Health information systems implementation: Weaving alliances in East African Community

Wilfred F. Senyoni

Department of Informatics, University of Oslo, Oslo, Norway

Correspondence
Wilfred Felix Senyoni, University of Oslo, Blindern, 0317 Oslo, Norway.
Email: senyoni@gmail.com

Abstract
This paper addresses the problem of fragmentation and lack of coordination in the context of health information systems. Drawing on a longitudinal action research study of implementing a regional database in East African Community; a process model is developed illustrating forms of institutional work in weaving alliance through three non-linear phases: standardisation, evolving and stabilisation. The study first contributes by conceptualising weaving alliance as a process whereby novel Information and Communication Technologies (ICT) capabilities such as the implementation and use of dashboards emerge and co-evolve with intentional actions by actors aligning stakeholders with diverse interests. The second contribution concerns how dashboards emerge and co-evolve with existing work practises facilitating a common understanding among multi-stakeholders. Collectively, the study broadens our understanding of introducing and sustaining ICT4D solutions in settings characterised by fragmented information systems.

KEYWORDS
alliances, dashboard, health information systems, institutional work

1 | INTRODUCTION

Health information systems (HIS) are acknowledged as one of the main building blocks of health systems (Lippeveld et al., 2000). In developing countries, HIS can support decision-makers at different management levels in making an informed decision such that scarce available resources are effectively allocated and utilised (AbouZahr & Boerma, 2005; Aqil, Lippeveld, & Hozumi, 2009; Kimaro & Nhampossa, 2005). However, HIS adoption and its widespread use in developing countries have received different outcomes. Several studies provide an account of HIS implementation being characterised as problematic, fragmented and unsustainable (Braa, Sahay, Lewis, & Senyoni, 2017; Heeks, 2002; Kimaro & Nhampossa, 2005; Sanner & Sæbø, 2014). The failure or lack of sustainable HIS implementations in developing countries has prompted researchers and practitioners to question why some information systems tend to have "longer legs" than others; leading to their widespread adoption and eventual institutionalisation (P. Wang & Swanson, 2008).

Lack of coordination and HIS fragmentation poses as the major challenges facing HIS implementation in developing countries (Braa et al., 2017; Sæbø, Kossi, Titledstad, Tohouri, & Braa, 2011; Stansfield, Orobaton, Lubinski, Uggowitz, & Mwanyika, 2008); and thus forming the vein of this study's problem. HIS fragmentation and lack of coordination often lead to overlapping and inefficient national systems which undermine the efforts towards providing better health services (Sæbø et al., 2011). For example, donors provide support to specific health programmes, such as Maternal and Child Health (MCH), Malaria, HIV/AIDS or TB and in doing so implement parallel reporting structures to monitor and control
their activities and impact (Chilundo & Aanestad, 2004; Sanner, 2015; Stansfield et al., 2008). By supporting vertical HIS and not taking into account the existing landscape of systems, national HIS are weakened, exacerbating the fragmentation and coordination challenges in the health sector. This is evident from the agreement named “Paris Declaration 2005” where donors acknowledge the ongoing fragmentation efforts and lack of collaboration and explicitly committed to coordinate and support local efforts (Edi & Setianingtias, 2007). The expectation is HIS fragmentation can be addressed through strengthening stakeholders’ alliance and collaboration (Braa, Monteiro, & Sahay, 2004; Saebé et al., 2011; WHO, 2008).

However, how can alliance be formed in a fragmented context such as in the health sector; a landscape characterised by multi-stakeholders with diverse interests? In management and organisational studies, the notion of alliance has received significant attention as a construct for understanding the change process at an individual and organisational level (Bamford, Gomes-Casseres, & Robinson, 2003; Dacin, Oliver, & Roy, 2007; Gulati, 1998; Kale & Singh, 2009; Mukherjee, Gaur, Gaur, & Schmid, 2013). In the context of HIS, forging alliances among multi-stakeholders requires organisational and institutional accommodation, not abstracted from by focusing only on technical aspects (Chilundo & Aanestad, 2004; Sahay, Monteiro, & Aanestad, 2007). An institutional work construct from institutional theory provides an apparatus for broadening our understanding of how individuals in their working environments can become actors of change through forging alliances with diverse stakeholders (Lawrence, Leca, & Zilber, 2013; Lawrence & Suddaby, 2006). In particular, the construct provides insights to the actors’ efforts of tinkering, transforming, creating and maintaining alliance within the environment which they live and work (Lawrence, Suddaby, & Leca, 2011). In a fragmented HIS context, actors continuously face pressures from different institutions requiring them to respond reflexively, creatively and incrementally. Attending more closely to the processes of how actors weave alliances in a fragmented context is of importance and forms the vein of this study. In addition, the study seeks to understand the emergence of shared Information and Communication Technologies (ICT) capabilities facilitating the aligning of diverse stakeholders in HIS implementation. Thus, the study attempts to answer the following research question: How can institutional work influence alliance formation of fragmented health information systems in developing countries?

