Enterprise Medical Imaging in Public Health Facilities in Zambia: Towards a Useful and Interoperable PACS Platform

Lighton Phiri¹ · Ernest Obbie Zulu²

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2nd Southern Africa Regional Hub Workshop (BETTEReHEALTH 2022)
July 19–20, 2022 | Salima, Malawi
About The DataLab Research Group

- The DataLab research group at The University of Zambia is composed of faculty staff and students—undergraduate and postgraduate—working in three main areas
  - Data Mining
  - Digital Libraries
  - Technology-Enhanced Learning

Data Mining
With the proliferation of data, the field of Data Mining has gained rapid popularity. Data Mining focuses on the discovery of patterns in large datasets by making use of statistical and machine learning techniques.

Our current focus involves leveraging machine learning techniques to facilitate efficient and effective delivery of services in the health and educational domains—two areas that are of significance in the so-called developing world.

The following members are actively working in this area:

- Lighton Phiri
  - Academic/Faculty
- Robert M’sendo
  - Masters Student
- Halwiindi Mulomba
  - Undergraduate Student
- Astence Chinonyama
  - Undergraduate Student
- Memory Banda
  - Undergraduate Student
- Kelly Mwilwa
  - Undergraduate Student
- Hangoma Maambo
  - Undergraduate Student

Digital Libraries
The field of Digital Libraries (DLS) generally involves the study of digital collections of information and corresponding network-based services used to retrieve data from the collections. DLS are in effect information systems that are used to persistently store digital objects, manage the digital objects and, facilitate access to digital objects.

Our focus in the field of DLS, as a research group, mostly involves experimenting with techniques that can potentially facilitate efficient and effective access to digital objects stored in DLS.

The following members are actively working in this area:

- Lighton Phiri
  - Academic/Faculty
- Dokwe Tembo
  - Masters Student

http://datalab.unza.zm
Digital Health Conference

Digital Health Conference
August 10-12, 2022 Livingstone, Zambia

Important Dates:
Submission Deadline (last call): 15 July 2022
Notification to Authors (last call): 22 July 2022
Final Camera-Ready Submission: 5 August 2022
Conference: 10 -12 September 2022

https://www.moh.gov.zm/?page_id=1800
Outline

- Zambia eHealth Strategy
- Zambian Health Sector at a Glance
- Radiological Workflows
- Preliminary Baseline Studies
- Enterprise Medical Imaging
- Ongoing Work: Usable & Interoperable PACS
- Conclusion & Future Work
Introduction: eHealth Strategy (2017-2021)

- eHealth Strategy
  - **Vision:** Quality, timely, secure and accessible Health information through an integrated national
  - **Mission:** promote effective and efficient delivery of Health to all Zambians using ICTs
- Draft Digital Health Strategy still work in progress

"Health Strategy 2017–2021 "
*Ministry of Health, Republic of Zambia*

https://www.moh.gov.zm/?wpfb_dl=89
Introduction: Health Sector in Zambia

- ~2815 health facilities
  - Government of the Republic of Zambia (GRZ), Military, Non-Governmental Organisations (NGO) and Private

“Enterprise Medical Imaging in the Global South: Challenges and Opportunities” Ernest Obbie Zulu and Lighton Phiri (IST-Africa 2022)

Ownership
- Military
- GRZ
- NGO
- Private

Introduction: Health Sector in Zambia

- Our work focused on GRZ health facilities
  - 151 facilities classified as Level 1, 2 or 3 Hospitals
- Only 9 GRZ Radiologists, operating in five facilities

“Enterprise Medical Imaging in the Global South: Challenges and Opportunities”
Ernest Obbie Zulu and Lighton Phiri (IST-Africa 2022)

Radiological Workflows

Order entry → Exam performed → Image processed → Image interpreted → Transcribed report

Baseline Studies: Radiological Workflows in Public Health Facilities in Zambia (1/3)

2019 Radiology Annual Returns at UTH-Adult Hospital

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2019 Radiology Annual Returns at UTH-Adult Hospital

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- Computed Tomography
- Contrast Aided X-Ray
- Dixa Scan
- Nuclear Medicine
- Paediatrics X-Ray
- Plain Film X-Ray
- Ultrasound
- Vascular Catheterisation

"Enterprise Medical Imaging in the Global South: Challenges and Opportunities" Ernest Obbie Zulu and Lighton Phiri (IST-Africa 2022)
Baseline Studies: Radiological Workflows in Public Health Facilities in Zambia (2/3)

How Does Your Facility Store Medical Images? (N=85)

- Not Stored/Given Back to Client: 31
- Specialised computerised image storage: 6
- Not Stored/Given Back to Client, Physical: 5
- Office or Personal Computer: 5

Number of Respondents
Baseline Studies: Radiological Workflows in Public Health Facilities in Zambia (3/3)

How Does Your Facility Store Image Reports? (N=85)

- Not Stored/Given Back to Client: 34
- Physical Storeroom: 8
- Not Applicable: 6
- Not Stored/Given Back to Client, Physical: 4

Number of Respondents
Radiological Workflows Using Enterprise Medical Imaging Strategies

https://wiki.ihe.net
Ongoing Work: Towards a Useful and Interoperable PACS Platform

https://wiki.ihe.net
Ongoing Work: PACS Platforms Store, Manage and Facilitate Access to Images
Ongoing Work: Current Organisation of Medical Images (1/2)

- Inefficient image organisation
- Example: Optical discs originate from University Teaching Hospitals (UTHs)
  - COVID-19 studies
Ongoing Work: Current Organisation of Medical Images (2/2)

- Inefficient image organisation
- Some medical images are stored on external hard drives
  - Medical images are stored and organised on generic filesystem in hierarchical folder structures
Ongoing Work: Current Organisation of Medical Images (2/2)

- Some medical images are stored on external hard drives
  - Medical images are stored and organised on generic filesystem in hierarchical folder structures
Ongoing Work: Standards-Based, Interoperable & Useful PACS Platforms (1/2)

- Standards-based platforms using international standards
- Interoperable with other systems used in health facilities
- Useful to key stakeholders involved in radiological workshops: Physicians, Radiographers and Radiologists
# Ongoing Work: Standards-Based, Interoperable & Useful PACS Platforms (2/2)

## DICOM Server Interface

![DICOM Server Interface]

## Example Patient List

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<th>Sex</th>
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Ongoing Work: Standards-Based, Interoperable & Useful PACS Platforms (2/2)

![DICOM image management interface]

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Ongoing Work: Standards-Based, Interoperable & Useful PACS Platforms (2/2)

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Ongoing Work: Standards-Based, Interoperable & Useful PACS Platforms (2/2)
Ongoing Work: Standards-Based, Interoperable & Useful PACS Platforms (2/2)
Conclusion and Future Work

- PACS platform anticipated to facilitate effective storage, management and access of medical images
- PACS platform design can potentially be standards-based to facilitate interoperability with current HMS
- Current and future work
  - Requirements elicitation to design a useful PACS platform
  - Usefulness and usability evaluation of PACS platform
  - Design and implementation of RIS platform
  - Feasibility of using artificial intelligence for semi-automated interpretation of common pathologies
  - Interactions with key stakeholders: Ministry and Infratel
Q & A Session

- Comments, concerns and complaints?
Bibliography

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http://datalab.unza.zm
http://lis.unza.zm/~lightonphiri
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