Approach to Implementing the GOEIC Automated Workflow Solution (GAWS)

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Approach to Implementing
the
GOEIC Automated Workflow Solution (GAWS)

For the
General Organization of Export and Import Control (GOEIC)
Ministry of Foreign Trade & Industry (MFTI)

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For the
Assistance for Trade Reform (ATR) Project
Egypt

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Executive Summary

This report presents a recommended approach to the implementation of an Automated Workflow Solution (GAWS) for the General Organization of Export and Import Control (GOEIC) of the Ministry of Foreign Trade and Industry (MFTI) of Egypt.

GOEIC is the Agency of the Government of Egypt responsible for certifying the compliance with government regulations and /or international standards of imported or exported products subject to inspection.

ATR has identified a number of high priority areas where automation is expected to yield faster processing times: (a) one-window registration concept for both GOEIC and Customs; (b) joint GOEIC and Customs inspections; (c) risk management methodology to help GOEIC concentrate on critical consignments; (d) sample selection methodology to accelerate the sample collection and testing; (e) modern sample testing and sample tracking with bar-coding systems; and overall improvement of management reporting capabilities at middle and top management levels.

In order to concentrate the automation effort in the highest yield areas that will help reduce average shipment clearing times, GOEIC's key objective is to bring together the various automation initiatives into a single GOEIC Automated Workflow Solution (GAWS).

The current and future automation initiatives at GOEIC are identified and placed within an organization-wide information systems strategy to permit a high level gap analysis and identify areas where additional systems are required. Within this context, the high priority systems that directly support the reduction of the average consignment clearance time is proposed as follows: (a) Risk Management System; (b) Customs-GOEIC Synchronization; (c) Sample Selection System; (d) Fee Calculation and Payment System; (e) Lab Testing System; (f) GOEIC Portal; (g) Automated Workflow System and (h) Decision Support System.

While each system can be designed, developed and deployed independently, once operational they will be able to cooperate and exchange information by adopting a new set of standards and technologies commonly known as XML WebServices.

Regardless of the technical solutions adopted, the success of each and all automation projects will be dependent on the adoption of a sound change management approach that includes among other things: (a) the active involvement of GOEIC's senior management; (b) the formation of implementation teams of knowledgeable users; (c) appropriately designed pilots; and (d) a high-level Business Process Reengineering (BPR) exercise.

More importantly, regardless of the specialized technical assistance called for in each project, a common theme to all the automation projects identified is demonstrated experience in the following three areas: (a) information technology project management; (b) organizational change management; and (c) project management in the public sector in the Middle East in environments similar to GOEIC's.

1 Introduction

This report presents an approach to the implementation of an Automated Workflow Solution (GAWS) for the General Organization of Export and Import Control (GOEIC) of the Ministry of Foreign Trade and Industry (MFTI) of Egypt. This work was performed under the Assistance for Trade Reform (ATR) project financed by USAID under the direction of its prime contractor Nathan Associates, Inc.

This report draws on the work performed to date under the ATR project, primarily by Mr. Alvaro J. Garcia, ATR's Senior Information Technology Consultant and his team and on interviews with GOEIC management and staff in Cairo and the Dekheila Port. Particularly important insight was gained during extensive work sessions with Dr. Samir A. El-Gammal, CIO and Minister's Advisor on IT and his staff. Additionally the author would like to thank Mr. Timothy S. Buehrer, Chief of Party for overall guidance and support.

2 Background

The General Organization for Export and Import Control (GOEIC) is the Agency of the Government of Egypt responsible for certifying the compliance or non-conformance with government regulations and /or international standards of imported or exported products subject to inspection.

GOEIC's key inspection function involves a number of procedures, such as selection of consignments for inspection, visual inspections, sample collection and testing, and calculation and collection of fees. In performing these processes, GOEIC must interact with many external entities, including: shippers, importers, exporters, consignees, auditing entities to verify compliance of imports and exports, other laboratories, Customs, port authorities, transportation providers, and banks. Because of labor intensive and inefficient manual processes and lack of fluid coordination with outside entities, the average time to clear a shipment is currently more than two weeks.

It is expected that properly deployed information technology can play a critical role in improving the inspection process. In this context, ATR has preliminarily identified the following high priority areas where automation is expected to yield faster processing times:

- Implementing a one-window registration concept for both GOEIC and Customs to permit traders to register consignments once with all entities at the port.

- Scheduling joint GOEIC and Customs inspections to reduce delays in the clearing of shipments by the two organizations.

- Implementing a risk management system as a way to concentrate on critical consignments within the inspection process.

- Improving the quality and effectiveness of the sample selection and management process.
- Modernizing sample testing and sample tracking with bar-coding systems.
- Improving management reporting capabilities at middle and top management levels.

Some automation of some of the processes involved in these areas is already underway at some of the ports. GOEIC's key objective now is to bring together the various automation initiatives into a single GOEIC Automated Workflow Solution (GAWS) that: (a) will support streamlining initiatives such as common registration and inspections with Customs and the introduction of risk management methodologies; (b) help manage and control the workflow in the various business processes; and (c) permit the electronic exchange of information among the various information systems within GOEIC and between GOEIC's information systems and those of external organizations.

3 Developing a GOEIC Information Systems Strategy

In order to concentrate the automation effort in the highest yield areas it is first necessary to understand how and where information technology can be properly deployed within GOEIC and how and where a future GAWS will help reduce average shipment clearing times.

All inspection related processes in GOEIC are dependent on specific types of information being available to management and staff at specific times and in many cases GOEIC's processes are also dependent on specific information being exchanged with external entities as illustrated in Figure 1.

