Inclusive Entrepreneurship in Handling Competing Institutional Logics for DHIS2 Adoption in Ethiopian Public Health Care Context

Birkinesh Woldeyohannes[1], Mark Gaynor[2] and Temtim Assefa[1]

[1]Addis Ababa University, School of Information Science, Addis Ababa, Ethiopia
[2]Saint Louis University, Missouri, USA

ABSTRACT

Information System (IS) research advocates employing collaborative and loose coupling strategies to address contradictory issues to address diversified actors' interests than the prescriptive and unilateral Information Technology (IT) governance mechanisms', yet it is rarely depicting how managers employ these strategies in Health Information System (HIS) implementation, particularly in a resource-constrained setting where IS implementation activities have highly relied on multiple international organizations resources. This study explored how managers in resource-constrained settings employ collaborative IT governance mechanisms in the case of District Health Information System 2 (DHIS2) adoption with an interpretative case study approach and the institutional logic concept. The institutional logic concept was used to identify the major actors' logics underpinning the DHIS2 adoption. The study depicted the importance of high-level officials' distance from the dominant systemic logic to consider new alternative, and to employ inclusive IT governance mechanisms which separated resource from the system that facilitated stakeholders' collaboration in DHIS2 adoption based on their capacity and interest.

KEYWORDS

IT governance, entrepreneurship, adoption, information system

1. INTRODUCTION

Information system (IS) implementation includes system adoption, development, and deployment (Koskinen, 2006). When diversified actors with different institutional and social backgrounds are involved in IS implementation, they often employ different information technology (IT) perspectives, which can impact IT governance and, in turn, affect IS implementation. IS implementation, particularly in a health setting, can lead to stakeholder contradiction due to the multiple perspectives of the heterogeneous actors involved (Gutierrez & Friedman, 2005). This study focuses on the system adoption phase of IS implementation and argues that such contradictions are heightened in resource-constrained settings due to the reliance of multiple organizations for successful implementation. Research conducted in developing countries reveals how health information system (HIS) implementation diverging interests of centralized government structures of health care and international organizations in Jordan (Avgerou, 2004) ; Tajikistan (Sahay et al., 2010) ; Nigeria (Asangansi, 2012), and Ethiopia (Gebre-Mariam & Fruijtier, 2018).

Scholars studied various conflicting issues in IS implementation and reported the significant failure of Health Management Information System (HMIS) implementation, in part, to the

complexity of addressing and satisfying multiple interests and logics in the implementation process (Asangansi, 2012; Boonstra & Broekhuis, 2010; Sahay et al., 2009). Researchers now a days have described the importance of balancing contradictory issues for success (Hiller et al., 2018; Kauppila, 2010; Papachroni et al., 2015). One of the significant challenges in HIS implementation is reconciling these diverging logics to achieve successful balance (Asangansi, 2012; Luger et al., 2018). Reconciling diverging logics requires understanding multiple institutional logics underpinning the HIS implementation, which reflects a large gap in practice, particularly in developing countries (Asangansi, 2012). More specifically, various works, ranging from technological change to organization design, have discussed the need for firms to achieve a balance between contradictory activities (Al-Gharbi Khamis N., 2015; Zimmermann et al., 2015). One of the ambidextrous approaches to handling conflicting issues is through IT governance (Constantinides & Barrett, 2014).

IT governance is crucial for handling conflicting issues when designing structural, process, and communication mechanisms during IS implementation in system adoption, development, and deployment stages (Weill, 2004) . However, the range of IT governance frameworks is inadequate to address the complexity of IS implementation caused by socio-cultural, contextual, political, and technological variety and changes (Sun et al., 2015). Dominant institutional logic often influences senior managers' decisions in IS implementation and leads to "either/or" strategies (Reay & Hinings, 2009; Xue et al., 2012). Furthermore, in a resource-constrained setting the dominant institutional logic influence is heightened because of the shortage of technical and resource capacity, which constrains to hold paradoxical perspective (Asangansi, 2012; Walsham, 2020). Stakeholder analysis research advocates employing loose coupling and collaborative strategies instead of dominant institutional logic for successful IS implementation in complex settings (Berente & Yoo, 2012; Boonstra et al., 2017; Jones et al., 2015). These strategies proved successful in Nigeria, with a changeover and dialectical resolution for successful HMIS implementation in the face of conflicting logics (Asangansi, 2012). Furthermore, senior managers are advised to distance themselves from prevailing institutional logic to employ collaborative and loose coupling strategies (Berente & Yoo, 2012; Reay & Hinings, 2009). Thus, understanding the prevailing institutional logics is important to employing collaborative strategy (Boonstra et al., 2017).

However, it is not explicitly stated how managers can distance themselves from prevailing institutional logics to handle collaborative and loose coupling strategies in instances where there are multiple contradictory stakeholder contexts. Furthermore, there is little research on the influence of institutional logic on system adoption (Busch, 2018), particularly in a resource-constrained setting where multiple international organizations have a huge role in HIS implementation (Asangansi, 2012; Walsham, 2020).

