimated cost of 2.5 to 3.0 million LE.

3.5.2. Internet Access

Internet access needs to be very carefully managed and controlled. All connections to the Internet must be through properly managed proxy servers and firewalls. This requires standardization of proxy server and firewall software and its configuration management. Through the WAN all proxy server and firewall software can be managed centrally.

Unauthorized connections to the Internet are a very serious security risk and must be prohibited. There are numerous ways for informal connections to be made—the easiest of which are dial up and ADSL access. Internet policies should strictly prohibit accessing the Internet through unauthorized Internet services. The main vulnerabilities are from spyware, hackers and viruses. The Customs network needs to be centrally managed and monitored for unauthorized Internet access.

3.5.3. Network Management Software

Although it is not critical since there is a service level agreement for the WAN with Raya, Customs may want to monitor WAN performance. In the short run, Customs IT staff can use open source network management software. There are two popular open source network management products available: Nagios (www.nagios.org) and openNMS (www.opennms.org). The Multi-Router Traffic Grapher that was already installed is also a good start for monitoring the WAN. In the longer run Customs may want to investigate using commercial products that are available, such as CiscoWorks, IBM's Tivoli, and Hewlett Packard's OpenView. If Customs decides that the commercial products are needed, then training will be required for the IT staff to properly use these tools.

3.5.4. LANs

LAN refurbishment is a critical issue, particularly in the five main Customs locations. A project to refurbish these LANs has been proposed, but funding for this project has not been identified. The estimated cost of the project is 2.5 to 3 million LE. At a minimum the hubs in these locations need to be replaced with switches. The approximate number of hubs that need to be replaced is 50. The table below highlights an estimate of the number of switches needed by location.

Table 11. Estimated Switches Required in Main Customs Locations

Customs Locations	Quantity
Alexandria	15
Cairo	13
Dakhalia	8
Port Said	8
Suez	5

Domains also need to be set up for the LANs, and this will require hiring and/or training more staff to setup domains. Network administration is one of the main courses recommended in the Gap Analysis. Donors should consider funding training for this course, since it is an immediate priority.

3.6. System Security

Correcting the current system security situation requires more than implementing the proper hardware and software. IT staff need in-depth training on system security. System security threats are evolving at an alarming pace, and only well trained IT staff will be able to properly protect the computer systems of Egyptian Customs. This section covers antivirus software, proxy servers and firewalls, network intrusion software, virtual private networks and software licensing.

3.6.1. Antivirus Software

Implementing antivirus software in Customs is an absolute priority. This deficiency could easily crash the Customs Commission Automated System and other systems, if any kind of malicious code ended up in the network. Antivirus software must be installed on all computers attached to the Customs networks. This comprises at least 900 computers if it is assumed that all of the computers from the two large procurements are connected to the network. Since additional computers have been purchased on an ad hoc basis, the number of PCs connected is almost surely more than 900. In order to resolve this problem, Customs needs to make sure that only computers with licensed software are connected to the Internet, operating system software is regularly updated and enterprise antivirus software is implemented. Enterprise antivirus software will automatically update virus definitions on computers connected to the network and schedule virus scans. A tender has been prepared for procuring antivirus software, but it is unclear if there is enough funding for all network nodes.

3.6.2. Proxy Servers and Firewalls

If additional Internet connections are established, beyond the pilot in Alexandria, Customs will need to develop a coordinated policy on implementing and configuring proxy servers and

firewalls. The first issue is to select appropriate proxy server/firewall software. Numerous products are available including free software downloadable from the Internet. The next issue is the proper configuration of the proxy servers and firewalls. Standard configurations need to be established and implemented for all connections to the Internet. Customs should procure and implement advanced proxy server/firewall software that allows centralized configuration and management of servers. And last, firewalls can be set up using routers. This is extra protection, but it is generally best in this kind of environment to use both software and hardware firewalls. The reason for this is that it is often hard to find qualified staff to manage routers and other networking equipment, and this way Customs can be sure that the firewalls are implemented correctly. Standardization of firewall software and its configuration must be addressed as new Internet connections are established.

3.6.3. Network Intrusion Software

Due to the sophistication of hackers, Customs needs to go beyond properly configuring servers and implementing firewalls. Network intrusion software is another important tool for preventing unauthorized access to Customs networks and systems. Network intrusion software is used to monitor networks and identify suspicious and malicious activity. Numerous vendors have network intrusion prevention products available, and there is also an open source tool, called Snort available at www.snort.org, that is widely used. Customs needs to acquire and implement network intrusion software as soon as possible and have key IT staff trained on how to use it properly.

3.6.4. Virtual Private Network

In the future Customs may decide to use VPN software to allow traders to connect to the Customs system for the submission of declarations and other trade documents. It could also be a backup solution for remote locations, if there are WAN problems. If VPN software is properly implemented, all that will be needed to connect to the system is an Internet connection.

3.6.5. Software Licensing

Software licenses need to be acquired for all software operating systems within Customs. In particular, special attention should be paid to the Microsoft PC operating systems and office productivity tools, since these are favorite targets of hackers. Customs should be able to avail itself of the Egyptian Government's blanket agreement with Microsoft to obtain proper licenses for these software productions.

3.7. Administration

In transitional countries, hardware and software for basic administrative purposes is often overlooked. The focus at the early stages of automation, and rightly so, is on hardware and software to automate key processes. As organizations develop, however, they will realize significant gains in productivity from providing computer equipment to support general office automation.

3.7.1. Hardware

File servers and PCs are required to support general office automation. File servers allow users to share files and resources over a LAN and can be used for the storage of files on shared drives. PCs are clearly needed for office productivity tools, e-mail and other software.

As a ballpark estimate, Customs should acquire in the nearest future the same number of PCs as is currently implemented to support the Customs Commission Automated System or about 1,000 new PCs. A one-to-one ratio of operational to administrative PCs at the early stages of Customs automation is a conservative estimate that corresponds to past experiences in similar environments. In the future, a more detailed assessment of PC requirements needs to be conducted based on staffing levels and position requirements. In

advanced economies all government administrative staff have a PC, and Egyptian Customs will converge with international norms.

Servers to support shared resources, such as drives and printers, can be estimated at an approximate ratio of 1 to every 100 PCs connected to a LAN or based on location. The large Customs offices need to have file servers installed. At least one file server is recommended for Alexandria, Cairo, Port Said, Suez, Damietta and Dekhela. In smaller offices robust PCs can be used as file servers, and very small offices should not need servers at all.

