DEI
DEPARTAMENTO
DE ENGENHARIA INFORMÁTICA
TÉCNICO LISBOA

MEIC-A

Enterprise Systems Integration (SEI)

2nd Semester – 2012/2013

Project Statement

This document describes the objectives, background, and requirements for the Enterprise Systems Integration course. The document is intended to describe the problem and the requirements of solution while leaving some of the development decisions open.

1. Introduction

In every organization, even those least related with business management practices, there are always ways to innovate and optimize operations

The case study scenario is an hospital, more specifically, an hospital emergencies.

The objective is to take advantage of numerous activities in emergency screening and the evaluation of the patients that are performed but whose effects are lost because there is no end-to-end business process integration. Repeated activities mean waste of time and less efficient use of resources.

Your mission, along with your IT team, is to make these processes much more efficient. A patient arrives to the hospital coming from a telephone service `HEALTH 365` or from a health center, that have already performed an evaluation of the patient, allowing physicians to know the symptoms, the potential problem, the severity and even drug prescriptions. This information should allow for a more swift patient arrival at the hospital.

Your management team will also improve the hospital management, seeking to optimize the medicine stock, keeping it to a minimum. It will collaborate with supply chain partners to make just-in-time deliveries. The invoice management will be electronic and the payment schedules will be monitored to ensure a good service level and quantity discounts.

Since dreaming is free of charge, you can substantially innovate in this case study using services that optimize operations. The restriction is that these services must exist and be accessible from public networks. If you need to depend on Health Ministry services (for which you have no access) you will have to simulate them, in a simple way.

1.1. Objectives

The aim of the solution is to support business processes of a fictional hospital – the São Nuno Hospital – which, as explained earlier, aims to treat their patients better and be more effective in management. You are intended to:

- Develop an integration architecture based on Processes and Services (BPM & SOA) involving both internal and external systems;
- Implement business processes through the orchestration of services;
- Choose and apply the integration techniques best suited to each component.

The technologies and tools to use are: Web Services (SOAP and REST); Oracle XE database; and, primarily, Oracle BPM & SOA Suite 11g. The construction of friendly human-machine interfaces is out of scope. It will be sufficient to provide a way to test the functionalities.

2. Business plan

You should build a plan for the business development through the integration of systems. You should follow the template provided in the theoretical lectures.

1. Define the added value;
2. Identify business drivers;
3. KPI;
4. Preliminary ROI study;
5. Define the integration strategy;
6. Define and represent the main stages of the business services. Use the BPMN notation or the BPEL present in the Oracle platform. Processes must define the interface with clients, collaborators and business rules;
7. Define the available external services and the internal services;
8. Define the information entities which are relevant for the processes;
9. Describe the technological architecture.

3. Business processes

A better management of resources in the front-office and back-office allows the hospital to improve quality and safety of care provided to patients and save financial resources. In this solution the following aspects require special attention:

- Integration in the national hospital system – receiving data sent by the telephonic service, validating it before the patient gets to the hospital;
- Integration with drug suppliers – order medications to replenish stocks;

- Internal integration – automate information flows within the hospital. For the management of internal processes, process templates will be used, that are called the 'Oracle Business Process Accelerators'.

3.1. Front-office

3.1.1 Preliminary screening

Before heading to the hospital, the patient contacts the telephone service and speaks with a nurse. Alternatively the patient goes to a local health center. The nurse makes a set of questions intended to find out what is the situation and whether it is urgent or not. In urgent cases, the nurse asks the patient to go to the hospital or calls an ambulance.

All collected information is sent electronically to the hospital, so the admission can be made as fast as possible.

Patient data sent includes: name, date of birth, identity document, health insurance (if it exists), and address. The preliminary screening data includes: date, time, type of care needed, level of urgency, drug needs. The following types of care are considered: Pediatrics, Orthopedics, Surgery and General Medicine; there are three levels of urgency: red, yellow and green; where red is the most urgent and green the least urgent.

3.1.2 Data validation

While the patient is heading towards the hospital, the following validations should be made:

- The customer's address must be verified using the validation service provided by CTT (Portuguese Mail) that provides a REST interface;
- The list of drugs must be validated using information available publicly on the Infarmed (Portuguese Medicine Authority) web page;
- The preliminary screening should be re-observed by a physician of the hospital, which classifies it as as 'sufficient' or 'insufficient'. If the screening is sufficient, drugs can be ordered immediately from the hospital pharmacy. The preliminary screening validation is an adaptation of the 'Document Approval' process template.