This study aims to fill this gap by formulating a research question on how the management of competing institutional logics affected IT governance mechanisms and impacted HIS adoption in the resource-constrained, complex, and dynamic health care context of Ethiopia. The study used institutional logic as a lens to identify competing logics in the case of District Health Information System 2 (DHIS2) adoption in the Ethiopian health care context. This paper contributes to IS literature by revealing how collaboration is handled in a multiple-dominant institutional logics context through an inclusive IT governance mechanism, which facilitates the adoption of a new system. The paper recommended employing an inclusive IT governance mechanism in the dominant institutional logics context to support actors' distancing from the prevailing institutional logics and contribute to better system adoption.

Our conceptual framework, IT governance mechanisms, and the concept of institutional logic and its mechanisms are described in the next section by highlighting existing research in this area.

Next, our research approach is explained before presenting the case description. After the case description, case analysis based on the institutional logic concept will be presented, followed by a discussion of the study's findings based on the current HIS literature. Finally, the theoretical and practical contributions of this study presented in conclusion section.

2. CONCEPTUAL FRAMEWORK

2.1. IT Governance Mechanism

IT governance is an institutionalized decision-making structure, process, and communication mechanism to specify the decision rights and accountability (Weill & Ross, 2005). Effective IT governance is determined by the way the IT function, process, and communication are organized and where the IT decision-making authority is located within the organization that is specified in structure. IT governance is challenged by multiple stakeholders with diverse institutional background in the course of IS implementation. A range of IT governance frameworks and standards (Weill & Ross, 2005) are inadequate to address the complexity and dynamic nature of IS where multiple stakeholders are at play (Boonstra et al., 2017; Malik & Nicholson, 2020).

IS complexity includes continuous change in technology and the world and the interventions of multiple socio-cultural and political issues create various contradictory issues in IT transformation programs (Gregory et al., 2015). To resolve these conflicts, IS research has shown how senior managers devised various mechanisms through alliance, sourcing arrangements, roles, teams, processes, and informal relationships that, in turn, shaped the IT governance decision-making process (Boonstra et al., 2017; Gregory et al., 2015).

However, these senior managers' actions on IT governance mechanisms can be affected by dominant stakeholders' beliefs, values, and norms (Boonstra et al., 2017). The dominant stakeholders' influence is expected to be high in resource-constrained countries. For instance, the central government of Tajikistan emphasized monopolizing data collection, which influenced automation of the existing manual system without achieving the goal of implementation to enhance efficiency and avoid duplication of work (Sahay & Lewis, 2010). Research conducted in Ethiopia has also revealed the influence of international organizations' on IS implementation (Gebre-Mariam & Fruijtier, 2018) and stakeholder analysis of HIS implementation in India illuminated the influence of high-level officials on open-source software system adoption (Hewapathirana & Sahay, 2017). In today's world, the either/or solution mandated by the dominant actor does not work for IT governance dilemmas (Debreceny, 2013; Weill, 2004; Xue et al., 2012).

Institutional logic has been advocated for and used to unpack such socio-cultural issues and handle contradictory issues (Boonstra et al., 2017). Understanding of institutional logics and their management is key to learning their impact on IS implementation, but is rarely studied, particularly in resource-constrained settings (Asangansi, 2012; Hayes & Rajão, 2011; Sahay & Lewis, 2010). This study uses the institutional theory of contemporary concepts, institutional logic, loose coupling, entrepreneurship, and collaboration (Avgerou, 2000; Jacobson, 2009) to understand how IT governance handles the contradictory institutional logics in DHIS2 implementation in Ethiopia.

2.2. Institutional Logic

Institutional logic integrates the structural, normative, and symbolic as three necessary and complementary dimensions of institutions (Thornton & Ocasio, 2008). It holds principles,

assumptions, identities, and domain dimensions (Berente & Yoo, 2012). The institutional logic principle guides actors on how to behave in a specific situation and provides reasons for action and, thus, embodies the goals and values of the institutions (Friedland & Alford, 1991). It is also established in assumptions associated with specific causal means and end relationships. Furthermore, institutional logic has its own identity and is distinct from others (Thornton & Ocasio, 2008). Finally, institutions are more and less salient to specific domains and their practices (Jepperson, 1991). In IT, institutional logics can be used as 'the organizing principles that govern the selection of technologies, define what kinds of actors are authorized to make claims, shape and constrain the behavioural possibilities of actors and specify criteria for effectiveness and efficiency" (Lounsbury, 2002, p. 253). Institutional logics are never homogeneous. Within an organization, multiple logics may be simultaneously in play and contribute to institutional conflicts that result in change or new activities (Thornton & Ocasio, 2012). The consistency of institutional logics brings stability to an organization's field (Friedland & Alford, 1991) .

Institutionally pluralistic organizations are not passive agents who navigate and maintain contradictory logics through various mechanisms. Rather, structural and temporal separation and contextual mechanisms have been advocated to handle contradictory logics (Al-Gharbi Khamis N., 2015; Gibson & Birkinshaw, 2004). Although, these mechanisms are important for handling multiple contradictions at one time, they are not sufficient for addressing the dynamic nature of the health care setting and suggested dynamic ambidexterity (Magnusson et al., 2021). Contemporary research demands the coexistence of multiple logics in collaboration instead of competition for success in dynamic and complex settings (Boonstra et al., 2017; Magnusson et al., 2021). Given the dynamic nature of the health care settings, this study employed the loose coupling, collaboration, and entrepreneurship concept as an organizational response to describe and analyze the competing institutional logics, which are inclined to balance the tensions.