3.7.2. Office Productivity Tools

All staff with computers, besides data entry staff, need to have standard office productivity tools. MS Word and Excel are the primary tools needed by Customs office staff. The Microsoft Office Standard Edition includes Word, Excel and PowerPoint and is a good value. There are alternative office productivity tools available, such as Sun's StarOffice, Corel's WordPerfect Office, and OpenOffice—an open source alternative. Although the alternatives to Microsoft are much cheaper or even free, the key issue is document format compatibility and the time spent converting and managing these files. In this case the decision is relatively easy because there is an agreement between the Egyptian government and Microsoft for supplying software and only one standard should be used throughout the Egyptian government. Customs only needs to identify the number of licenses required, and the software will be procured from a central government budget.

3.7.3. E-mail

Setting up official e-mail accounts for all professional staff should be a high priority for Customs. The main considerations are to restrict attachments and to ensure proper backup of the server. E-mail attachments need to be restricted in order to avoid overwhelming the network. (Analyzing network traffic should allow Customs to determine the size of attachments that can be allowed.) Data backup in general needs to be addressed by Customs, but it is particularly important to have a permanent record of official correspondence, including via e-mail. Technically, data backup is not difficult. The main issues are establishing proper policies and procedures and monitoring that they are followed properly.

Customs should launch e-mail for all professional staff during the modernization phase to improve overall communication and efficiency within Customs and also because it will be an important tool for communicating to employees during the rollout of new Customs systems. Large complex projects, such as the rollout of a new Customs Commission Automated System, often fail during implementation, and one of the key issues is properly communicating expectations to employees—particular users of new systems. Without proper communication, users often do not know what they are supposed to be doing and revert back to old ways of doing things. E-mail will greatly enhance the ability of the system implementation team to communicate directly with users and other key staff involved in system implementation and will improve the overall chances of successful systems implementations.

3.8. Website

Although the website is primarily informational, there are some key functional requirements that need to be considered. These requirements include:

- A content manager,
- Multilingual capabilities,
- Search, and
- Downloadable documents.

A content manager is needed to allow non-IT staff to update the website. The suggested content manager should have a user-friendly interface that allows users to update text, add links and attach downloadable documents. This is critical to ensure that content on the site is maintained properly and is current. Multilingual capabilities are also required because not all users will speak Arabic. English and probably French should be available. Implementing a multilingual website requires storing text labels in a database in order to easily switch from one language to another. Once multilingual capabilities are implemented, the remaining task is to translate text labels and update the appropriate database tables. Search is a standard feature on websites, and the main issue is updating the search engine index when updating the content of the site. The last key requirement is the ability to attach downloadable documents, such as forms, to the website. This capability must be part of the content manager. Of course, there are other website requirements, but these are the main ones that should not be overlooked.

Managing the development and rollout of a website can be tricky. The main reason is that the quality of a website is very subjective. This may lead to a situation where the client and the website development firm go back and forth for a long period of time as the client keeps asking for changes and modifications. In some cases, the firm and the client may never agree that a final website is acceptable. Therefore, there needs to be a clear website development and acceptance process that explicitly defines when the Web development firm has satisfied its obligation. To control this process, a website request for proposal (RFP) should clearly state that the Web development firm needs to prepare a specific number of unique designs that the client will choose from. If none of the proposed designs are acceptable, the client can request a new set of designs or cancel the contract and pay a base fee. Assuming a design is selected, the website development firm finishes the development of the website, and the client then has a limited number of revisions that can be requested after the first version is completed. As long as the final version of the website satisfies the written requirements from the RFP, covers all written requests for revision and does not contain bugs or errors, then it should be accepted. Appendix B provides further guidance on the issuance of a website RFP, since this is priority task.

Due to the importance of maintaining a public presence on the Internet 24/7, a backup server needs to be set up for hosting the website. This is particularly important for Customs because people living in different countries and time zones will often access the site outside of normal working hours in Egypt. Alternatively, the website could be hosted by an Internet service provider that supplies its own backup systems. Sometimes backup Web hosting services will even be supplied from a different country, such as a European country. The point is simply to make sure the website is always available. For the Interim Modernization Phase, Customs should either implement a backup server or pay for website hosting services.

3.9. Data Backup and Recovery

The data backup and recovery that is currently performed is only rudimentary. The goal at least at the main Customs locations should be 100% uptime. Currently, this is not possible if there is a major systems failure, and not much can be accomplished during the Interim Modernization Phase. Restoring data from tape in particular is slow, so this is not sufficient. In addition, the use of servers with RAID controllers helps protect against hard disk failure, but does not protect against software, processor and other potential failures. When a new Customs information system is implemented, Customs will need to implement full backup servers in Alexandria and Cairo and also robust data backup and recovery systems, such as IBM's Tivoli Storage Manager or SteelEye Technology's LifeKeeper for Linux, in order to meet the goal of 100% uptime.

In addition to the proper hardware and software to maintain 100% uptime, Customs needs proper disaster recovery policies and procedures and should periodically perform disaster recovery tests to ensure that these policies and procedures are working properly.

As a note, centralization of data processing in Cairo and Alexandria and implementation of the new server clusters will help improve system reliability and uptime substantially. The server cluster configuration calls for two quad processor servers with external mass storage at both locations. This provides a secondary (backup) processing center and backup servers at both locations. This configuration is robust as long as the processing centers have enough processing power for daily operations. At the time of initial implementation, it is anticipated that this configuration is sufficient. If more processing power is needed, additional servers can easily be added to the cluster.

3.10. Technical Support

Technical support is a critical function to ensure proper implementation and use of systems, as well as system sustainability. Many IT system implementations fail or produce poor results because of insufficient technical support and training. Outsourcing is an effective way to ensure sufficient support, and this is typically what has been done by Egyptian Customs. Three key issues to keep in mind, regarding technical support contracts, include ensuring that technical support plans provide the level of support required, support coverage does not lapse because of contractual or funding issues, and the value of the service justifies its cost.

Even with technical support being largely outsourced to local vendors, Customs will need to provide frontline technical support. Solid frontline support contributes to smoother running operations because users will not always be inclined to call vendors for minor or small problems, and they will appreciate the option of being able to contact internal technical support staff. Frontline support should consist of a helpdesk and limited onsite support at the different Customs locations. The helpdesk should answer basic user questions, track all reported user problems and their status, elevate user problems to appropriate IT staff or the vendor for resolution, and provide information on user problems to management in order to address systemic problems. Onsite technical support staff should be able to troubleshoot basic hardware, software and application problems. Organizing and implementing frontline technical support should be a priority for Customs.

3.10.1. Customs Applications

For major systems, such as the Customs Commission Automated System, outsourcing technical support is, realistically, the only option, since Customs staff will not have developed the system. In general outsourcing is an effective way to ensure sufficient support, if the necessary expertise is not available internally. When the new Customs Commission Automated System or any other new systems are procured, the contracts must specify in detail the level of technical support to be provided.