Empirically, I draw on a longitudinal study of implementing a regional database for health information dissemination and promotion of transparency and accountability in the East African Community (EAC). The research was carried out within the Health Information Systems Programme (HISP), a global action research network that seeks to strengthen HISs, predominantly in low and middle-income countries (Braa et al., 2004).

Theoretically, the study contributes by first, developing a conceptual framework illustrating how weaving alliance unfolds through three phases: standardisation, evolving and stabilisation. Second, the study highlights how shared ICT capabilities, such as the implementation and use of dashboards, emerge and co-evolve with existing work practice, facilitating a common understanding among diverse stakeholders. Collectively, the study contributes to information systems studies by broadening our understanding of addressing information systems fragmentation in developing countries.

## 2 | RELATED RESEARCH AND THEORETICAL FRAMEWORK

### 2.1 | Alliance

Alliance is a voluntary arrangement between two or more organisations involving exchange, sharing, or co-development of products, technologies, or services (Dacin et al., 2007; Gulati, 1998). An alliance is a result of aligning different goals and objectives, taking a variety of forms and spanning one or more part of organisations, that is, across vertical and horizontal boundaries of organisations. Organisations are now more relying on alliances as the means of enhancing their positions in the market and grow (Dyer, Kale, & Singh, 2001; Kale & Singh, 2009). Forging alliance among individuals and organisations facilitates the promotion of exchange of skills, sharing of experience, economies of scale and scope, gaining institutional legitimacy and entry into new or unknown space (Bamford et al., 2003; Dacin et al., 2007; Kale & Singh, 2009; Y. Wang & Rajagopalan, 2015).

Kale and Singh (2009) pointed out that the formation of alliance unfolds through three phases: the formation phase wherein appropriate partners are selected; the design phase where alliance governance is established and post-formation phase where alliances are managed on an ongoing basis to realise value. With each phase, they identified elements necessary in forging alliances. For example, managing coordination and building trust among partners was essentials in the post-formation phase, while, selection of partners based on their traits to engage with had a positive influence on alliance performance in the formation phase (Dacin et al., 2007; Gulati, 1998; Kale & Singh, 2009; Shah & Swaminathan, 2008). The development and evolution of alliance over time has contributed to a better understanding of the interpersonal relationships to inter-organisation collaboration providing insights to how changes could be introduced or resisted in areas with uncertainty (Dyer et al., 2001; Gulati, 1998; Kale & Singh, 2009; Mukherjee et al., 2013).

In the context of HIS, the alliance construct holds promise in understanding the process of aligning diverse stakeholders towards a shared goal. Within Information Systems (IS) studies, other notions have been used to discuss similar traits such as collaboration, partnership, network of action, grafting information infrastructure and agora (Braa et al., 2004; Hamel, 1991; Kaasball, Kanjo, & Kimaro, 2019; Kumar & Van Dissel, 1996; Matavire, 2016; Sanner, 2015). For example, Braa et al. (2004) used the notion of network of action to emphasise the need to place actions within
networks rather than on a single entity. They argue that for the sustainability of interventions in developing countries, one needs to be part of a larger network allowing for sharing of experience, knowledge, technology and values. Their contribution of networking and collaboration have been applied in many subsequent studies such as Kaasbøll et al. (2019) which focused on building sustainable collaboration and academic networks around the development and implementation of HIS in developing countries.

With the proliferation of HIS in developing countries, addressing HIS fragmentation and lack of coordination requires an alternative approach. The alliance construct holds promise to address such challenges in HIS. However, the notion is not without criticisms; some studies have pointed out that forging alliances might fail to deliver the benefits they purported to provide (Bamford et al., 2003). Thus, attending more closely to the processes of how actors weave alliances among diverse stakeholders is of importance. Recent developments in new institutional theory provide a construct to examine processes of radical changes organised by actors within their environments such as Institutional Work (Lawrence et al., 2013; Lawrence & Suddaby, 2006). Consequently, in the next section, I review the literature of institutional work, particularly in IS studies.

### 2.2 Institutional work

Institutions are the building block of institutional theory and refer to the enduring social patterns governing interactions and actions among individuals - “rules of the game” (North, 1990). Institutions include a combination of formal rules such as contracts, political and economic rules and informal rules such as traditions, customs and taboos (Jepperson, 1991). In the institutional analysis, the central assumption is that organisations and organisational actors seek to gain legitimacy within their environment to ensure their acceptance and long term survival (Jepperson, 1991; Lawrence & Suddaby, 2006; Mignerat & Rivard, 2009).