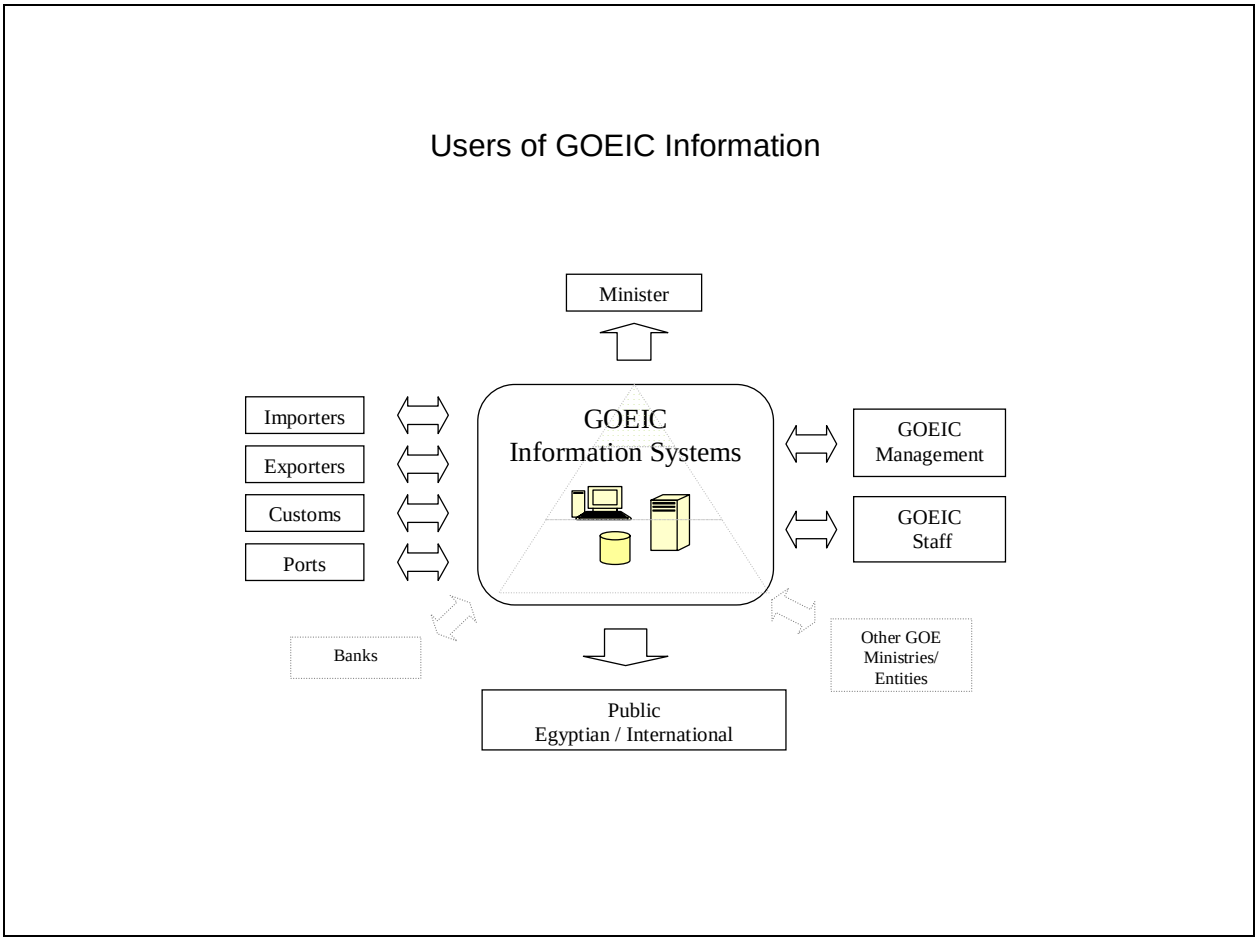

Figure 1

It is also necessary to understand that within any organization, each level of management and staff requires different kinds of information to perform their duties. The classic management decision pyramid is illustrated in Figure 2 showing the relative effect of management decisions at each level (strategic, tactical and operational) and the general timeframe of their effect.