For the sake of efficiency, basic frontline technical support should still be provided for all systems, even when specialized technical support is outsourced. When users have problems, they should either ask the local onsite person or call the helpdesk. The helpdesk will assist the user in resolving basic problems (often user error) or elevate the problem to the vendor. The main benefits of having users contact the helpdesk first are that many problems will be simple issues trained helpdesk staff can help resolve and management needs to track user problems in order to take corrective action when there are systemic problems.

3.10.2. Hardware

Hardware technical support needs to be carefully managed. In some cases, it is better for hardware technical support to be provided internally, and in other cases, it should be

outsourced. The main issues to be considered when managing hardware technical support internally include:

- Manufacturer warranties,
- Hardware costs,
- Obsolescence, and
- Training.

Manufacturers' warranties cover faults and defects usually for a period of one to three years. This is an important consideration when purchasing equipment because it reduces the need for technical support. If hardware under warranty has a problem, it is taken to the vendor to be fixed or replaced. Cost is another consideration because relatively inexpensive hardware can be replaced and does not justify the cost of a technical support contract. A similar argument applies to obsolescence. When hardware reaches the end of its useful life, it should be replaced in many cases rather than fixed. Taking these first three considerations into account, internal technical support can be an economical and effective option for basic IT hardware, as long as technical support staff are provided sufficient training.

On the other hand, for expensive, specialized hardware and large procurements, outsourcing technical support is usually the best option. The decision will need to be made in many cases at the time equipment is procured, and this will be one of the responsibilities of the Technology Sector's Planning and Support Services in coordination with the IT Technical Support Department.

3.10.3. Software

Technical support can be purchased for major software, such as database management systems. This support, however, is often very expensive—in some cases, up to twenty percent of the original cost of the software for one year's worth of support. Customs will need to look very closely at technical support agreements to ensure they are worth the extra cost. For some of the more expensive software, technical support means simply free access to the software firm's helpdesk. The people assisting the customer, however, may or may not be able to resolve the problem, and there are no guarantees according to standard software licenses. In addition, some technical support agreements include free software upgrades. This can save a substantial amount of money if the agreement happens to be in force at the time of a major upgrade. The question still remains, though, if it is worth the expense. Migrating when there are major version changes of software requires significant planning, and it may be determined that the free upgrades obtained under technical support agreements should not be implemented. Overall, experience on other projects indicates that the Internet is really the best source of information for resolving software problems, and the technical support fees are not worth the expense.

Technical support is also needed for standard software, such as Windows and Microsoft Office. This support can and should be managed internally. Generally, outsourcing this type of technical support is not worth the expense. It should only be seriously considered if the whole IT technical support function is going to be outsourced. Again, the key point is properly training IT staff to provide this support.

3.10.4. Networking

Outsourcing the WAN is the right approach for Customs, and the technical support provided by Raya has been satisfactory, as reported by the Manager of IT Operations at Alexandria. No further actions are need at this time.

3.11. IT Planning and Support Services

The new organizational structure proposed for Customs addresses the current lack of coordinated and coherent IT planning and support services. The IT Planning and Support Services Department included in the recently proposed organizational structure would include IT consolidated planning, project management, budget monitoring and control, technology asset management, procurement, contract management, liaison with other government agencies and IT policies and procedures (see Appendix C for the proposed organizational structure of the Customs IT Department). As the demands for IT support grow, Customs will need to plan and manage IT more effectively, and this new department will provide a mechanism to accomplish this.

3.12. Environmental Controls

In general environmental controls in Customs locations are in good shape with the exception of remote locations. The subsections below highlight actions that should be taken during the Interim Modernization Phase. When a full-blown system security review is conducted, additional actions will be identified and can be prioritized.

3.12.1. Electrical Systems

In any locations where a significant amount of new computer equipment is going to be installed, an electrician needs to evaluate the existing electrical system, that is, unless the Customs location has been recently renovated.

3.12.1.1. Generators

Four diesel generators (60 KVA) need to be obtained for Cairo (MCC), Dekhila, Atteba and Rafa.

3.12.1.2. UPSs

The Operational Manager of the IT Department estimates that 10 UPSs are needed for the servers at remote Customs locations. UPSs should also be provided for PCs to avoid damaging them.

3.12.1.3. Voltage Regulators

No voltage regulators are required at this time.

3.12.2. Air Conditioning

Air conditioning units need to be obtained for Atteba, Rafa, key remote locations and some front offices for trader submission of documents. A full review of air conditioning requirements should be conducted to determine exactly what is needed.

3.12.3. Physical Security

This analysis recommends that a full IT systems security review be conducted, and physical security would be part of the overall review. Nonetheless, there are basic considerations that should be taken into account now. All Customs locations with IT equipment should have at a minimum door locks, window bars (first floor offices), smoke detectors, fire extinguishers, security guards and control procedures for moving IT equipment from buildings. The remote locations are the primary concern, since the major ports tend to be in good physical condition or are being renovated.

For the main processing centers, which are planned in Cairo and Alexandria, the physical security requirements will be much higher. The primary recommendation of this analysis, in addition to the normal considerations, is to implement an electronic access system (for door locks). This kind of system will restrict access to the server rooms and will also track who has been in them. Closed circuit cameras should also be considered at these locations.

3.13. Staffing

This document is not intended to be a complete IT staffing plan and only provides basic guidance on the number of IT professional needed to support a new Customs information system. It is safe to say that there are currently not enough qualified IT professionals to support the Customs IT function properly. The vast majority of the IT staff perform data entry and related duties, not professional IT work. The IT Operational Manager in Alexandria has emphasized that there are not enough IT staff to support all the new projects that are going on or that are currently planned.

Customs needs to start recruiting and hiring new IT staff immediately to support the Customs reform program. The situation is currently dire and will mean that the only viable option for implementing a new Customs information system will be outsourcing the implementation, operation and primary technical support, until operation and technical support can be transferred back to Customs. Centralizing the Customs information system will help some because the primary IT staff (with the exception of System Administrators and Frontline Technical Support Specialists) will be located in either the Cairo or Alexandria data processing centers, but nonetheless a large number of IT staff need to be recruited. The table below provides estimated projections for the IT professionals required to support a new Customs information system. The projected needs are more than a four-fold increase over current IT staffing levels.