3.1.3 Patient admission

Patient admission gives priority to the most urgent cases. Upon arriving at the hospital, the patient is identified and the information status is confirmed. If the previous validation have all been successful, the patient may be forwarded to a care unit. If there are errors in customer data, they will have to be fixed at this stage. If preliminary screening has been classified as 'insufficient', the patient will be screened again. In any case, an admission record is created with date and time information.

After the screening (if necessary), the patient can be attended as soon as a care unit is available. The assignment of patients to the care units should be an adaptation of the process template 'Internal Service Request'. The hospital has limited resources to care for patients, according to Table 1

Type of Care	Units
Screening	2
Pediatrics	2
Orthopedics	2
Surgery	1
General Medicine	3

Table 1: Care units available at the hospital.

3.1.4 Patient exit

After the patient has been cared, an exit record should be generated. The patient is asked to fill-in an exit form, where the service is evaluated and suggestions can be made. This process should be an adaptation of the template process 'Public Sector Incident Reporting'.

3.1.5 Summary

All information mentioned so far must be stored in the hospital database. Figure 1 presents a summary of the solution that is being built to support the front-office processes.

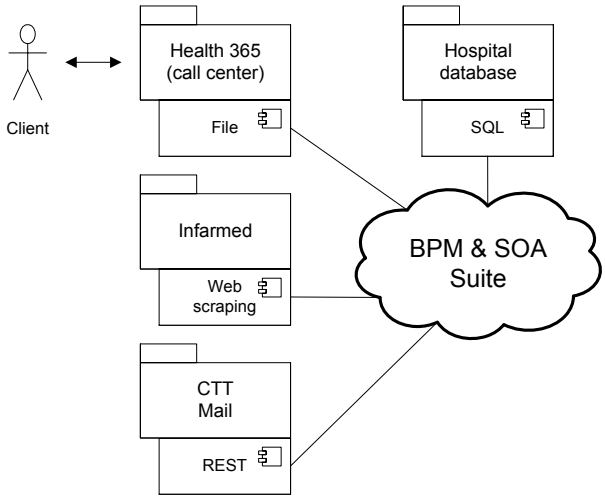

Figure 1: Front-office solution.

3.2. Back-office

3.2.1 Orders

The drugs needed for emergency care are ordered from hospital pharmacy. The hospital pharmacy stores the drugs appropriately and maintains the stock i.e. how many medicines are available. The subtraction of drugs from the stock should trigger medication orders for new drugs. All this information is also part of the hospital database.

Suppliers are pharmaceutical distributors, who provide drugs from different brands, and also generics. They deliver according to pre-agreed arrangements. To represent Purchase Or-

ders there are the UBL and HDMA formats.

Additionally, for the management of relationship with the suppliers the purchase orders must be integrated with the issuance of electronic invoices.

3.2.2 Self-invoicing

After the orders are submitted, the hospital contacts an external service that allows the issuing electronic invoices. In this case, we are operating using self-invoicing. This means that the client issues the invoices, that are later checked by the supplier.

The invoice data is sent, and later, the electronic document is received.

3.2.3 Accounting record

After the invoice is issued, the hospital must submit it to the financial system, to record in the ERP accounting. This integration must be made asynchronously, using MQ technology with assured delivery of messages.

3.2.4 Summary

Figure 3 provides an overview of the solution that is being built to support the back-office processes.

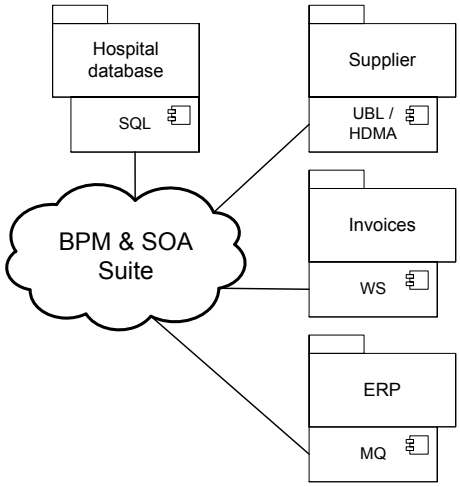

Figure 2: Back-office solution.

