



**Influence of Design–Reality gaps on Electronic  
Medical Records use: *The case of Malawian Health  
Centres***

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# Introduction

- Information technology has changed the way data is collected, stored, manipulated and used
- In hospitals, the advancement of technology in patient data management came in the form of Electronic Medical Records (EMRs)
- Electronic Medical Records capture, store and retrieve patient data through electronic gadgets (Conrick, 2006)
- Malawi started EMRs installations in 2001 with Kamuzu Central Hospitals' ART clinic and Patient Registration EMRs (Baobab Health Trust, 2017)
- Several EMRs have been deployed throughout the country



# The Problem

- Several benefits of EMRs have been enjoyed including easy generation of reports, easy access and retrieval of data
- 50 % of EMRs world wide are partly used or not used at all (Keshavjee et al., 2006)
- Since the year 2000 several EMRs have been deployed in this country.
- There seems to be a misalignment of EMRs workflow and clinical processes.
- These mismatches have resulted in non use or occasional use of EMR



# Research Objectives

## Main Objective

- To analyse how design-reality, socio-technical gaps influence EMR use.

## Specific Objectives

- Analyze technical gaps that affect the use of EMRs;
- Analyze organizational gaps that affect the use of EMRs;
- Analyze staffing gaps that affect EMR use;
- Suggest strategies for minimizing design-reality gaps, to enhance EMR use



# Literature Review

- EMRs are patient-level systems within Health Information Systems (Shuemie, 2009)
- Since 1960 various EMRs have been deployed world wide (Russell, 2012)
- EMRs assist health care delivery through improved legibility of clinical notes, reminders of tests, production of reports for decision making (Fraser, 2005)
- In low resource settings, some challenges facing EMRs include cost of implementation, lack of infrastructure and unstable power supply. (Douglas, 2009)
- Half of the EMRs deployed are not used or are partly used (Keshavjee et al., 2006)
- Some of the common reasons why EMRs are not regularly used include computer illiteracy, users' perspective of EMRs and lack of incentives to motivate users (Msukwa, 2011; Jawhari, 2016)
- Almutairi (2011) asserts that some EMRs fail because of technology design. Some design are very different from the actual practices on ground making it difficult for users to use the system.