Table 12. Current IT Staffing and Projected Needs

Position Description	Current Number	Projected Needs
Head of IT	1	1
Deputy Head of IT	1	1
Business Applications Manager	0	1
IT Infrastructure Manager	0	1
Technical Support Manager	0	1
Communications Manager	0	1
Customs Systems Operational Manager	1	2
Project Manager	0	3
System Architect	1	2
Programmer / Analyst	5	6
IT Infrastructure Engineer	0	3
System Security Specialist	0	2
Database Administrator	3	4
Systems Administrator	3	10
System Integration Specialist	0	3
Senior Technical Support Specialist	0	4
PC Hardware Engineer	5	6
Helpdesk Specialist	0	4
Frontline Technical Support Specialist	0	29

IT Procurement Specialist	0	2
Web Developers	0	2
Total Number of IT professionals	18	87

3.14. Policies and Procedures

Customs should start developing IT policies and procedures immediately, since they will help with the overall management of the IT function and will significantly aid any future systems implementations. Below is a list of policies and procedures that need to be developed, roughly in their order of priority.

- 1) Antivirus
- 2) Data Backup
- 3) System Configuration Control
- 4) Confidentiality Agreements
- 5) Data Access and Control
- 6) IT Procurement and Vendor Management
- 7) Network Management and Monitoring
- 8) Database Administration
- 9) Production Testing
- 10) Disaster Recovery
- 11) Problem Escalation
- 12) Helpdesk and Technical Support
- 13) Internet Usage
- 14) System Auditing

Developing and implementing these policies and procedures will substantially improve the management of the IT function, and end users will also notice an improvement in the quality of IT support they receive.

3.15. Training

IT training should be carefully targeted to the needs of Egyptian Customs. The focus should be on the core systems that currently need to be maintained, and new systems that will be installed in the next year or so. The main courses that donors should consider as priorities for funding include the following.

- Linux (3 Courses): Linux Fundamentals; Linux System Administration; Linux Network Administration
- Certified Information Systems Security Professional
- Sybase Database Administrator
- ISA 2004 (Internet Security and Acceleration Server)
- Interconnecting Cisco Networking Devices (Preparation for Cisco Certified Network Associate)
- Windows 2003 System Administration (This is suggested because the Trader Web Services are hosted on a server running Windows 2003)

- Windows XP Operating System
- Data Warehousing Principles
- Statistical and Data Mining Tools⁵ (SPSS for statistical analysis and SPSS Clementine for data mining are recommended)
- Report Writing Tools (Crystal Reports or an equivalent tool is recommended)

Additional training will probably be identified, but it is premature to identify too many courses until the selection of a new Customs information system has been made.

3.16. Other IT Gaps

A few additional IT gaps were identified that do not neatly fit in with the rest of the analysis. These gaps include:

- 1) The procurement and implementation of a video conferencing center. The EU TEP-C project has agreed to implement this task.
- 2) The procurement of hardware and software to support the CRU in Alexandria. USAID has agreed to fund this task. The funding is for approximately \$130,000 worth of equipment.
- 3) The procurement and implementation of equipment to support the Account Management System (AMS). Specifically, laptops are needed for the AMS Account Managers. The EU TEP-C project is a potential funding source for this activity.

⁵ This training is really for the Risk Management Department and not IT staff.

4. GAP ANALYSIS – COMPARISON MATRIX

The matrix below summarizes the gaps that were identified, highlights the suggested resolution, rates both risk and priority, and states anticipated actions.

Gap Description	Suggested Resolution	Risk	Priority	Anticipated Action
<i>Customs Commission Automated System</i>				
The Customs Commission Automated System does not meet international standards.	Procure a new Customs Information System.	Medium	High	The USAID TAPR-II project is assisting Customs with the selection of a new system.
The system is not centralized.	Centralize the new Customs information system in Cairo and Alexandria.	Medium	High	Customs already has plans to implement a main data processing center in Cairo.
The system architecture does not take advantage of modern technologies.	Convert the current system to or procure a new system based on an n-tier architecture.	Low	High	An n-tier architecture must be a requirement for any new Customs information system.
The database management system is not an industry leader.	Migrate to a more appropriate database management system.	Low	High	Migrating to a new database management system needs to wait until a new Customs information system has been selected.
The application development environment is not an industry leader.	The application development environment should be changed, but this will not be necessary if a new Customs information system is selected.	Low	High	Changing to a new development environment will only be required if Customs decides to upgrade the current system.
The Cairo Data Processing Center needs to be developed.	Hardware, software and related infrastructure need to be procured and installed.	Low	High	A tender has been prepared for this equipment, but funding has not been identified.

Gap Description	Suggested Resolution	Risk	Priority	Anticipated Action
The Electronic Payments System was developed for the current system.	Ensure that the new Customs information system is compatible with the Electronic Payments System.	Low	High	Requirements specifications for a new Customs information system need to highlight compatibility with the Electronic Payments System.
Single window capabilities need to be part of the overall new Customs information system solution.	Ensure that single window capabilities are part of the Customs information system solution.	Low	High	The RFP for a new Customs information system must include single window capabilities as part of the overall solution.
Trader Web Services have not been implemented securely.	A demilitarized zone needs to be implemented to protect the system server and public key infrastructure needs to be implemented to secure data transfer over the Internet.	High	High	Procure a new router and implement a demilitarized zone and procure a digital certificate and upgrade the Web services to support SSL.
Data quality in the current system is very poor.	Analyze the data quality problems, identify their source and correct data quality problems. These problems are likely to be due to poor or improperly followed data entry procedures.	Low	High	Customs needs to analyze, identify the source of and correct data quality problems. A key point to remember is that historical data in the existing system will be uploaded into the new one.
The current system does not produce useful standard reports.	Procure a report writer to assist in the development of standard reports.	Low	High	The organization that will address this gap needs to be identified, but this would be a good gap for the EU TEP-C project to fill because it complements the future creation of a data warehouse, which is being funded by TEP-C.
Other IT Systems				
Customs needs a more robust system for managing human resources.	A human resources system should be procured and installed. A suitable system can probably be supplied by a local vendor at a reasonable cost.	Low	Low	Human resource systems available from local vendors should be identified.

Gap Description	Suggested Resolution	Risk	Priority	Anticipated Action
Customs needs to manage IT equipment inventory better.	An IT equipment inventory database should be developed and used.	Low	High	Customs or one of the donors should identify resources to develop this database.
Customs will need to implement a proper helpdesk before the roll out of a new Customs information system.	A helpdesk system should be procured or developed to support the roll out of a new Customs information system.	High	High	Customs needs to address this issue soon in order to make sure it is properly addressed before the roll out of a new Customs information system.
<i>Hardware and Software</i>				
Many of the Customs PCs supporting the Customs Commission Automated System are old and need to be replaced.	The PCs that need replacing should be identified and new PCs procured as needed.	Low	Medium	Customs should analyze the number of PCs required to support the new Customs information system and identify the number of old PCs that need to be replaced.
Many printers are old and worn out.	The printers that need replacing should be identified and new printers procured as needed.	Low	Medium	The organization that will address this gap needs to be identified.
The MCCs have extensive hardware needs.	Procure hardware for the MCCs.	Low	High	The organization that will address this gap needs to be identified, but this may be a good gap for the EU TEP-C project to fill.
The Risk Management Department has hardware and software needs.	Procure hardware and software for the Risk Management Department.	Low	High	The EU TEP-C project plans to procure the hardware and software required to support the Risk Management Department.
The Post Clearance Audit Department has hardware needs.	PCs for PCA have been factored into the estimate for the MCCs and only laptops need to be procured.	Low	High	The EU TEP-C project plans to procure 50,000 Euro worth of laptops.