3.3. Extensions

The front-office and back-office described are the basic features of the integration project. Having regard to the business plan set, it is up to each group to extend the solution, so that:

- More features of the Oracle BPM & SOA Suite tool are used to improve the solution in a meaningful way;
- More services and processes provide notorious improvements to the business;
- More integration technologies are used, different from the ones already used.

Here are some suggestions for improvement:

- Forwarding of patients to other hospitals with greater availability for the type of care required by a patient;
- In the case of not very urgent patients, send them a text message telling them to go to the hospital when the wait times are lower;
- Business rules for customer orders to help improve the purchase processes, without compromising patient safety;
- Sending drugs prescriptions to pharmacies near the patient's home;
- Etc.

To search for APIs available on the Internet we suggest the following start pages: `http://www.programmableweb.com/` and `http://www.xmethods.net`.

3.4. Overview

Figure 3 provides an overview of the global solution, encompassing the various packages and technologies. Some possible extensions are also identified.

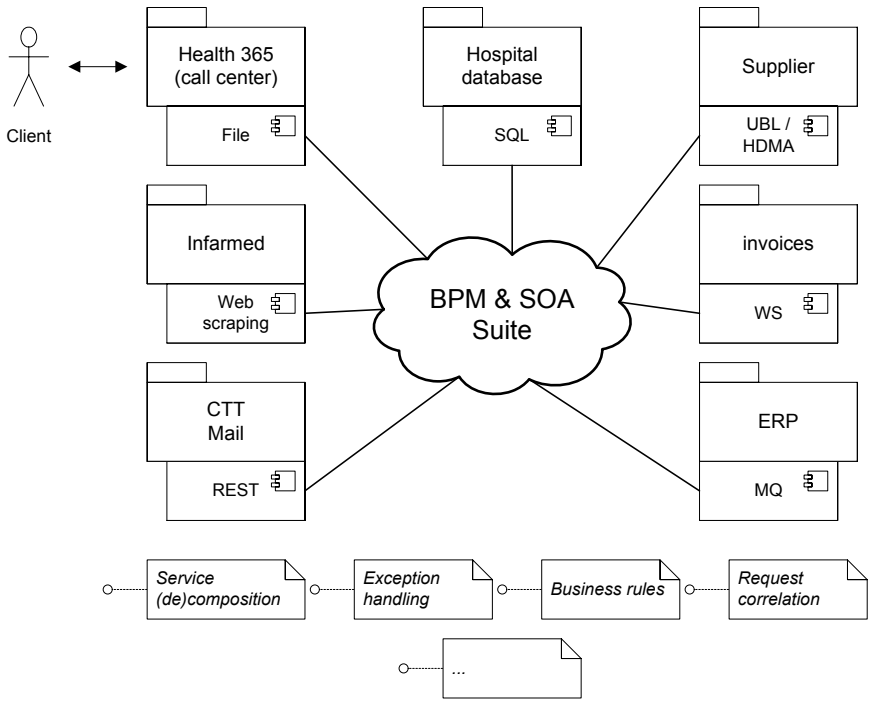

Figure 3: Solution overview.

4. Deliveries and Evaluation

The project will be accompanied every week in the laboratory sessions. Students should show the work in progress and discuss options with the lab assistant. Each week will have a goal:

Dates	**Goal**
March 4th and 5th	Start of development
March 11th and 12th	**Delivery of preliminary business plan** – project development
March 18th and 19th	Project support
March 25th and 26th	**1st delivery** – front-office
April 1st and 2nd	Easter Holidays
April 8th and 9th	Evaluation of 1st delivery
April 15th and 16th	**2nd delivery** – back-office
April 22nd 23rd	Project support
April 29th and 30th	Project support
May 6th and 7th	**Final delivery** – extensions
May 13th and 14th	Project discussion

Each work delivery will be viewed and evaluated in the following lab sessions. The final delivery is evaluated with a visualization and discussion, in a date and time to be set. Each student will have an individual grade to reflect its participation in the project throughout the semester. The minimal grade required to not fail the course is 9. The evaluation grade is split between deliveries in the following way:

- Preliminary business plan: 3 ;
- First part (front-office): 3 ;
- Second part (back-office): 3 ;
- Final delivery + business plan: 11 .