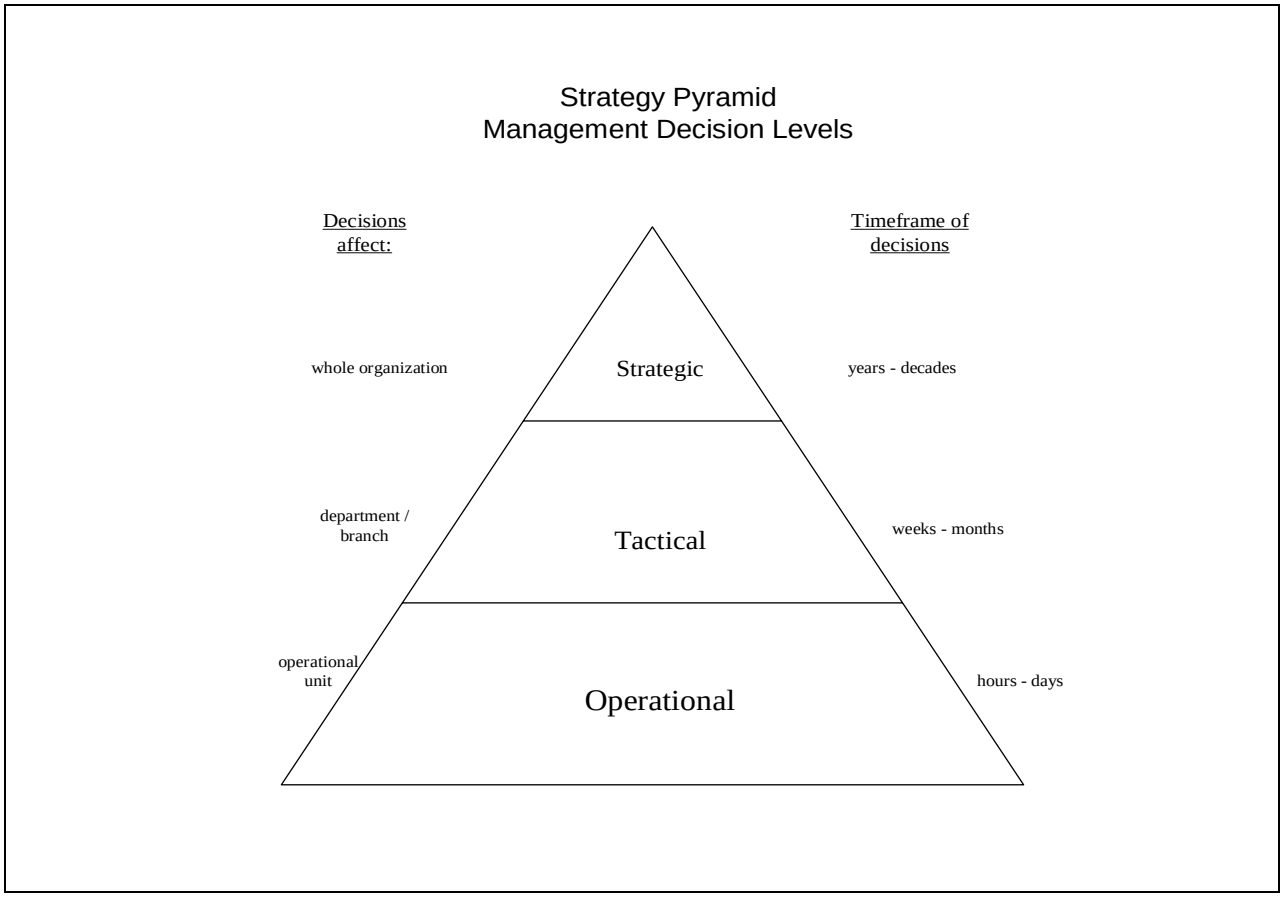

Figure 2

Within this context, Figure 3 illustrates where different kinds of information systems fit within the organizational strategy pyramid. In very simplistic terms:

- At the lower or operational level information systems tend to be primarily transaction oriented, they capture data at the lowest level of detail, usually are highly dispersed within the organization and widely distributed geographically, they tend to capture and generate high volumes of data, tend to involve multiple data input methods and instruments (keypads, barcode readers, web-forms, scanners, etc.) and tend to require larger infrastructure investments.

- At the middle or tactical level information systems support mid-management in their daily work which tends to involve scheduling and planning, analyzing statistics and performance measures and making decisions on based on this information. The information systems at this level tend to be both industry specific and general purpose analysis tools and generally require relatively low infrastructure investments since the bulk of the data required is captured by the systems at the lower/operational level.

- At the top or strategic level, when they exist, information systems tend to support the development of longer term plans and policies. Systems at this level are also known as Executive Information Systems (EIS) or Decision Support Systems (DSS). They tend to integrate different kinds and sources of information, not necessarily quantitative, and assist senior management in understanding the effect of internal and external factors on their organization. Naturally, systems at this level are heavily dependent on the existence of well functioning systems at the lower levels.

Also illustrated in Figure 3 is the transformation of raw data at the lowest level of detail into management information ant the middle level and into deeper understanding and broader knowledge of the business at the top level.