Gap Description	Suggested Resolution	Risk	Priority	Anticipated Action
The Account Management System needs laptops.	Procure laptops to support AMS.	Low	High	The number of laptops required needs to be estimated, and then the organization that will fill this gap can be identified.
The National Customs Training Institute has extensive hardware and software needs.	Procure the necessary hardware to support the National Customs Training Institute.	Low	Medium	The EU TEP-C project plans to procure the hardware and software required.
The Customs Reform Unit needs hardware and software for basic administrative purposes.	Procure the needed hardware and software.	Low	High	USAID has agreed to fund the procurement of the needed hardware and software, approximately \$130,000 in value.
Implementing a data warehouse will require appropriate hardware and software.	Procure the hardware and software necessary to implement a data warehouse.	Medium	High	The EU TEP-C project plans to procure the hardware and software to fill this gap as part of its support for risk management.
PCs, other peripherals and office productivity software are needed for basic administrative purposes.	Analyze hardware, peripheral and office productivity software needs and procure as necessary.	Low	Medium	A needs analysis should be conducted to determine what needs to be procured.
Wide Area Network				
There is no redundancy in the WAN.	Review network performance, analyze options for introducing redundancy and make a decision based on cost/benefit.	Low	Medium	Customs needs to start analyzing options because centralization of the Customs information system will substantially increase network demands.
The network connections for the Cairo (MoF) and Alexandria data processing centers are too slow.	Upgrade the network connections to 1.9 Mbps.	Low	Medium	Customs should upgrade these connections based on the schedule for implementing the new Customs information system.

Gap Description	Suggested Resolution	Risk	Priority	Anticipated Action
Two new Customs locations need to be connected to the WAN.	Add two new connections to the WAN.	Low	High	Customs should add these connections quickly.
Networking				
LANs are typically running at 10 Mbps instead of the standard 100 Mbps.	Replace all hubs at Customs locations with switches.	Low	High	A project to upgrade WANs has been proposed, but funding has still not been identified.
No domains have been implemented for the LANs.	Domains need to be set up as an additional level of security. Servers will need to be identified or procured to fill this gap.	Medium	High	Customs should start setting up domains, but there are not enough qualified IT staff to do it.
No network management software is used by Customs.	Obtain and implement open source network management software.	Low	Low	Customs can download and implement open source network management software or procure commercial network management software.
System Security				
No antivirus software has been implemented in Customs.	Enterprise antivirus software should be procured, implemented and configured in order to update virus definitions automatically on PCs and schedule virus scans. Approximately 900 licenses are needed.	High	High	Customs has prepared a tender, but it is unclear if there is funding for the entire organization.
Not all PCs have licensed software.	Customs needs to identify PCs that are not running licensed versions of Microsoft Windows and Office and obtain licensed software.	High	High	Licenses should be obtained as soon as possible through the government agreement with Microsoft, and PCs without licensed software should be removed from Customs networks.
Proxy server and firewall software needs to be installed for all new Internet connections.	Obtain proxy server and firewall software and implement it for all Internet connections.	High	High	A plan for extending Internet access to the main Customs locations has been prepared. However, no funding has been identified for the project.

Gap Description	Suggested Resolution	Risk	Priority	Anticipated Action
No network intrusion software is used by Customs.	Obtain and implement network intrusion software.	High	High	Customs should first try implementing Snort, an open source program, and if this does not satisfy their needs, commercial network intrusion software can be procured.
No virtual private network software is used.	For Internet access to the Customs information system, VPN software should be implemented as an extra security layer.	Low	Low	Customs should address VPN software after other more important gaps. Implementing SSL technology is the main priority.
Physical security issues also need to be addressed.	Conduct a full systems security review that includes physical security.	High	High	A systems security review should be conducted as soon as possible.
Website				
The website does not meet basic standards for an official government website and is not multilingual.	Hire a website development firm to create a new website.	Low	High	The EU TEP-C project has agreed to fund and manage the development of a new website.
The Web server is really a PC and cannot support high volumes of traffic.	Procure a new primary Web server and also a backup Web server.	Low	Medium	The organization that will address this gap needs to be identified.
Administration				
E-mail needs to be extended more broadly to Customs staff.	Set up e-mail accounts for new users.	Low	Medium	Customs should start setting up new e-mail accounts. This, however, will be a slow process because there are not enough IT staff.
The current e-mail server is a PC.	New primary and backup e-mail servers need to be procured.	Low	Medium	The organization that will address this gap needs to be identified.

Gap Description	Suggested Resolution	Risk	Priority	Anticipated Action
File servers should be set up at the main Customs locations.	Identify or procure servers and set them up.	Low	Low	Customs should identify or procure servers to be implemented as file servers, if there are not already proper file servers.
<i>Environmental Controls</i>				
Diesel generators are needed in Cairo (MCC), Dekhila, Atteba and Rafa.	Procure four 60 KVA diesel generators.	Medium	High	Diesel generators should be procured as soon as possible.
UPSs are needed in 10 remote locations.	UPSs should be procured.	Low	Medium	UPSs should be procured to protect data and equipment.
Air conditioning is needed at some Customs locations.	A complete analysis of air conditioning needs should be conducted.	Low	Medium	Air conditioning units should be purchased right away for Atteba and Rafa.
<i>Data Backup and Recovery</i>				
100% uptime will be required for the new Customs information system.	Upgrading the system hardware to two server clusters with external mass storage will go a long way towards providing 100% uptime, but data backup and recovery software should also be procured and implemented.	Low	Medium	Customs or one of the donors should consider procuring data backup and recovery software.
Data backup and recovery is only at rudimentary levels.	Data backup policies and procedures need to be developed.	Medium	High	Customs needs to develop proper data backup and recovery policies and procedures as soon as possible.
<i>Staffing</i>				
Customs does not have enough professional IT staff to properly support Customs IT systems.	Start recruiting new IT staff immediately. Approximately 70 new IT professionals need to be hired.	High	High	Customs needs to start recruiting IT staff immediately to get them hired, trained and supporting Customs IT systems effectively as soon as possible.