# Theoretical Framework

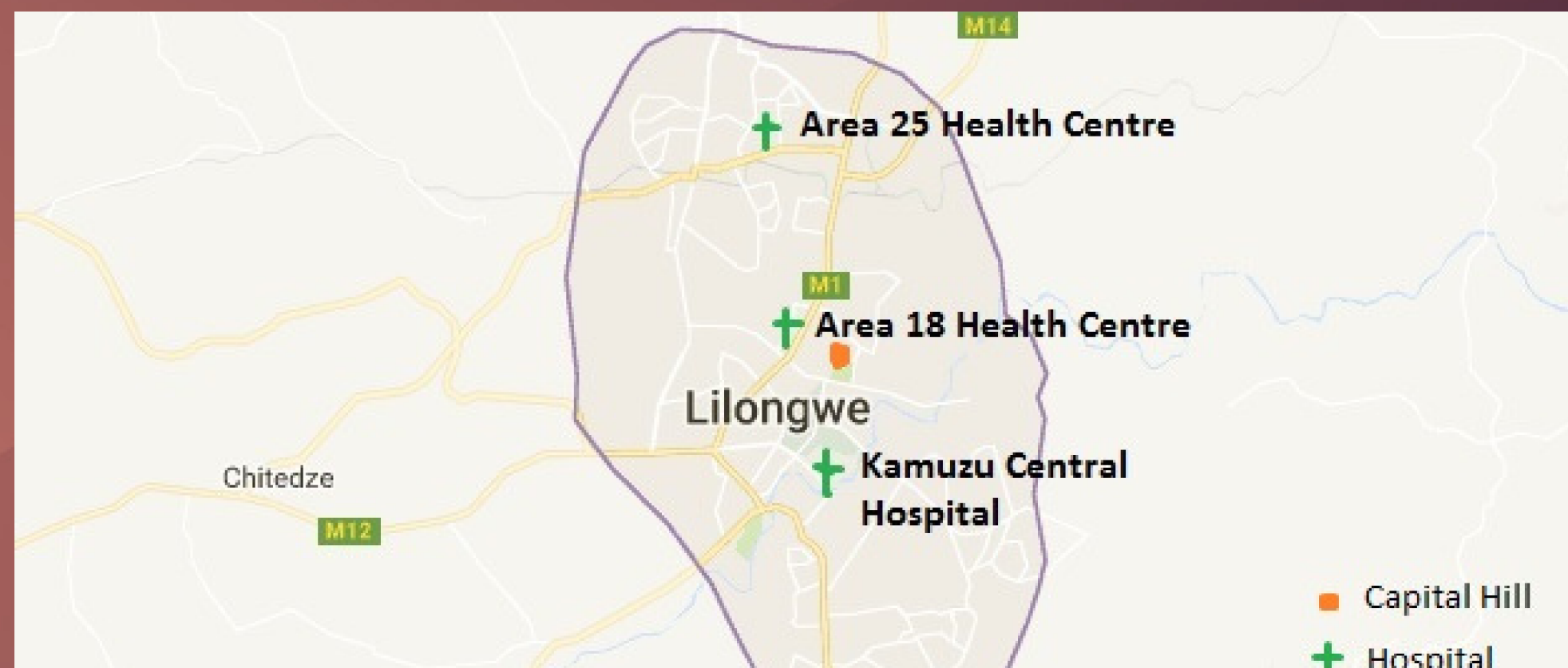
- The study was guided by Design–Reality Gap Theory (Heeks, 2003)
- The theory asserts that the gap that exists between the designs and reality determines whether the system will succeed or fail.
- Concepts in design–reality gap theory are **Information, Technology, Processes, Objectives, Management and Other Resources (ITPOSMO)**
- This theory uses scores to show gaps (magnitudes) between Design and Reality
- Gaps range from 0 to 10

Meaning of Gaps

0	1	2	3	4	5	6	7	8	9	10
No Gaps				Middle Gaps			Serious Gaps			

# Study Context

- The study was conducted at Area 18 and Area 25 Health Centers in Lilongwe
- EMRs have been in use for over 5 years
- ART and OPD EMRs usage were compared at each facility





# Methodology

- Qualitative study design
- Data collected through user interviews, document reviews and observations
- The sample size was 36 Participants
- Participants were identified using Purposive sampling
- Data analysis was done by developing themes from the findings

# Document analysis

	Area 25		Area 18	
	OPD	ART	OPD	ART
User Manuals	✓	✓	✓	✓
Treatment guidelines	X	✓	X	✓
System usage reports	✓	✓	✓	✓
Meeting	✓	✓	✓	✓



# Results – Area 25 Health Centre

## OPD EMRs

- EMR require several steps to achieve a goal.
- EMR is used by clerks only
- OPD reports are different from the MoH required.
- Management is not supportive of EMRs
- EMR workflow is very different from manual processes
- Users are frequently transferred/rotated leaving untrained staff in the clinic

## ART EMRs

- ART has features that enhance use e.g. tips
- EMR produces reports that are submitted to MoH
- MoH offers support and monitoring to the clinic
- EMR workflow similar to manual processes
- Enough trained staff is available during clinic days



# Results – Area 18 Health Centre

## OPD EMRs

- EMR has lengthy steps to achieve one thing
- EMR collects unnecessary data for OPD
- Insufficient hardware in some places
- OPD reports are different from the required ones.
- EMR workflow are very different from manual process
- Staff/Users is frequently transferred/rotated

## ART EMRs

- ART has features that enhance use
- EMR produces reports that are submitted to MoH
- MoH offers support and monitoring to the clinic
- EMR workflow similar to manual processes
- Partners (Lighthouse and Baylor) provide staff to assist in data collection