The final delivery will be made using the Fénix system. A single ZIP file should contain the source code and project report in PDF format.

5. Conclusion

This statement has described the integration project domain and how it should be implemented. The labs web page will have more information about the project. Be sure to visit it regularly.

Sigla	Significado
API	Application Programming Interface
BPEL	Business Process Execution Language
BPM	Business Process Management
BPMN	Business Process Model and Notation
ERP	Enterprise Resources Planning
HDMA	Healthcare Distribution Management Association
KPI	Key Performance Indicators
MQ	Message Queue
UBL	Universal Business Language
REST	Representational State Transfer
ROI	Return On Investment
SOA	Service-Oriented Architecture
UBL	Universal Business Language
WS	Web Services
XML	eXtensible Markup Language

Attachments

Acronyms

CTT

Validation service address: `http://www.ctt.pt/pdcp/xml_pdcp`.

Manual: `http://www.ctt.pt/fectt/wcmservlet/system/galleries/download/servicosonline/conteudosextra/man_util_xml_v15.pdf`.

Infarmed

Address: `http://www.infarmed.pt/infomed/pesquisa.php`

To collect the information use web scraping techniques. Please do not overload the server. Make a 5 second pause between each access.

UBL

More information at: `https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=ubl` Look for information about the Purchase Orders.

HDMA

More information about the EDI guidelines:
`http://www.healthcaredistribution.org/ir_issues/edi_guidelines-full.asp`

Oracle Business Process Accelerators

The Oracle Business Process Accelerators are templates for business processes that should be customized to fit the organization's needs. More information available at: `http://www.oracle.com/technetwork/middleware/bpm/learnmore/processaccelerators-1609559.html`.

Document Approval Process

Template illustrated on Figure 4.

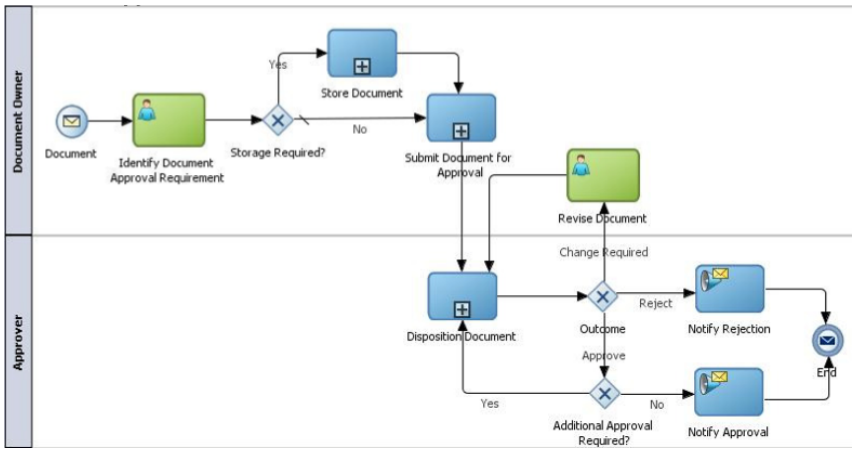

Figure 4: Document Approval Process.

Internal Service Request Process

Template illustrated on Figure 5.

Public Sector Incident Reporting Process

Template illustrated on Figure 6.