Gap Description	Suggested Resolution	Risk	Priority	Anticipated Action
The technical support function is of critical importance when implementing new systems.	Customs needs to have sufficient technical support staff in place, who are properly trained, to support the roll out of a new Customs information system.	High	High	Customs should start recruiting IT technical support staff as soon as possible.
<i>Other Gaps</i>				
A video conferencing center is needed to reduce the travel required by Customs staff.	Procure and implement a video conferencing center.	Low	High	The EU TEP-C project plans to procure the video conferencing center.
IT staff need intensive training.	Identify staff and organize IT training.	High	High	Identify funding source and organize appropriate training courses.

5. CONCLUSION

The Gap Analysis has identified serious IT gaps that need to be addressed by Egyptian Customs. Many of these gaps are of critical importance and should definitely be resolved before the implementation of a new Customs information system. Arguably the security gaps are the most pressing. Staffing problems will also have significantly adverse affects when it comes time to implement a new system, and Customs needs to start recruiting new IT professionals as soon as possible. Although the gaps are manageable, it will take careful planning to overcome them and achieve the IT goals and objectives of Customs.

5.1. Open Issues and Future Considerations

There are a few open issues that require further consideration including the following.

- 1) In order to accurately determine the total number of PCs and related hardware and software required by Customs, a full staffing review needs to be conducted analyzing the number of employees by type, their duties and responsibilities and estimates on the percentage of certain types of staff that require PCs.
- 2) A determination still needs to be made on the IT equipment that is needed to support the initial activities of the Account Management System.
- 3) IT gaps were not identified for the Container Security Initiative because not enough information was available at the time of the analysis.

5.2. Key Recommendations

To summarize, the key recommendations made as a result of preparing the gap analysis include the following.

- 1) The new Customs information system, which is under consideration, must be based on a scalable n-tier, Web-based architecture.
- 2) The overall Customs information system solution must include single window (or document workflow) capabilities in order to increase the efficiency of administrative procedures significantly, especially when it involves the interaction of Customs, GOIEC and other control agencies.
- 3) Either Oracle or Microsoft SQL Server should be used for the database management system of the new Customs information system. Sybase is not a mainstream product and may not be viable for much longer. In addition, it is difficult to find IT professionals that are knowledgeable about this product.
- 4) Customs should standardize on one (or maybe two) PC operating systems and make sure all PCs connected to the network are properly licensed. Microsoft no longer supports some versions of Windows, and these need to be phased out, since security patches are not available for these versions.
- 5) Professional training courses need to be organized for the Customs IT staff as soon as possible. The main donors, USAID and the EU, have training budgets and should prepare a training plan, identify training providers and organize training courses.
- 6) LANs in the main Customs locations need to be upgraded to support 100 Mbps data transfer. This will require replacing hubs in these locations with switches. Customs will still want to use old PCs in their LANs that only have 10 Mbps network cards, but replacing hubs with switches will allow PCs to connect to the network at the highest speed their individual network cards will support.

- 7) Network domains need to be set up, and users need to be assigned logins and passwords. The main issue to overcome in order to create network domains is the shortage of qualified IT staff to setup network accounts.
- 8) Appropriate firewalls must be installed wherever there are Internet connections. Preferably a router firewall should be combined with a software firewall to increase network security.
- 9) Snort open source network intrusion software should be implemented immediately. Snort is freely downloadable from the Internet, and user documentation is available from www.snort.org. Customs can start with Snort to detect network intrusions and upgrade to commercial product, if they think it is necessary.
- 10) A demilitarized zone needs to be set up for the Trader Web Services. This will require the purchase of a new router. In addition public key encryption technology needs to be used to ensure that data transferred over the Internet by traders is secure. Secure socket layer (SSL) technology is required for encryption, and digital certificates are required for authenticating users and the Trader Web Services server. This is the same technology used for online banking and will ensure the safety of the trader data submitted online.
- 11) An IT security review should be conducted for Customs. There are many obvious security problems, and there are undoubtedly more serious issues that have yet to be uncovered.
- 12) The implementation of the Raya WAN needs to be reviewed. Customs believes the WAN is private, but there is no way to be sure without reviewing its implementation. A trusted VPN could be implemented on an MPLS network at the layer 2 or layer 3 network levels, or a secure VPN could be implemented using IPsec. Reviewing the network implementation will reveal how the network was implemented and whether or not it is secure. Customs will need to decide the appropriate configuration for the WAN. TAPR-II recommends a secure VPN.
- 13) Introducing network redundancy into the WAN should be investigated. Customs should analyze the different options for introducing WAN redundancy against the cost of the different options to determine the best option.
- 14) Enterprise antivirus software must be procured and implemented as soon as possible. An enterprise solution will automatically update virus definitions on computers connected to the network and schedule virus scans.
- 15) E-mail should be set up for all administrative employees of Egyptian Customs. Particular emphasis should be placed on system users. System users will be of critical importance when rolling out a new Customs Information System, and they need to be fully informed about their roles and responsibilities. A new e-mail server and a backup server need to be procured. The current server being used for e-mail is really no more than a PC, which is inadequate.
- 16) Customs should obtain basic OLAP or report writing tools in order to generate management reports from the central database that is currently under construction.
- 17) Customs should obtain a robust data backup and recovery system in order to help meet the goal of 100% uptime of the core Customs information system.
- 18) Data backup and recovery policies and procedures need to be developed, compliance with data backup and recovery policies and procedures needs to be regularly audited, and disaster recovery policies need to be periodically tested.

- 19) Data quality problems with the Customs Commission Automated System need to be addressed soon—definitely before building a data warehouse.
- 20) The website must be upgraded to meet standard conventions for official government websites. This is planned with EU support.
- 21) An IT equipment database with standard management reports needs to be implemented.
- 22) Helpdesk software needs to be implemented in order to track user problems and improve the efficiency of technical support.
- 23) The Customs IT Department should start a major recruiting drive, since it currently only has 17 IT professionals and is estimated to need about 87 for the initial implementation of a new Customs information system.
- 24) The development of the IT technical support function needs to be emphasized because technical support is crucial during the implementation of new IT systems. Users that are not well supported tend to become frustrated and often do not use IT systems properly.
- 25) The data entry staff working with the Customs Information System must be shifted to operations in order for the IT Department to focus on IT.