# Results – Dimension Scores

<u>ELEMENT</u>	<u>AREA 25 HC</u>		<u>AREA 18 HC</u>	
	<u>OPD</u> Score	<u>ART</u> Score	<u>OPD</u> Score	<u>ART</u> Score
Information	<u>6.5</u>	<u>0</u>	<u>8</u>	<u>0</u>
Technology	<u>7</u>	<u>0</u>	<u>7</u>	<u>0</u>
Processes	<u>5</u>	<u>1</u>	<u>4</u>	<u>0</u>
Objectives and Values	<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>
Staffing and Skills	<u>6</u>	<u>0</u>	<u>5</u>	<u>0</u>
Management and Structures	<u>4</u>	<u>2</u>	<u>2</u>	<u>2</u>
Other Resources	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>



# Discussion

- **Technical factors**
  - **System design**
    - Some EMRs do have features that attract user to use the system (Douglas, 2009) e.g. ART Reports, Graphs and warnings
    - Some EMRs have features that are burdensome to use e.g. number of clicks to dispense drugs (Msiska et al., 2017)
  - **System up-time**
    - Lack of hardware in some key locations results in non usage of EMR (Fraser, 2005)
    - Networking challenges heavily affect the usage



# Discussion

- **Organizational factors**
  - **Ministry oversight**
    - EMRs that have direct support from MOH are used regularly (Jawhari, 2016)
      - E.g. ART EMR monitored by Department of HIV
  - **Facility management oversight**
    - Facility management which offer support to the clinic enhances the use of EMR
    - ART EMR is generally supported by management unlike OPD

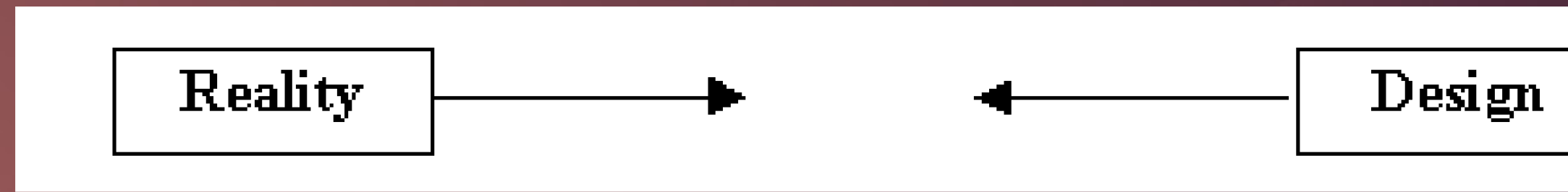


# Discussion

- **Staffing and Skills**
  - **Rotations/transfers**
    - For a system to succeed you need well trained users (Heeks, 2003)
      - OPD EMR is usually staffed with untrained staff due to rotations and transfers
      - EMR refresher courses/trainings are rarely done

# Discussion

- **Minimizing Design – Reality Gaps**



- **Information**

- EMR to produce necessary output for users to use (Henricks, 2002) e.g. HMIS 15 in OPD – EMR

- **Technology**

- Redesign the system to conform to HCI principles of reduced clicks to achieve a task (Chen, 2010)
- EMRs should feature that enhance use e.g. auto-selection of common drugs, warnings and alerts



# Discussions

- **Staffing and skills**
  - Trainings are required in order to enhance system use (Msiska et al, 2017)
  - Transfers and Rotation; Partners have to ensure that routine trainings are organized immediately after.
- **Management Issues**
  - Implementers have to work with MoH and facility management on their needs before deploying a system.
- **Other resources**
  - Partners have to work in ensuring that resources are also poured towards maximizing accurate data



# Recommendations

- Recommendations
  - Implementers should design system relevant to users
  - Implementers should work with MoH when developing EMRs to ensure support
  - Trainings and refresher course should be organized periodically to ensure that all users have the skills
- Practical Contribution
  - This study will inform technical implementers on some of the reasons why some EMRs fail.



# Conclusion

- Factors that affect EMR use include
  - Technological factors e.g. System design, hardware availability, system outputs
  - Management factors e.g. Managerial support
  - Staffing factors e.g. Rotation and transfers, user perceptions and skills



Thank you