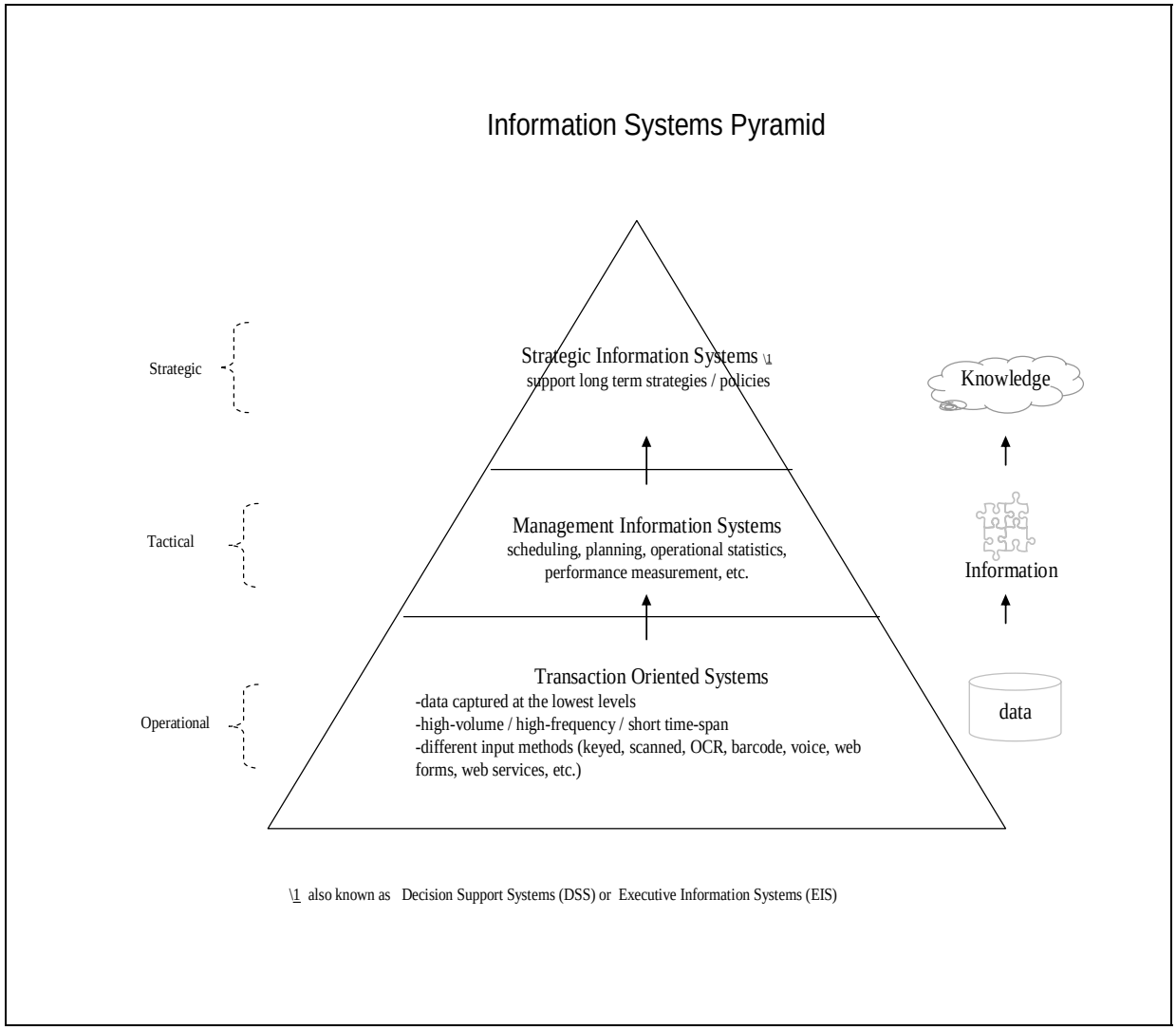

Figure 3

Developing the GOEIC Information System Strategy involves: (a) taking stock of the ongoing automation initiatives; (b) understanding where they fit within the organization-wide information system strategy pyramid, hence GOEIC strategic objectives; (c) assessing their present capabilities and deficiencies; and (c) laying out an overall plan to address those deficiencies. The resulting strategic plan should structured as a set of discrete activities, each addressing a specific deficiency, that can be packaged as separate projects to be budgeted and managed independently if necessary.

4 Existing Information Systems Initiatives

Against this background, we place the existing and planned information systems of GOEIC within the strategy pyramid as illustrated in figure 4.

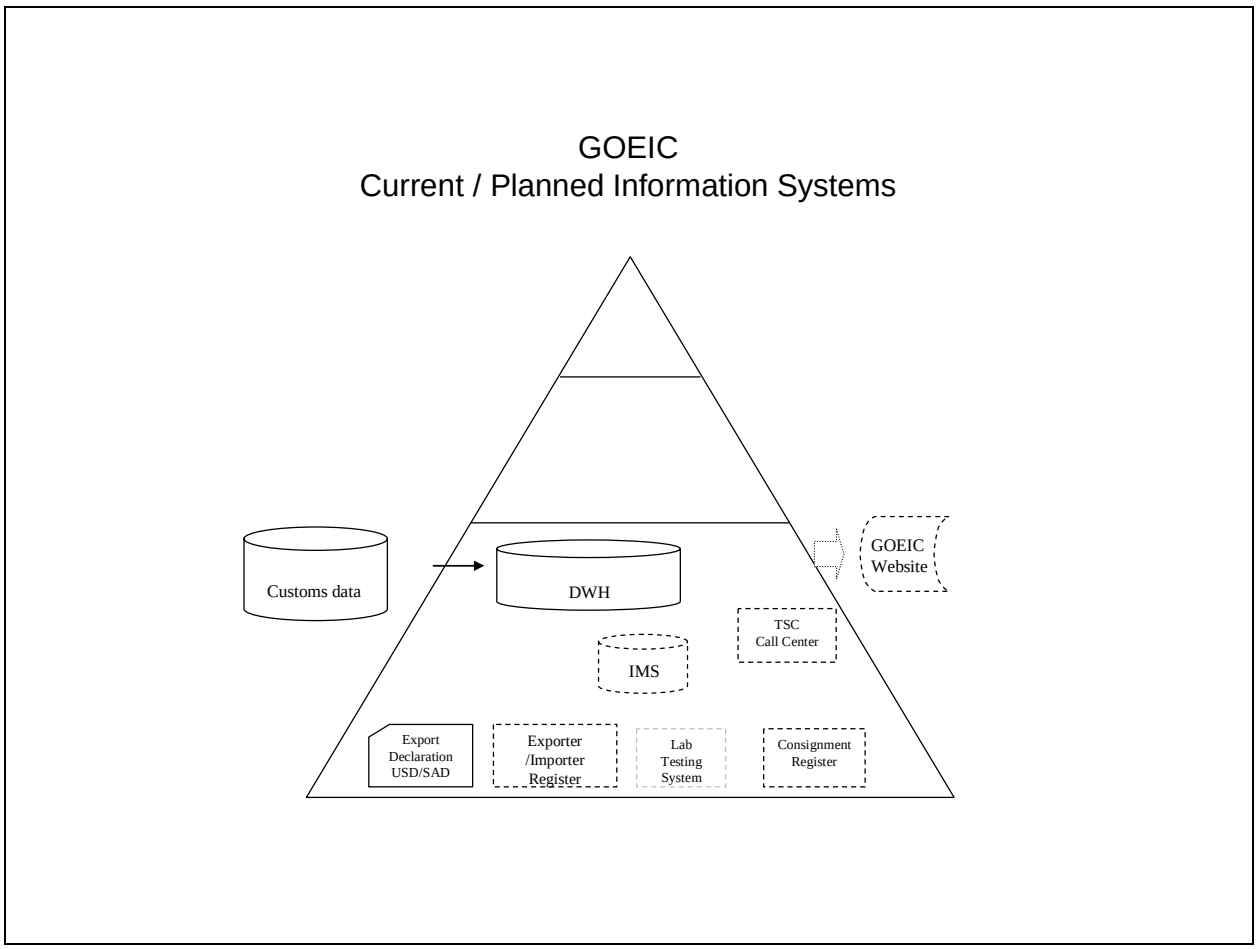

Figure 4

To date there are only a few automation initiatives at very early stages of completion and they all, at this stage, support primarily the operational level of the pyramid. They are described below:

(a) Data warehouse in Cairo

The data warehouse initiative intends to concentrate all relevant information from various parts of GOEIC as well as relevant external entities into a single data warehouse that will support the information needs on internal and external users. This concept is presented the Target Architecture depicted in Attachment 1

To date the data warehouse initiative is capturing import and export declarations data. Exporters declaration data is keyed-in by GOEIC personnel from a paper document called the USD or Unified Statistical Document (Attachment 2). Importers declaration data is imported via electronic file transfer from Customs. It is GOEIC intention to convert eventually to the use of the SAD or Single Administrative Document (Attachment 3) for both importers ad exporters declarations.

The data warehouse is today a set of tables, whose logical schema is depicted in Attachment 4 but whose physical schema no longer mirrors it and it is undergoing a process of data normalization (Attachment 5) in order to eliminate duplicate and incorrect records and achieve data integrity. The data warehouse is not yet accessible directly to its intended users as it lacks the necessary user interfaces but it already contains a considerable amount of data and with the assistance of specially trained technical staff it can be interrogated for some statistical information regarding importers and exporters declarations.

(b) Laboratory Testing System in Dekheila

This system is part of a pilot project to set up a model automated food testing operation at the Meat and Poultry lab at the Dekheyla facility. It consists of a bilingual (English-Arabic) application that allows for the tracking of test samples from shipments through the various tests in the Meat and Poultry lab. The system generates standard tests for products, records the results and compares them to GOEIC's stated thresholds for these products (which are pre-populated in the database), and outputs a bilingual report on the results of that sample and any related samples. Samples are barcoded and tracked trough the lab. The system also provides a logging module for all lab equipment maintenance, calibration and testing and maintains a library of relevant documents and internet links as a reference library for the lab.

The system has been in operation since April 2004. The pilot software was designed to create a model lab that GOEIC could replicate elsewhere.

(c) Consignment Register in Dekheila

This system is used to register consignments and to scan all the required backup documentation. It is not clear how the information captured and the electronic copies of

the documentation are used by any other unit in GOEIC or if and how they are exchanged with any other information system.

(d) Ayn Sokhna – Registration System Shared with the Port Authority and Customs

This system is used to register declarations and to scan the backup documentation. At this facility there is a single registration window for both Customs and GOEIC. While the Ayn Sokhna operation is often cited as an example of how the joint Customs-GOEIC registration and inspection processes should take place, the automation support at this facility has been implemented by the Port Authority and it is not clear to what extent GOEIC can take advantage of the software for replication at other sites independently of either Customs or the Sokhna Port Authority.

(e) Trade Services Center – Call Center

The Call Center is a key initiative of the Trade Services Center and its objective is to deliver information and advisory services to importers and exporters to assist them in meeting international and domestic requirements. The information systems supporting the Call Center include a Customer Relationship Management (CRM) package, and a web-based content management system to provide basic info about GOEIC's operation.

(f) GOEIC Website

A skeleton website (www.goeic.gov.eg) has been established with basic static information on GOEIC's operation. Proposals have been presented for enhancement of the site contents with more dynamic information such as status information on consignments and more useful functionality such the ability to enter declarations directly.

(g) Inspections Monitoring System (IMS)

The Inspections Monitoring System is a new system developed under the ATR project and is now at the final stages of development. The IMS will monitor the various activities within the inspection process, track inspection start/end times, gather statistics about each step and assist in identifying strategies to improve performance and reduce overall throughput times.

5 Proposed GOEIC Information Systems Architecture

Based on the stated objectives of GOEIC of reducing overall consignment clearing times through more streamlined and automated procedures, and based on an assessment of the information systems already at some stage of development discussed in the previous section, Figure 5 depicts a proposed information systems architecture showing at the conceptual level both new specific systems required and the exchange of data and workflow status among them.