APPENDICES

Appendix A – Sample Hardware Specifications

Customs Headquarters (MOF Towers) and Alexandria Backup Site

System Servers

IBM eServer xSeries 255

Processor: Quad Xeon MP 2.2 GHz processor front side bus 400 MHz

L2 cache: 512 KB

L3 cache: 2 MB

Chipset: SWGC – HE

RAM: 2 GB ECC SDRAM DDR PC1600 expandable up to 24 GB

Hard drive: 4x73.4 GB hot swap, Ultra 320 SCSI, 10 Krpm

HDD Bays: 6/6, 6 hot swap SCSI

RAID controller: IBM serveRAID6M SCSI controller – 128 MB cache controller (supports RAID 0, 1, and 5)

I/O slots: 6x64 bit 100 MHz PCI-X, 1x32 bit 133 MHz PCI-X

Network Interface Card: 10/100/1000

Optical drive: 48x CD-ROM

Shared Storage

IBM Fast 600 Storage Server

2 – IBM short wave SFP modules

14 – IBM 2 Gbps FC 73.4 GB 100 Hot-Swap HDD

4 – IBM total storage fast FC2-133 host bus adaptors

4 – 5M LC-LC fiber channel Cables

Main Customs Locations

System Servers

HP Proliant ML 350 G4

Processor: Dual Xeon MP 3.0-3.2 GHz processor front side bus 533 MHz

L2 cache: 1 MB KB

Chipset: SWGCSL

RAM: 2 GB ECC SDRAM DDR PC2700 expandable up to 8 GB

Hard drive: 6 x 72.8 GB hot swap, Wide Ultra 4 SCSI, 10 Krpm

HDD Bays: 6/6, 6 hot swap SCSI

RAID controller: Smart Array RAID Controller with 64 MB cache

I/O slots: 4 x 64-bit / 100 MHz PCI slot 1 x 32-bit 33 MHz PCI slot

Network Interface Card: 10/100/1000

Optical drive: 48x CD-ROM

Data Warehouse

Server

IBM eServer xSeries 255

Processor: Quad Xeon MP 2.2 GHz processor front side bus 400 MHz

L2 cache: 512 KB

L3 cache: 2 MB

Chipset: SWGC – HE

RAM: 2 GB ECC SDRAM DDR PC1600 expandable up to 24 GB

Hard drive: 4x73.4 GB hot swap, Ultra 320 SCSI, 10 Krpm

HDD Bays: 6/6, 6 hot swap SCSI

RAID controller: IBM serveRAID6M SCSI controller – 128 MB cache controller (supports RAID 0, 1, and 5)

I/O slots: 6x64 bit 100 MHz PCI-X, 1x32 bit 133 MHz PCI-X

Network Interface Card: 10/100/1000

Optical drive: 48x CD-ROM

Customs National Training Institute

Servers

Processor: Dual Intel Xeon 2.8 GHz with 512 KB L2 Cache, at least or approved equivalent.

Front Bus Speed: 400MHz , at least.

RAM: 2GB ECC DDRAM 266MHZ DIMM .upgradeable to 8 GB.

Hard Drive Controller: Single channel ultra 3 SCSI RAID controller support RAID(0 ,1 & 5).
64 MB Cache memory.

Hard Disk: 6 x 72 GB HOT SWAP HDD ,Ultra3 SCSI, 10k rpm.

RAID controller: RAID(SATA OR SCSI)Controller (Integrated OR PCI card),support.
RAID LEVEL 1.

Floppy Disk Drive: 1.44 MB.

Optical Drive: High speed IDE 48x CD-ROM Drive.

Tape Drive: SCSI Tape Drive 20/40 GB,(5) tape media &(1) Cleaning media.

I/O slots: 5 PCI, (at least 2pci 64 bit 100MHz).

Graphics Controller: Video Controller with 128MB SDRAM, at least.

Network Card: Network Card 10/100Mbps.

Operating System: Windows 2003 Standard Edition open license (include media &Doc) or OEM License.

Power Supply: Dual & redundant power hot swap power supply 350w , at least
Include One fast serial ports, 2 USB ports, Mouse, Mouse-pad, Arabic Keyboard, all drivers S/W for (Win2003 Standard & Win 2003 Enterprise).
19" monitor

Workstations

Processor: Intel Pentium IV 2.4 GHz (at least), with L2 Cache 512 MB or approved Equivalent.

Chipset: Server Works Grand Champion SL (SWGCSL) or equivalent.

Front Side Bus: 533 MHZ at least,

Memory: 2GB ECC DDRAM 266MHZ (at least) ,upgradeable to 4GB.

Hard Drive Controller: SATA or SCSI

Hard Disk: 2* 80 GB SATA HDD OR 2 X72 Ultra 320 SCSI

Floppy Disk Drive: 3.5",1.44 MB

Optical Drive: High Speed IDE 48x CD-ROM Drive .

Tape Drive: SCSI Tape Drive 20/40 GB,(5) tape media &(1) Cleaning media.

I/O slots: 4 PCI

Graphics Controller: Video Controller with 128 MB SDRAM, at least.

Network Card: One 10/100/1000 Mbps (Auto Sense)

Power supply: At least Single power supply 250W.
One fast serial port, 2 USB ports, Mouse, Mouse-pad, Arabic Keyboard, all drivers S/W for (Win2003 Standard & Win 2003 Enterprise).
19" Monitor

Appendix B – Website Tender Process

This appendix provides guidelines on the preparation of a request for proposal (RFP) for an official government website.

The request for proposal should start out with a brief introduction about the goal of the project, highlight the proposal due date and inform vendors that this is a fixed price tender. In addition to the introduction, the RFP should state up front that firms will not be reimbursed for any costs associated with preparing a proposal and that Customs or the donor funding agency is under no obligation to make an award.

Managing the process of developing and accepting a website requires special consideration and needs to be tightly controlled. Recommended stages of the process are as follows:

- After award of the project, the selected firm will have three (3) weeks to present three design proposals.
- One of the three proposals can be selected as is, changes to a proposal can be requested, or elements of the different designs can be combined into a new design.
- If none of the proposals are deemed satisfactory, the client reserves the right to ask for three more design proposals within two (2) weeks or cancel the contract and pay a flat fee. (The flat fee must be included in the vendor's proposal.)
- After the website design has been selected, the firm will develop an initial version of the website within four (4) more weeks that meets the requirements included in the RFP.
- The first version will not be accepted unless it meets all the requirements of this RFP. Furthermore, the client reserves the right to cancel the contract if an acceptable first version is not submitted within the four-week period.
- The client will then have two (2) weeks to review the proposed website and provide to the firm a written description of required changes. These changes will not introduce additional requirements.
- The development firm will then have two (2) weeks to make the changes and submit the second version of the website to the client.
- After receiving the second version, the client has one (1) week to review the second version and one last opportunity to request changes.
- After the client submits the last list of changes, the development firm will have two (2) weeks to complete and deliver the website.

Following these steps will help ensure that a satisfactory website, meeting all requirements, is developed and delivered on schedule.