2.3. Collaboration and Loose Coupling

Regardless of competition that emphasizes dominant logic, some research has employed loose coupling and collaboration as strategies for the co-existence of competing logics (Berente & Yoo, 2012; Reay & Hinings, 2009). Collaboration is defined as a group of autonomous stakeholders of a problem domain engaging in an interactive process that uses shared rules, norms, and structures to act or decide on issues related to that domain (Baldwin & Woodard, 2008). However, collaborators might hold different interests, identities, and intentions. Some sustain collaboration while maintaining their own identity and others enact a new identity by partially diverting from their former identity(Maguire et al., 2004; Reay & Hinings, 2009). Literature reveals how collaboration supports the co-existence of competing logics by allowing stakeholder entities to maintain their own identity using separation, informal communication, cooperation, and establishing experimental sites techniques (Reay & Hinings, 2009), while others show stakeholders adopting enacting others' identity over time (Boonstra et al., 2017). For example, National Aeronautics and Space Administration (NASA) used various collaboration mechanisms such as alliance, joint experimenting, interpreting and delegating in their IS implementation (Goodrick & Reay, 2011; Reay & Hinings, 2009)

Loose coupling refers to patterns of action that are distinct or separate from each other, yet are still responsive to each other in some fashion and often uses compromise and avoidance strategies to handle competitive institutional logics (Berente & Yoo, 2012). Loose coupling, then, provides a "working space" for individuals navigating multiple conflicting institutional forces (Seo & Creed, 2002) and can be achieved through informal coordination, the avoidance of detailed inspection, and the performance of activities (Berente et al., 2007; Berente & Yoo,

2012).   The manager who handles multiple institutional logics simultaneously will become an entrepreneur, which can provide another impetus for change.

2.4. Entrepreneur

The entrepreneur concept emphasizes the role of institutional actors in changing the institutional context, thus requiring IS researchers to have a broad view of entrepreneurship. Institutional entrepreneurship is one of the drivers of institutional change (Jepperson, 1991; Thornton & Ocasio, 2012) and is a process of creating new institutions or transforming the existing institutions through leveraging resources (Hardy & Maguire, 2008; Maguire et al., 2004). Entrepreneurs are responsible actors, individuals, groups, or organizations who have resources, abilities, and skills for new or changed institutions (Hardy & Maguire, 2008).

The study of institutional entrepreneurs emphasizes how entrepreneurs regulate and coordinate the process of institutional entrepreneurship (Garud et al., 2002). To engender change in stable institutional settings, institutional entrepreneurs need to develop an understanding of the prevailing institutional context, undermine its utility by showing that the existing institutions are ineffective in some way, and develop a picture of an alternative future that 'solves' the identified problems so that consensus can be developed around a new set of institutional arrangements (Hinings et al., 2018).

3. RESEARCH METHODOLOGY

This research uses an interpretive approach to understand the natural setting of HIS adoption through a case-study approach (Walsham, 1995). The purpose of this study is to understand how multiple institutional logics influence IT governance and its impact on the process of system adoption. This study employed an interpretative case study (Klein & Myers, 1999) with a focus on the multiple interpretations principle. Interpretive research focuses on understanding the complexity of human sense-making processes in situated contexts. Case study research is the most common qualitative method used in information systems to answer the 'how' and 'why' questions (Walsham, 2006) and is useful to explain associated processes, actions, and/or interactions (Easton, 2010). Further, a case study methodology has been adopted for most paradox studies (Andriopoulos & Lewis, 2009), similar to the case representing in this study.

Therefore, an interpretive qualitative case study approach is vital for the research at hand to understand multiple stakeholders' perspectives, assumptions, expectations, and roles in system adoption. Per Yin's (2002) suggestion, this research aims to explain how and why IT governance mechanisms handle contrasting needs to shape the system adoption.

Data were collected through interviews and document analysis (Walsham & Sahay, 2006) as shown in Table 1. Purposive sampling (Marvasti, 2018) was employed to identify key informants such as IT professionals, health and IT managers, and planners at national and regional levels. Thirty-two informants were interviewed initially and a few required an additional interviews, all of which were conducted from May 2019 to August 2020. The aim was to use smaller numbers of research participants for a more in-depth, detailed, understanding of a given topic (Marvasti, 2018).

The data collection followed the guidance of Walsham (1995). An interview guide with objectives of the research and research ethics documents received from their health institutions were forwarded to informants ahead of time, as well as a process to select the times and places of the interviews. Most of the interviews were conducted online in Zoom meetings to   meet

informants' preferences due to the COVID-19 pandemic. The interviews ranged from 30 to 90 minutes, depending on informants' levels of involvement in the process. The data collection continued until it reached saturation (i.e. when no new information was gained from multiple informants and interviews resulted in similar recurring information from multiple informants.