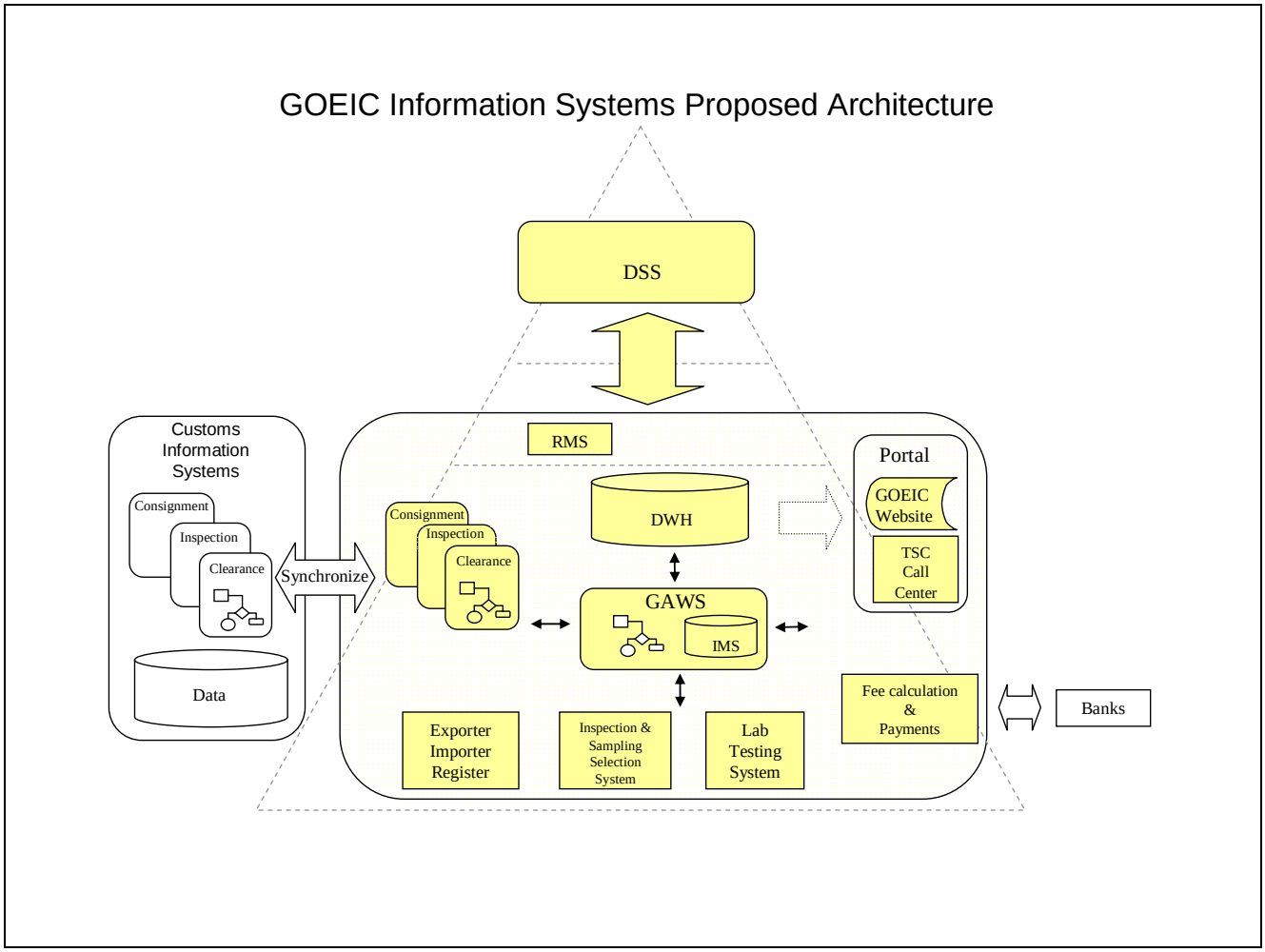

Figure 5

5.1 Gap Analysis

In order to discuss the overall architecture and how the various information systems will cooperate it is first necessary to identify those systems that are still missing. They are described below:

(a) Risk Management System (RMS).

The single, most basic and fundamental improvement over current procedures which will reduce dramatically the average consignment clearing time is the adoption of a methodology to decide, based on sound risk criteria associated with the country, nature of the product, shipper, historical precedents and various decision rules, weather a given consignment should be: (a) not inspected, (b) visually inspected; or (c) visually inspected and sampled.

While adopting his methodology is primarily a legal, cultural and management challenge, the eventual implementation of a risk based inspection methodology will require an information system known as a Risk Management System that will allow GOEIC officials to determine the need to inspect any given consignment.

(b) Customs-GOEIC Synchronization

Once GOEIC establishes that a consignment does need to be inspected, the next most important procedural improvement will come form scheduling joint visual inspections with Customs. In fact there are three different actions in the life of a consignment that should be closely synchronized with Customs in every port-of-entry: (1) common consignment declaration; (2) joint visual inspections; and (3) common final clearance. To enable this collaboration it is necessary for Customs and GOEIC to exchange basic data and status information about each shipment. This does not entail a separate information system per se but rather a set of automated procedures and standards for the electronic exchange of data among the information systems in Customs and those in GOEIC.

(c) Sample Selection System

Based on the nature of the consignment, GOEIC may have to proceed beyond visual inspection with more in-depth procedures which involve the collection and testing of samples. To expedite this process a Sample Selection System will be necessary to: (a) assign time and inspector; (b) determine sampling procedures, quantity and nature of the samples to be taken; (c) issue sample numbers and bar codes; (d) issue instructions to the inspector on how to collect and store the samples; (e) notify the appropriate lab system that a sample needs to be tested and generate the necessary paperwork; and (f) exchange the data electronically with other information systems.

(d) Fee Calculation and Payment System

The calculation of fees is currently a manual process in all ports, including the most automated one of Ayn Sokhna. A Fee Calculation and Payment System is required to: (a) automatically calculated all fees due on each consignment; (b) allow shippers to authorize related payments; (c) exchange fee and payment information with banks so that payments are processed electronically by the shipper's bank and credited automatically to GOEIC's account. Some of Egypt's larger commercial banks already allow web-based electronic payments and GOEIC's Fee Calculation and Payment System should take advantage of this capability.

(e) Consignment Status Information to/from Shippers

The Ayn Sokhna port authority already provides updated status information on large thouch-screen monitors in the premises and sends via phone text messaging updated

status information to registered shippers. It is not clear to what extent GOEIC will be able to take advantage of such capability at other ports but in any case GOEIC should be able to either exchange status info with the port system or be able to provide the equivalent inspection status information through the web and other means such as phone text messages.