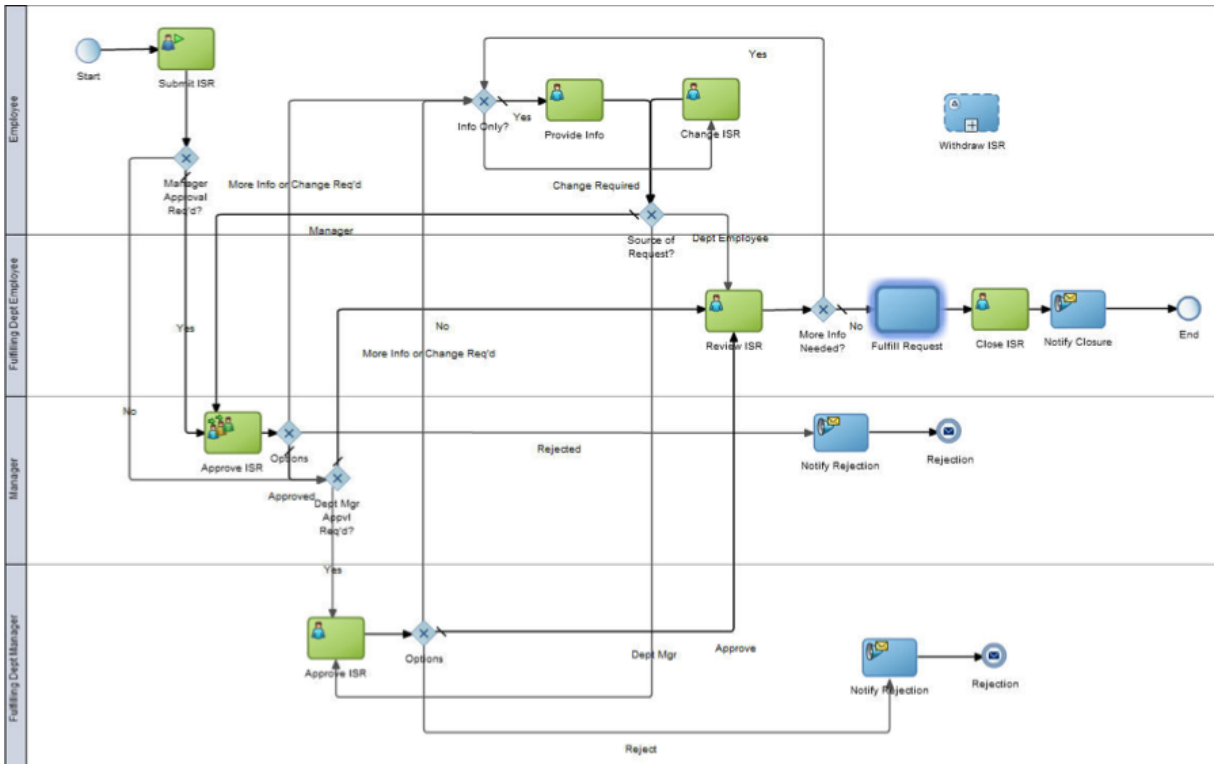

Figure 5: Internal Service Requests Process.

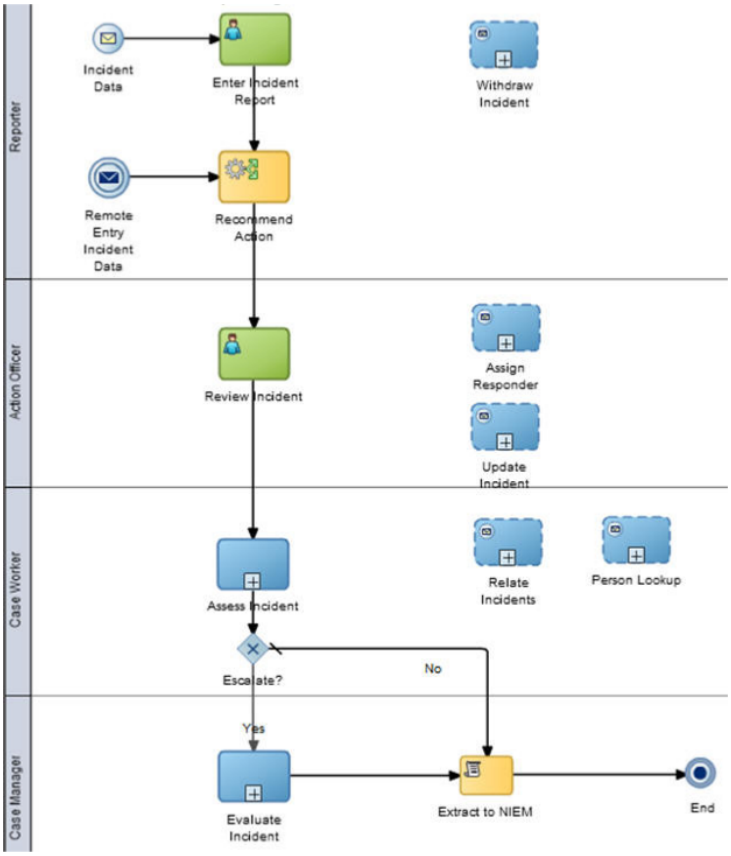

Figure 6: Public Sector Incident Reporting Process.