Table 1. Data Collection Details

Levels	Departments	No of informants	No of Interviews
Ministry of Health (MOH)	Information Technology Department (ITD)	5	18
	Policy Plan Monitoring and Evaluation Department (PPMED)	7	
	Health Program experts	4	
Regional Health Bureau(RHB)	ITD	3	10
	PPMED	2	
	Health Program experts	5	
Partner organization	HISP	3	9
	JSI-DUP	2	
	JSI-DHA	1	
Total		32	37

NVvivo 10 was used to organize and code a large amount of collecting qualitative data (Brandão, 2015). The interview data were transcribed verbatim by listening and pausing the interview records several times immediately after the interview. This generated emerging insights to guide the subsequent data-collection efforts and enabled modification of the subsequent interview guide to collect quality data (Klein & Myers, 1999). Repetitive listening and reading of the interview records and transcripts were employed to categorize the informants' logic dimensions. These categories were also cross-checked with data found from related health documents and reports generated from the sector, such as Information Revolution and health sector development program documents, which state the strategy, philosophy, and plan of health information systems. Furthermore, the author handled the discussion with selected informants based on the first round of data analysis to create shared meanings. Last, IT and IS literature related to stakeholders' perspectives were frequently used while analysing the data. A pattern-inducing technique is applied to capture logic by categorizing and coding the qualitative data gained through the interview and documents (Reay & Jones, 2015). The institutional logic dimensions (principle, assumption, identity and domain) were used as a guide to identify and describe the institutional logics of heterogeneous actors (Reay & Jones, 2015).

4. CASE DESCRIPTION

4.1. Electronic Health Management Information System(E-HMIS) Implementation and Challenges

Most of the country's health documents and the informants of this study described how multiple partner organizations' introduction of computer systems to collect, process, and analyse health information generated multiple fragmented systems in the health sector (FMOH, 2010; Gebre-Mariam & Fruijtier, 2018; MOH, 2016). The absence of Ministry of Health (MOH) involvement in the computerization effort was considered as a factor for such negative results (Lagebo & Mekonnen, 2005). Accordingly, the MOH national harmonized health management information system (HMIS) implementation effort was conducted from 2006 to 2010 to overcome the fragmentation issue that reduced the system fragmentation into two fragmented electronic health

management information systems (e-HMIS). e-HMIS was the first nationwide computerized health information system in the country and was developed and implemented with two partner organizations' technical and resources capacities in different regions. MOH granted full-fledged right to partner organization A to design and implement in eleven regions and allowed partner B to continue its previous computerization effort in one region. Besides system design and implementations, related resources supply such as computer, hard disk, networking of the health institutions were the responsibility of partner organizations. Partner organizations were overwhelmed ranging from system design to equipping health institutions with required technical infrastructure and capacity.

The region-based separation without serious MOH coordination resulted in two un-communicable systems with different technologies, support, and philosophies. Thus MOH was being challenged to generate a periodic national level report from these two distinct systems. The Policy Plan Monitoring and Evaluation Department (PPMED) staff who were involved in report generation said:

> *"...as it was impossible to generate the national report from these systems, an intermediate system was designed by an American company to integrate the data came from the distinct systems"*- Experts, PPMED.

One of the former PPMED staff put this as:

> "*No one understands the messes that we had while generating a report from the two systems...first, we export data to excel from both systems....import it to the intermediate system to generate the report.*" - Partner organization, staff.

These experts revealed the challenge they had while generating a national-level periodic report. In addition to the fragmentation problem, significant running cost was required to address the frequent technical problems, such as aggregation problems, missed indicators, reports, summation problems, system failures, and so on. These technical issues required the partner organizations' IT professionals physical presence at each health institution, although less so later on as issues were becoming more stable towards the end of the implementation. Thus creating sound solutions to this system fragmentation and technical failures were part of the agenda in various HMIS meetings. Furthermore, these excerpts depicted how the function of HIS continued to rely on partner organizations' resources and support. The following excerpt described this.

> *"The IT department let alone the source code did not have a password to change the user name*" - Directorate, MOH.

This statement is seconded by various MOH reports and documents. A 2013 assessment of the e-HMIS states that there is *"strong dependence on the IDP at all levels for a range of functions, including software development, support, infrastructure, training, and others. This reduces the capabilities of the health systems to become self-reliant and sustainable."* (FMOH, 2013, p.14). The national strategic plan states that there is a "*lack of appropriate structure to guide planning and implementation of HIS components*" *(FMOH, 2013, p. 21).*

In addition to the technical issues and partner organizations' dominance, in 2015, these systems were not responsive to address the emergent needs. MOH had revised the data collection and reporting formats to incorporate new and modify the existing data elements, and indicators which also required modifying the existing e-HMISs. Thus, MOH, in cooperation with stakeholders, reached a consensus for having a centralized system that can overcome the existing system

fragmentation at the national level based on the revised indictors. However, which systems of the two will become the centralized system became an emerging problem. MOH faced a dilemma over choosing which existing systems to use, as both partner organizations put great investment in health institutions that ranged from equipping health institutions with IT equipment and networking to designing and deploying the system in the course of e-HMIS implementation. MOH suggested two alternatives, system evaluation and system integration, to maintain these systems, neither of which materialized.

4.2. Organization Response to System Selection Dilemma

4.2.1. System Evaluation

A committee was established to evaluate the two systems and select the one that would be chosen as the centralized system. However, the evaluation committee result was rejected because of the other party's complaint on evaluators. MOH staff described:

"you know, it is difficult to say just goodbye for an actor who has gone through many ups and downs for the implementation in the absence of infrastructural and technical capacity. They did great jobs in establishing the current IT infrastructure and capacities"- Director, IT.