(f) Decision Support System

Once the various operational systems are in place, GOEIC's management should be able to benefit greatly from a Decision Support System (DSS) that will assist them in understanding better the complexities of GOEIC's operations and in finding new ways to make them more efficient and responsive. A DSS should be able to reach into the processes and data incorporated in the different information systems within GOEIC and provide answers to senior management questions that are not always easy to anticipate. A key component of a DSS is usually an organization-wide central data warehouse where data from all kinds of sources is gathered and analyzed in various ways using specialized techniques known as 'data mining' (Attachment 6).

Data warehouses store as much historical data as possible from as many parts of the organization so as to make those analysis techniques useful. Also important is to note that the data stored in the data warehouse does not have to conform to the strict normalization and integrity criteria of a live operational database since its purpose is to answer very broad questions about the business not to replace the specialized systems that require those databases. As an example, the historical data in the data warehouse should be able to answer questions such as "What has been the average inspection time for tires over the last 6 months?" but would not be able to answer accurately the question "What is the current inspection status of tire shipment number 12345?". This kind of specific real-time information is the purview of specialized operational systems such as the IMS in this particular case.

(g) Automated Workflow System

Given the multiplicity of information systems that will need to interact with each other and with the staff in different ways and given the mix of purely manual processes (inspections, lab sample collections, lab tests, etc.) and partially automated processes (declaration registration with document scanning, etc.) it will be necessary to have an automated workflow system that will: (a) acts as traffic controller among different systems; (b) facilitate and control the exchange of data among systems; (c) initiate, monitor and terminate processes in other systems; (d) generate, either on screen or hard-copy, instructions for personnel to carry out; and (e) monitor and track those activities.

5.2 Information Systems Interoperability

Once the specialized information systems discussed in the previous sections are deployed, it will be necessary for them to interoperate, i.e. to be able to exchange data, instructions and process status information with each other. For example:

- Electronic copies of the export and import declarations (SAD) have to be exchanged between the Customs systems and various GOEIC systems.
- Instructions such as the order to inspect a given consignment are issued by the RMS and received by the Sample Selection System.
- The IMS communicates to the GOEIC Portal the current inspection status of a consignment.

In all cases a standard information exchange format is required. The technology that makes it possible for different systems, even when residing in geographically dispersed locations and based on different technical platforms is based on the use of the XML standard (Attachment 7) and is known as WebServices (Attachment 8). This concept is illustrated in Figure 6.

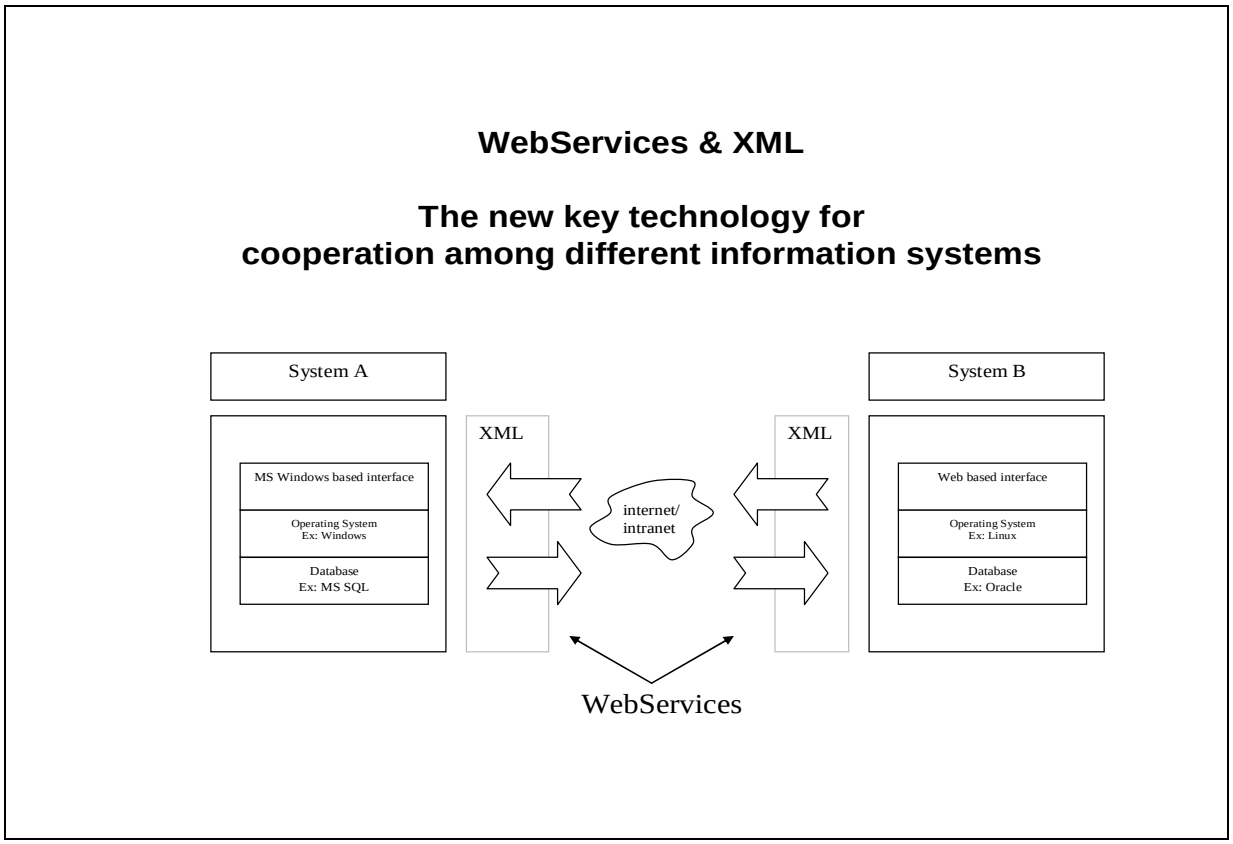

Figure 6

The key advantages of adopting an XML/WebServices based approach are:

- The various GOEIC systems can be developed and deployed independently and concurrently.
- Specialized systems can be developed or acquired without concern about their ability to interface with other existing or future systems.
- The need for tight integration among communicating systems which would require common data formats, common databases, and tightly synchronized programs, is eliminated.
- Existing legacy systems can be incorporated in the overall GOEIC information architecture without modification beyond creating or updating the appropriate WebService interface.
- Any single system can be upgraded or replaced without having to modify any other system internal or external to GOEIC
- Interoperability with all external systems, such as those of Customs, ports authorities, financial institutions, shippers and other external actors is similarly easily achieved.

6 Key steps in the Implementation of the GAWS

The first step in the implementation of an effective GOEIC-wide Automated Workflow Solution, is to assign priorities to each of the independent systems based on their direct contribution to the reduction of the average consignment clearing time. A proposed priority list is as follows:

1. Risk Management System (RMS).
2. Customs-GOEIC Synchronization
3. Sample Selection System
4. Fee Calculation and Payment System
5. Lab Testing System
6. GOEIC Portal
7. Automated Workflow
8. Decision Support System

By adopting the XML/WebServices approach to achieve interoperability, each of the above systems can be developed and deployed independently and concurrently to the others, since the need for interoperability can be met after each system is deployed. Hence, the next step is to develop a full project design for each system to include scope, objectives, tasks, deliverables and resource requirements.

In doing so, it is crucial to keep in mind that the success of automation projects is very seldom dependent on the specific technology adopted but that it is almost always the result of properly managing the soft, intangible, and extremely complex aspects of human reactions to the changes being introduced by information systems. The vast body of knowledge regarding this subject can be reviewed at http://www.change-management-directory.com/ and is concisely covered in the attached paper (Attachment 9).

It is challenging enough to introduce automation in any kind of organization where most processes are manual. It is virtually impossible to do so successfully into an environment such a GOEIC's where the benefits of automation may be perceived as being detrimental by those charged with implementing it. Resistance to change may be the result of a perceived future loss of status or power, or the fear of loss of the job or position, or simply the elimination of an often lucrative intermediation role. Consequently the design of each project should include the following basic activities that address the all too critical non-technical aspects of change management:

(a) Obtain and maintain GOEIC Senior management commitment.

This is a fundamental "sine-qua-non" requirement to managing the change brought about by automation. All members of GOEIC, form the lowest levels to the senior management ranks must clearly understand the intention of their superiors and that obstructionism will not be tolerated.

(b) Establish an implementation team.

For each system to be introduced, identify a group of knowledgeable and influential users who will embrace the new system enthusiastically and co-opt them into helping design, develop and deploy it.

(c) Design a first pilot in a "laboratory-like" environment

Especially in an environment like GOEIC's where the physical conditions are less than ideal and where the staff works in noisy and often chaotic environments, when setting up a first pilot it is important to control as many variables as possible, especially unnecessary interruptions to the regular workflow.

(d) Understand the challenges specific to each initiative and design each project accordingly

Each project will have specific challenges that need to be addressed in its design, for example, coordination between GOEIC and Customs is critical with the RMS but not so with the Lab testing system. Naturally each project will have to identify its specific Critical Success Factors, level of complexity in the implementation, current level of

technology development, and the capacity and readiness of GOEIC staff to absorb and embrace the changes introduced by the technology.

(e) Understand and streamline existing business processes.

Eliminating all the unnecessary manual, paper-based steps is necessary before it can be established which processes are to be streamlined and then automated. For this to happen a high-level Business Process Reengineering (BPR) exercise is necessary early on while keeping in mind the natural resistance by the staff to eliminating established procedures.

(f) Test and refine the new system in the pilot environment

Once a new information system and its associated set of re-engineered processes are designed and developed, extensive testing with live data and situations should continue within the relatively "clean" pilot environment so as to anticipate as many of the challenges likely to be encountered in different settings.

(g) Replicate across GOEIC.

Once a new information system and its associated set of re-engineered processes are ready to be rolled out in the other ports, the initial group of pilot users will ideally become team leaders, each in charge of rolling out the system in a different port.

7 Technical Assistance Requirements

The specific technical assistance required in each project naturally depends on the specific subject area, for example specialized data warehouse expertise is required to implement a DSS while experience in rule-based risk assessment engines for Customs is required, among other things, to implement the RMS for GOEIC. Regardless of the technical specialty called for in each project, a common theme to all the automation projects listed above is demonstrated experience in the following three areas: (a) information technology project management; (b) organizational change management; and (c) project management in the public sector in the Middle East in environments similar to GOEIC's.

These skills are not likely to be found in the same individual but in a team of consultants that together can bring to bear the necessary management expertise in each project and that are able to identify and recruit the more specialized subject area experts and information technology experts with the appropriate skills for each project.

Attachment 1 – Data Warehouse Target Architecture

Attachment 2 – Unified Statistical Document (USD)

Attachment 3 – Single Administrative Document (SAD)

Attachment 4 – GOEIC current data warehouse logical schema

Attachment 5 – Data Normalization Basics

Attachment 6 – Data Warehousing and Data Mining Basics

Attachment 7 – XML in 10 Points

Attachment 8 – Introducing Web Services

Attachment 9 – Change Management 101