Vendors must provide certain information in their proposals to allow proper evaluation. Below are recommended submission requirements for website proposals.

- Samples of their work that demonstrate that the firm can create a website incorporating all of the requirements stated below. This can be accomplished by providing links to active sites developed by the firm or code that demonstrates the firm's competency. For example, search functionality is typically required for a website, and firms can provide links to sites or code to show they can implement this functionality.
- References from satisfied customers with links to the websites developed for these customers.

- A financial breakdown showing the number of staff that will work on the website, the estimated hours to complete development, billing rates for website developers, and the total price.
- Resumes of all staff who will work on the website's development.

Including these submission requirements will help the client evaluate the proposals.

Proposal evaluation should be based on an objective scoring of criteria. The criteria and weightings recommended are: 1) cost – 35%, 2) the quality of samples presented – 50%, and 3) references and experience – 15%. Although the latter two criteria are subjective, scoring based on these weightings will introduce objectivity to the process. When high quality proposals are presented, price is often the differentiating factor.

The RFP must also present basic submission requirements including:

- Submission deadline, delivery location and recipient.
- The fixed total price for the website must be valid for up to sixty days after the proposal deadline.
- The proposals must be delivered in a sealed envelope and labeled as instructed.
- All original pages of a firm's proposal must be signed.
- Late proposals will not be accepted.

Finally, the RFP should outline the requirements of the website. In general terms, the website must be fully functional and complete in regard to structure. Some specific requirements that should be kept in mind include:

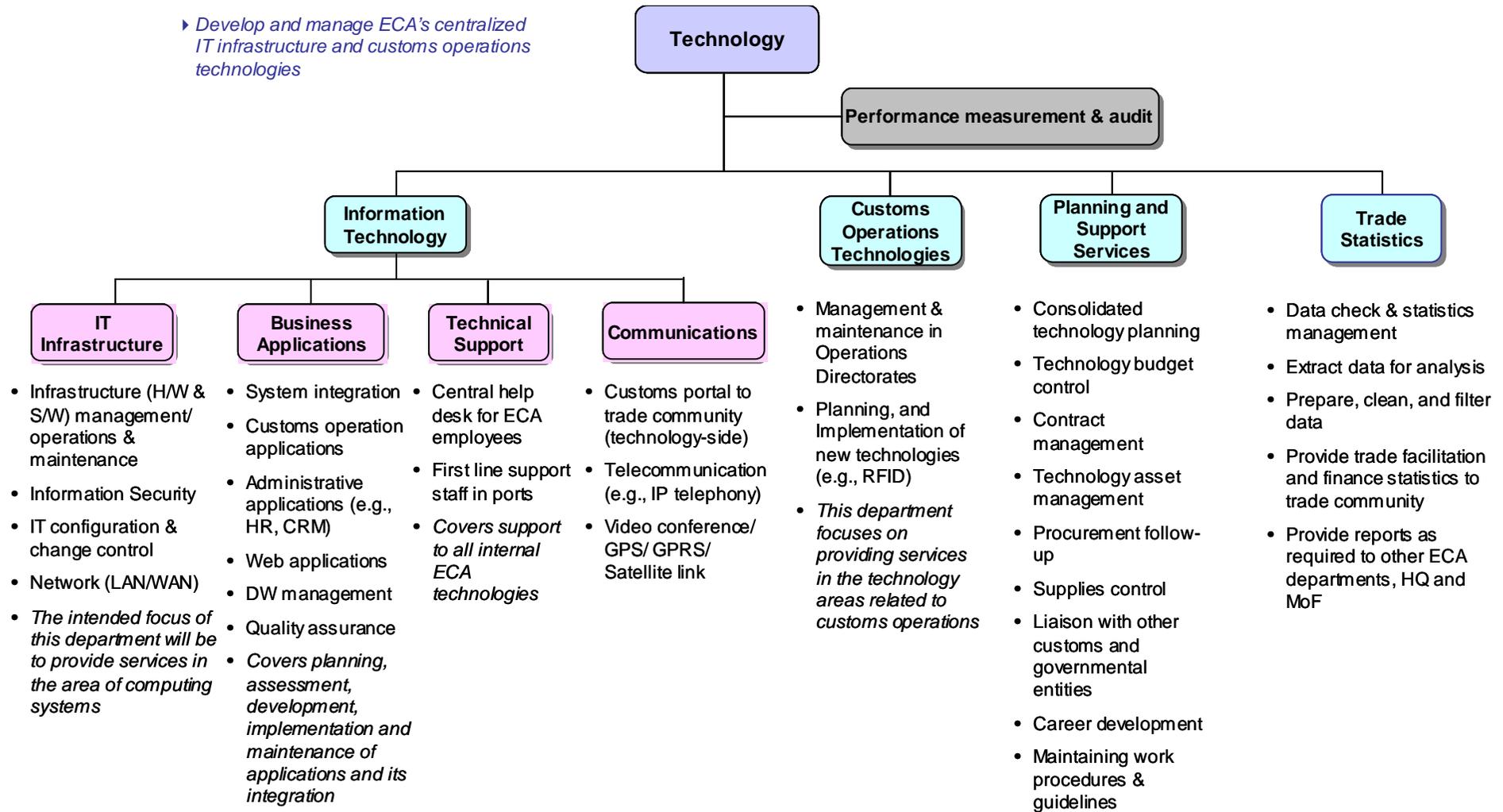
- The technology to be used for implementing the website should be specified, if there are particular requirements. Otherwise, this can be agreed during negotiations and included in the contract.
- The official seal of the organization must be prominently displayed on all pages.
- Arabic-English-French versions must be developed, which can be easily toggled back-and-forth between.
- A section for recent news is recommended.
- All relevant procedures, instructions and regulations should be available through the website.
- Tariff classification information should be posted to the website.
- The Customs reform program should be highlighted.
- Contact information including address and phone numbers should be included.
- A search function to locate information on the website quickly must be present.
- A frames-based layout is recommended that allows easy navigation and retrieval of information without completely changing the website's look.
- Key documents must be loaded in separate windows for easy viewing and printing.
- A site map should be included to give an overview of the site.
- All forms should be downloadable in PDF format.
- A content manager must be developed to allow the Web administrator to update the website's content. The content manager must have basic login/password protection. It will allow the administrator to change basic text through out the website without

requiring knowledge of HTML or other markup languages. The administrator can also add or remove downloadable documents and appropriate links.

In summary, following the guidelines presented above will help ensure that a professional quality website is developed and implemented on time for Egyptian Customs.

Appendix C – Proposed Technology Sector Organizational Chart

► Develop and manage ECA's centralized IT infrastructure and customs operations technologies



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