This statement revealed how the MOH managers' decision was influenced by partner organizations' previous work instead of technical excellence. Therefore, the either-or strategy based on the system evaluation could not be materialized, which forced MOH to consider other alternatives.

4.2.2. Integrating Systems

The next alternative was compromising. MOH planned to develop a hybrid system by taking the two systems' better features and leading system implementation itself. This approach considered two-fold benefits: first, re-using the developed IT capability and infrastructures for ten years concerning these systems and giving recognition to both partner organizations for their work. Second, shifting the system ownership right to MOH from partner organizations. Thus, MOH created a deadline for partner organizations to submit their source code for system integration. However, the partner organizations did not hand over the source code within the specified deadline, which frustrated MOH and led to planning the development of a new system development from scratch at the local level that clashed with the introduction of a new system developed from North.

4.2.3. Introducing New System vs Local System Development

The MOH high-level official who was exposed to a new system called District Health Information System (DHIS2) at an international conference suggested DHIS2 be considered as a third alternative system in this case. DHIS2 is an open-source web-based system developed by Health Information System Program (HISP), which is an international project situated at Oslo University, Norway. The system has been used in more than seventy low-income countries of Africa, Asia and Middle East countries since 1994. The previous version of DHIS2, DHIS 1.3, and 1.4 were also used in Ethiopia from 2003-2005 at the regional level until MOH launched a harmonized system. However, the idea of DHIS2 initially received significant pushback from most of the experienced managers and staff who were involved in the previous e-HMIS implementation because they were opposed to the open source, foreign system and the absence of ready-made functionality. Furthermore, the opponent group recalled the big investment that had already been put into the existing e-HMIS and suggested improving it or developing a local

system from scratch, rather than accepting a foreign system, DHIS2. The following excerpts taken from different informants described how DHIS2 was challenged by different stakeholders:

> *"We invested a lot in infrastructure, resource, system development, now when it became stable…it is difficult to ruin all and start from scratch"- PPMED, manager*
> *"The data entry is not simple as e-HMIS which has two data entry formats one for plan the other for the routine data; DHIS2 merged both." - IT staff, at regional level.*

As a response to these issues, the local HISP staff used the available channels, such as demonstration, training, and informal sessions, to describe the importance of open-source software for overcoming the technical capacity barriers and simplifying local system development according to its context. Furthermore, some donor organizations that have experienced DHIS2 implementation in other developing countries have shown interest in supporting DHIS2 implementation. Similarly, the previous donor organizations who were financing the previous system implementation declared their unwillingness to continue supporting the previous system. Thus, the high-level official gave direction to commence communication between the MOH concerned directorates, ITD and PPMED, and HISP to consider DHIS2 as a third alternative. This indicates how donor organizations have key role in system adoption.

The high-level official initiation coupled with committed HISP staff and willing donor organizations to finance the implementation introduced DHIS2 through demonstration, piloting, training, and evaluation based on inclusive IT governance mechanisms.

4.3. Inclusive IT Governance Mechanisms

Inclusive IT governance mechanisms involved all actors in the introduction of DHIS2 based on their interest and capacity. DHIS2 introduction includes demonstration, piloting, and system evaluation led by MOH with multiple actors' involvement, including HISP staff, for the technical issues. Accordingly, most stakeholders invested their time, finance, and technical capacity in DHIS2 demonstration, piloting, and training, which enabled them to enhance the system understanding. However, MOH staff was hesitant to participate in the introduction process due to the resistance of certain high-level officials with decision-making power and significant stakeholders' to accepting DHIS2. A former member of the PPMED staff stated, *"Most of the government staff including me did not want to participate in DHIS2 introduction because it was not firm to become the future system. The partner organizations' staff of the MOH hugely participated in the process. "*.The statement revealed the opponent group's influence in DHIS2 introduction.

The introduction of DHIS2 has taken three years prior to launching to adopt DHIS2 due to significant resistance. Experienced participants in the previous systems were challenging DHIS2 in various channels for the absence of ready-made DHIS2 functionalities, such as disease reporting, top ten diseases, special aggregation, layout, and format compared to the previous system. The DHIS2 demonstration was followed by formal and informal communication with DHIS2 developers, HISP leaders, and African countries that have already deployed DHIS2 to enhance the system understanding. After a certain level of system awareness was achieved through demonstration and communication, MOH piloted DHIS2 in four regions' (Gambela, Addis Ababa, Afar, and Oromia) of selected weredas comprised of good and poor resources.

A five-day pilot training was conducted in the Kuyera training center for staff representing pilot regions in December 2015. After six months of DHIS2 piloting, an in-house system evaluation was conducted to examine the functionality of the system in the diversified context. The evaluation results depicted the success of the system by diminishing the 28-days reporting time in

hour and improving the analysis capacity, visualizing feature, and online and offline capacity of the system to serve both well-resourced and poor-resourced health facilities. The informants had expressed their interest in DHIS2 as:

> "When you compare it with DHIS2, the analysis feature of the previous system was too limited, I did not know the pivot table, and dashboard before DHIS2. Previously I did not know about pivot table, I know it in DHIS2. it was a wonderful tool for analysis." - Health expert, MCH.

