Integration of Patient Information System with Picture Archiving and Communication System through Radiology Information System platform: case of OAUTHC

By

Roussel AZANFACK and Abimbola SORIYAN

Department of computer science and engineering, Obafemi Awolowo University, Ile-Ife, Nigeria
Outline

• Introduction
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• Methodology
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• Proposed System
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Introduction

• In standard hospitals today, there is a need for easy and timely access to patient information and diagnosis.

• In the early 90s, a joint research and development project at the Health Information System (HIS) research group, Computer science and Engineering Department, Obafemi Awolowo University in conjunction with the Finnish researchers produced a package called “Made In Nigeria Primary Healthcare Information System (MINPHIS)” (Soriyan et al, 2007).

• Federal Ministry of Health (FMoH, 2011), in the early part of 2011 provided some state of the art imaging equipments to some of these hospitals in their radiology department.
Level of Integration

• **Data integration**, which requires that data does not need to be entered more than once;

• **Functional integration**, which is ensured when services provided by a module can be used where they are needed

• **Presentation integration**, which is given when different modules present their data in a unified way

• **Context integration**, meaning that settings such as the selection of a certain patient or image, which are done in one module, are passed automatically to another module when this is called.
Integration Approaches

• **Web-based systems:** allow information sharing within global teams and the dissemination of information through a shared Web server.

• **Distributed objects/components:** It has been widely used for the implementation of integrated systems, particularly after the development and deployment of three major Distributed Objects standards: CORBA, COM/DCOM and Java RMI.

• **Software agents:** agents are used and best suited for applications that are modular, decentralized, changeable, ill-structured, and complex. They cope with dynamic changing.

• **Web services:** web services support interoperable machine-to-machine interaction over a network.
Hospital Systems

• **Patient Information System** (PIS) is regarded as an integral part of Hospital Information System (HIS) to manage patient information.

• **Picture Archiving and Communication System** (PACS) is referred to the electronic information systems that acquire, sort, transport, store, and electronically display medical images (Becker and Arenson, 1994).

• **Radiology Information System** (RIS) is a computerized database used by radiology departments to store, manipulate and distribute patient radiological data and imagery.
Objectives

a) Design an integrated platform for information exchange;

b) Implement the system in (a) above
Methodology

a. First an interview was conducted at the Department of Radiology, Obafemi Awolowo University Teaching Hospital Complex (OAUTHC), with the aim of identifying the basic requirements for designing the integrated system. The result along with and the RIS feature identified in the literature combine with the investigation of the PACS and the PIS were used to model the system.

b. Secondly, the integration process was divided into four phases, namely: a) examining the application architecture and technical infrastructure of existing systems to determine or identify the data or functionality that must be shared, b) development of the integration model, c) choose technology and technical standard adoption and d) specify technical interface.

c. Thirdly, the integration mechanism followed the agile method for System Development Life Cycle (SDLC) and Digital Imaging and Communications in Medicine (DICOM) and the Health Level 7 (HL7) messaging technology were employed for the interface and medical images viewed from the PACS.
Existing Workflow in OAUTHC

Legend
- Clerk steps
- Additional steps
- Generic workflow

Exam Request

Referring Source

MRO

Floor Manager

Cassette

Examine request
Conduct examination
And save it into PACS or
Print the film

Register patient
Forward request to radiographer

Radiographer

Film

Consultant Radiologist

Write report or edit and approve report being written by resident radiologist and return it to the referring doctor

Typist

Resident Radiologist

Patient

INNER Source

OUTER Source

RADIOLOGY UNIT
**Legend**

- Additional manual steps
- Additional steps
- Generic workflow

**Improved Workflow**

1. **Referring Source**
   - Register patient
   - Forward request to radiographer

2. **Exam Request**
   - Inner Source
   - Register patient
   - Forward request to radiographer

3. **MRO**
   - Examine request
   - Conduct examination
   - And save it into PACS or Print the film

4. **Floor Manager**
   - Examine request
   - Conduct examination
   - And save it into PACS or Print the film

5. **Radiographer**
   - Examine request
   - Conduct examination
   - And save it into PACS or Print the film

6. **Cassette**
   - Print the film

7. **Typist**
   - Write report or edit and approve report being written by resident radiologist and return it to the referring doctor

8. **Resident Radiologist**
   - Write report or edit and approve report being written by resident radiologist and return it to the referring doctor

9. **Consultant Radiologist**
   - Write report or edit and approve report being written by resident radiologist and return it to the referring doctor

**RADIOLOGY UNIT**
Patient Information Systems - UML Use Case
Picture Archiving and Communication Systems - UML Use Case
use case diagram of the proposed system
Manufacturer Products

1. Standalone system
   - HIS
   - RIS
   - PACS

2. Integrated HIS/RIS
   - HIS/RIS
   - PACS

3. Integrated RIS/PACS
   - HIS
   - RIS/PACS

4. Combine HIS/RIS/PACS
   - HIS/RIS/PACS
Existing System in OAUTHC

HIS

???

PACS

RIS

???
Proposed MINRIS Integration Platform

- Feature System
- Appointment
- Worklist Preparation
- Billing
- Scheduling
- Registration
- Image Indexing
- Report
- Approval
- Inventory
- SSL

MINRIS
Confidentiality
Security

(Web Services/RMI/CORBA)

HIS
PIS

PACS
Image Server

HL7

SSL

16
Detail layer of MINRIS Architecture
Basic data flow Model

Legend

- Generic workflow
Result
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</table>
The implementation of MINRIS application will fulfill the requirements for distributing medical images and integrates them with the patient information system.

This system allows the user to work in a consistent environment without switching between applications.

The images will be called up by functions in the PIS and displayed in the same work place.

This system will respond quickly to the needs of imaging specialties and help clinicians in their decision process.
Thanks

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