This statement depicted how the DHIS2 introduction garnered a significant number of proponents of DHIS2. However, few opponent groups at federal and regional levels of decision-making position kept resisting DHIS2 adoption mainly for its foreignness due to fear of dependence on partner organizations. Instead, they promoted local system development. To resolve such disagreement, an international consultant commissioned by United States Agency for International Development (USAID) was hired from San Francisco to evaluate the three systems; the John Snow Inc. (JSI) e-HMIS, the Tulane University e-HMIS, and DHIS2. The 60 to 70 page evaluation report recommended open-source software for low-income countries that are inclined to use DHIS2. However, it was not a trivial task to adopt DHIS2 in place of the dominant partner organizations' systems, which had a well-established and long-standing network in all hierarchies of the sector. Thus, adoption of DHIS2 was delayed for about three years due to the incongruence of the opponent and proponent groups with decision-making positions.

4.4. DHIS2 Adoption

The high-level official who first supported and initiated DHIS2 was replaced with a new official. DHIS2 adoption to collect, collate and report monthly data to MOH then became the prime activity of the new minister due to the absence of a system after the end of 2017, when the deadline was reached for the existing e-HMIS project and the system functionality ended. Based on these institutional pressures and external evaluation results, the newly appointed Minister declared the direction to adopt DHIS2 in the Joint steering committee (JSC) meeting and gave direction to involve potential actors in technical, financial and resource supply.

5. CASE ANALYSIS USING INSTITUTIONAL LOGIC

5.1. Multiple Institutional Logics

Multiple logics may be simultaneously in play, contributing to institutional contradictions (Friedland & Alford, 1991). Accordingly, this study identified three major institutional logics as systemic, integrating, and innovation logics underpinning the DHIS2 adoption. The systemic logic was facilitated by international organizations that emphasized competition to outshine their system through system development and improving and extending the system to satisfy MOH. MOH also facilitated the integrating logic by relying on experienced IS implementation managers who emphasized developing a hybrid system through reusing the established technology, systems, and infrastructure. Finally, the innovation logic was initiated by a high-level official based on their understanding of the existing system's undesired technical and organizational situations and suggested considering a new system, DHIS2, which has been widely used in low-income countries.

5.2. The Systemic Logic

The systemic logic was introduced following the MOH decision to assign the two partner organizations in different regions without proper coordination mechanisms at the federal level.

The logic emphasized competition through specific system development and implementation with different sources of resources for different regions. It was facilitated by partner organizations and government and non-government managers and staff of health institutions, ranging from MOH to regional health offices which gained material and financial advantages in relation the implementations. This study identified systemic logic as a dominant logic in the initial stage of system adoption, as it had a well-established network from the federal to health institution level through fulfilling the technical and resource constraints of the sector for more than a decade. Given the absence of adequate technical and financial capacity in the public sector, these two competing systems were being used for more than a decade despite their fragmentation and frequent technical problems. This depicted how the functionality of HIS has relied on these partner organizations' systems, which influenced MOH to devise various mechanisms, such as geography separation and intermediate system development, to sustain these systems. However, this was found to be inadequate for handling the revised data collection elements and indicators made at the national level in 2014.

Competitive institutional logic conflict results in the change or new account of activities, and their consistency brings stability to an organization's field (Thornton & Ocasio, 2012). Similarly, both partner organizations rejected the MOH's system selection and collaboration proposal to develop an integrated system for the revised indicator lists. Furthermore, despite the effectiveness of DHIS2 that was revealed in the demonstration, system evaluation, piloting, experience sharing, and evaluation, the systemic logic challenged and delayed the adoption of DHIS2 for three years by raising different issues, such as the foreign origin of a DHIS2 system, the absence of some functionality in the new system, and emphasis on reusing the established local capability to improve or develop a local system. This dynamic shows how the systemic logic emphasizes competition instead of working together to respond to the emergent need of the Ministry that led to the introduction new alternative system, DHIS2, to the health sector. Furthermore, this study reveals how systemic logic was dominant in the sector due to the monopolization of both the technical and resource capacity that pushed the actors to continue supporting the partner organizations' flawed systems. Thus, this study argues that although both system excellence and resources are crucial for system adoption, managers should separate system technical excellence from its resource for better system adoption, which requires distance from the existing institutional logics.

5.3. The Integration Logic

The integration logic is drawn from the MOH 'one plan, one policy, and one report' principle and Enterprise Integration architecture aimed to implement a centralized and harmonized system. The logic emphasizes investment in resources and established technical capability, systems, network, and infrastructure as basic elements for implementation. Thus they wanted to have a smooth relationship with the dominant logic, systemic. The integration logic was facilitated mainly by experienced MOH key directorates (policy, plan, and IT), who devised various mechanisms for the co-existence of the two competing systems in previous e-HMIS implementation.

Structural and temporal separation has been advocated to handle contradictory logics (Al-Gharbi Khamis N., 2015) which requires a coordination process at the top management-level to integrate the distinct activities (Raisch & Birkinshaw, 2008). However, MOH with resource and IT capability constraints, had given the full-fledged e-HMIS implementation responsibility to two different competing partner organizations in a different geographical context without playing a coordination role. As a result, the fragmented systems were implemented at the regional level, which did not enable MOH to generate the national level report. To alleviate the system fragmentation problem, MOH with the help of other partner organizations, developed and

implemented an intermediate system to generate the national level report from the two distinct systems without integrating the two systems. Although the two e-HMIS systems served the sector for a decade by devising a structural separation and intermediate system solutions, it was found to be inadequate to handle the revision of data collection elements and indicators made in 2014 (Gebre-Mariam & Fruijtier, 2018; Lagebo, 2019). This finding confirms that separation solutions are important for handling contradiction at certain times in certain specific contexts, but is not sufficient for the dynamic nature of the health care setting (Gibson & Birkinshaw, 2004; Magnusson et al., 2021).

Thus, all stakeholders reached consensus on replacing the existing systems with a centralized system capable of addressing the above-mentioned problems (technical failure and fragmentation), as well as responding to the emergent needs of the MOH concerning indicator list revision. However, the MOH system evaluation and hybrid system development proposals to re-use the established systems, technology, and infrastructure both failed due to the partner organizations' unwillingness to compromise their logic. This partner organizations act revealed the dominance of the systemic logic in HMIS implementation.

Exposure to different institutional logics may increase the awareness of shortcomings of the dominant logic and enable central actors to become institutional entrepreneurs (Thornton & Ocasio, 2008, 2012). Likewise, recognizing the dominance of partner organizations, on the one hand, the experienced managers of MOH planned to take the leading role of IS implementation from partner organizations in the future system implementation. On the other hand, the new high-level official suggested considering a new system that developed in the North region and implementing it in many developing countries in the South. The next section described how the innovation logic was initiated and challenged and enabled other actors to distance themselves from the prevailing institutional logic, allowing them to bring in new institutions through employing inclusive IT governance mechanisms.

5.4. The Innovation Logic

The innovation logic was initiated by a new high-level official as a result of HIS fragmentation and competing actors' unwillingness to collaborate to address the emergent needs of centralization expressed by the ministry. Institutional entrepreneurs bring about change by providing alternative models for mobilizing resources to challenge existing structures (Seo & Creed, 2002). Similarly in this case, the innovation logic suggests DHIS2, which has been deployed and used in many developing countries to alleviate existing systems' fragmentation and technical problems. Research demanded managers' distance from the prevailing institutional logic to accommodate other logic in the organization field (Boonstra et al., 2017). Likewise, the high-level official's distance from the prevailing institutional logics enabled him to accommodate other logics to the existing logic (Reay & Hinings, 2009) . However, the innovative logic received great challenges from the existing logic, systemic and integrating logic, and supporters. Both systemic and integrating logic proponents recalled the investment that was made to the existing systems and promoted to reuse of these infrastructures and systems through improvement instead of importing a new system from the North. This finding depicted how distance from the prevailing institutional logics matters in system adoption, while those who did not have affiliation in previous e-HMIS implementation and were exposed to the new system supported the innovation logic, while most of those who were involved in the previous e-HMIS implementation opposed the innovative logic.

Entrepreneurs are responsible actors, individuals, groups, or organizations who have resources, abilities, and skills for new or changed institutions (Hardy & Maguire, 2008). These finding reveal how the DHIS2 adoption was initiated by high-level officials with decision-making power,

technically supported by HISP ,developer of DHIS2, and financed by donor organizations who have been exposed to DHIS2 in other developing countries. To engender change in stable institutional settings, institutional entrepreneurs need to reveal the existing institutional context and its inefficiencies and provide an alternative solution that solves the identified problems (Greenwood et al., 2002). Similarly, actors who were behind the innovation logic introduced DHIS2 through inclusive IT governance mechanisms, which allowed the participation of all stakeholders with their capability and resources in the demonstration, piloting, experience sharing, and system evaluation. Thus the innovation logic accommodated the integration and the systemic logic through their actors' participation in the new system adoption process by reusing the established technology, technical capacity, and financial resources.   Furthermore, the inclusive IT governance mechanisms, on the one hand, developed the new system understanding and, on the other hand, realized the drawbacks of the existing system, which in turn created the necessary distance from the dominant logic to shape the innovation logic.

Entrepreneurship is beyond creating a business organization. Rather it focuses on new organizational models and policies to bring fundamental change in organizational activity (Hwang & Powell, 2005). Similarly, the innovative logic has brought two fundamental changes in system adoption for the public health care setting of Ethiopia. First, MOH began considering open source software as a criterion to overcome the technical and infrastructure capacity constraint of the context (the evaluation document). Second, the dominant logic influence trend on system adoption was shaped by an inclusive IT governance mechanisms, which resulted in actors' necessary distance from the dominant logic to challenge and support the new institution. Furthermore, it facilitated stakeholders' collaboration by effectively allocating their finances, time, technology, and technical capacity in the adoption process.

6. DISCUSSIONS

The findings identified three competitive logics in HIS adoption where all logics had a consensus to deploy a centralized system to overcome the existing systems' problems whereas the logics differences was relying on the means to achieve the goal.   The systemic logic focused on improving their own existing systems, the integration logic advocated by government senior managers to integrate the two systems, and the other involved in the introduction of a new system, DHIS2. These logics were competing with each other for three years before adoption while the systemic logic kept providing the usual e-HMIS maintenance and support service. The integrating logic was finding a way to reuse the existing systems, technologies, and resources and the innovative logic was introducing the new system through demonstration, piloting, training, system evaluation with inclusive IT governance mechanisms. This finding, the co-existence of competing logics in IS implementation, is similar to results found in health information systems using different types of IT governance mechanisms (Asangansi, 2012; Boonstra et al., 2017; Sahay et al., 2010).

Regarding the mechanisms they employed for the coexistence of contradictory logics, the study finding reveal how merely separation solution without establishing coordinating mechanisms at the MOH level resulted in a fragmented system, which incurred additional costs to the MOH for system integration to generate the periodic national level report. Furthermore, the findings depict how the loose coupling strategy works temporarily, as the intermediate system was unable to address the emergent needs of the ministry following the revision of data elements and indicators lists of the health care. These findings are similar to the existing literature on how separation without a coordination mechanism is insufficient for handling paradoxical issues in the dynamic nature of health care setting and that loose coupling strategy works only for temporary purposes (Blaschke & Brosius, 2018; Gibson & Birkinshaw, 2004; Magnusson et al., 2021).

Different from the inadequacy of a separation solution to address the paradoxical issues, this study depicts how a separation solution created multiple dominant actors over time that emphasized competition. This dynamic was revealed in this case showing how the health system function relied on partner organizations' systems, resources, and support. As a consequence, the study shows how partner organizations rejected the national level proposals, system evaluation, and integration, which was aimed at overcoming the existing systems' identified problems, and delayed the adoption process until the project termination period. This case also shows how the systemic logic dominance stemmed more from resources than system technical excellence. This was apparent when partner organizations' dominance was diminished when donor organizations' declared discontinuing the financial support for the existing systems. The international organization dominance was also echoed in the previous e-HMIS implementation study conducted in Ethiopia (Gebre-Mariam & Fruijtier, 2018), India (Hewapathirana & Sahay, 2017), Nigeria (Asangansi, 2012) , and Jordan (Avgerou, 2004).

Thus one way to overcome the funding agency dominance on system adoption, this study recommended separating system from resources for HIS adoption, as shown in the innovation logic. The innovation logic was introduced as a result of both the integration and the systemic logics, which emphasize reusing the existing systems and resources, was unsuccessful due to the partner organizations' competition. Thus, the innovation logic with inclusive IT governance mechanisms accommodated all logics in different technical and resource aspects that facilitated collaboration among partner organizations. This finding is similar to that of Henfridsson and Yoo (2014) that marks institutional entrepreneurship as a liminal phase where multiple logics coexist and new institutional orders can arise from a resolution of conflict among competing logics.

Furthermore, this study depicts how initially the high level official's distance from the prevailing institutional logics influenced system adoption by introducing new system and devising inclusive IT governance mechanism, which facilitated the accommodation of other logics. On the other hand, the study showed how experienced heath staff and managers who were involved in the previous e-HMIS implementation resisted accepting the new system, DHIS2, due to their proximity to the prevailed institutional logics. This finding depicts how their proximity and distance to the prevailing institutional logics influenced the system adoption. Thus, this study shows how the high-level official distance from the prevailing institutional logics is not only to accommodate other logics, but also to devise inclusive mechanisms that enable other actors' to accommodate other logics and facilitate collaboration.

7. CONCLUSION

This study aims to deepen the understanding of how competing institutional logics and their management affected the IT governance mechanisms and in consequence, impacted the HIS adoption in Ethiopia. The study first identifies integration, systemic, and innovation logic underlining the DHIS2 adoption and their influence in system adoption. The study identifies how system adoption is challenging in resource constrained health care setting due to both system and its related resources were supplied by specific partner organizations. This entanglement of resources and systems challenged managers to reject the flawed existing systems and accommodate new logic, rather devised quick-fix mechanisms to maintain these systems with huge investment for a decade.

This study highlights the importance of the high-level official distance played a key role not only for introducing a new system but also enabling other actors to accommodate new logic by designing an inclusive IT governance mechanism.

The contribution of this paper to research is four-fold. One it revealed how structural separation solution without top-level coordination generated two dominant organizations in addition to significant resource consumption and its inadequacy to handle the paradoxical issue. Second, it also showed how difficult it is to introduce a new system where multiple dominant institutional logics are in play, particularly in a resource constrained setting as systems are often come with specific partner organization's resources. Third, the research extends the importance of managers' distance from prevailing institutional logics not only to accommodate a new logic but also to enable other actors to consider new logic through designing inclusive IT governance mechanisms. Finally, the study depicted how an inclusive IT governance mechanism allowed collaborative innovation where multiple actors have a stake in system adoption (financial, technical, and/or administrative).

The practical contribution of the study is the recommendation that managers maintain their distance from existing logics that enable them to separate system excellence from resources, particularly in resource-constrained settings. Second, the study encourages employing inclusive IT governance mechanisms to maintain actors' distance from the prevailed logics during system adoption in cases where multiple actors are in play. This study is limited in scope by exploring a specific software in one region's situations from health facility to the national level. Future research should examine multiple systems' adoption in different regions to examine how multiple systems at a national level have been adopted, which might also highlight new insights to depict the difference across regions and systems. This study's findings can be generalized to other complex sectors in resource constrained setting.

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