An institutional approach receiving significant attention in organisational studies is that of understanding the role of actors and practices in affecting institutional change by effecting, transforming and maintaining institutions and fields (DiMaggio, 1988; DiMaggio & Powell, 1983; Eisenhardt & Graebner, 2007). DiMaggio (1988) argues that actors are key to institutional change as “new institutions arise when organised actors with sufficient resources see in them opportunity to realise interests that they value highly” (p. 14). Along with similar perspectives, the concept of institutional work, first articulated by Lawrence and Suddaby (2006), highlights the efforts of culturally competent actors navigating within their organisational field in an attempt to create, maintain and disrupt institutions. Institutional work emphasises the importance of understanding the knowledgeable, creative and practical work of actors in accomplishing the social construction of rules, scripts, schemas and cultural accounts. The concept is concerned with how individuals’ actions affect institutions by inducing or resisting institutional change (Lawrence et al., 2011; Pemer & Skjølsvik, 2017; Wooten & Hoffman, 2008). The construct provides a set of tools necessary in understanding one or more types of institutional change occurring as actors engage in introducing and maintaining change while undermining existing structures within their organisation. Wooten and Hoffman (2008) argue that institutional work contributes to the institutional change debate as it focuses on the activities required to introduce or maintain the social mechanisms that ensure compliance with institutional structures.

Various IS studies have drawn upon the concept of Institutional work to analyse change processes within organisations (Sahay, Nielsen, & Aanestad, 2018; Senyoni, Kimaro, Braa, & Kumalija, 2019; Thorseng & Grisot, 2017; P. Wang & Swanson, 2008). For example, in their analysis of designing a tool for changing diabetes care, Thorseng and Grisot (2017) described how the change process unfolds, by illustrating how visions of new practices become inscribed into digital tools. Similarly, in their study of introducing Universal Health Coverage (UHC) in primary healthcare, Sahay et al. (2018) describe how countries ensure new practices take root in a sector with multi-stakeholders. In particular, they identify new forms of institutional work supporting the establishment of new structures such as UHC-HIS-related technologies and practices. Similarly, P. Wang and Swanson (2008) in their study of introducing customer relationship management system point out that, the forms of institutional work for maintaining momentum differs from that needed in the initial stages of adopting an information system. These studies illustrate how institutional work facilitates understanding of the change process when introducing information systems in an environment with diverse stakeholders and the ongoing dynamics in which the actors are involved in introducing or resisting changes.

### 2.3 Understanding weaving alliances in HIS

Braa et al. (2004), through the notion of network of action, argue for situating actions within networks rather than on singular unit, allowing for learning and sharing experience, thereby producing sustainable solutions. This study extends these arguments by positing itself towards establishing an understanding of the process of weaving alliances in a fragmented HIS setting. In particular, it aims at highlighting the efforts of individuals in tinkering, transforming, creating and maintaining alliance within the environment which they live and work, and the necessary shared ICT capabilities for aligning diverse stakeholders (Braa et al., 2017; Hanseth & Lyytinen, 2010; Lawrence et al., 2011). Such a holistic alliance perspective in the context of HIS requires an adaptation of the earlier Kale and Singh's model of alliance formation. The examination of the implementation of a regional database in East African Community provides an empirical context for understanding how alliance formation unfolds in a fragmented HIS context from previous management studies (Braa et al., 2004; Mukherjee et al., 2013).

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Braa et al. (2004) identify standardisation as an initial focus to undertake within a fragmented and uncoordinated HIS setting. By standardisation, I refer to the process of harmonising, reaching compromises between variations of local structures and interests, allowing for the emergence of a common understanding among diverse stakeholders (Braa, Hanseth, Heywood, Mohammed, & Shaw, 2007; Star & Griesemer, 1989). In a health domain, characterised as having several stakeholders with diverse interests and the plethora of adopted systems, a standardisation process provides a mechanism of forming a common understanding and establishing a shared goal among diverse stakeholders.

Another process is that of addressing Information and Communication Technology for Development (ICT4D) projects with organic solutions (Ciborra, 1991; Star & Ruhleder, 1996). Kale and Singh (2009) point out this aspect by arguing that not all details are clear at the beginning of the project and some adaptation might be needed in the later stages in light of the uncertainty that exists. This highlights the need for actors to pay close attention to such contingencies and emerging issues while they continue to navigate and align stakeholders in a fragmented setting. Fruijtier and Senyoni (2018) point out that ICT4D projects should be met by actors and processes which are "equipped to anticipate for the longitudinal and organic nature of ICT4D processes" (p. 171). Implementing actors should continuously work towards forging new alliances while maintaining existing ones, ensuring the sustainability of introduced solutions (Fruijtier & Senyoni, 2018; Hughes, 1994; Kale & Singh, 2009).

Stabilisation is another process which refers to the creative and maintenance work associated with legitimising the implemented solution. In their study of introducing new regulations, Pemer and Skjølsvik (2017) argue that, through stabilisation, collaboration and trust can be achieved, and introduced structures in previous stages can be adjusted, normalised and scaled. Actors in this process are engaged in the work, ensuring the introduced system becomes a de-facto solution within the environment, meeting and responding to interests from different stakeholders (Jepperson, 1991; Kimaro & Nhampossa, 2005; Pemer & Skjølsvik, 2017).

Together, the above processes formulate the study’s conceptual framework for understanding weaving alliances in the context of fragmented HIS through three phases: standardisation, evolving and stabilisation. The conceptual framework is motivated by literature, and its operationalisation is an empirical question the next sections of this study will focus on through a longitudinal study of designing, implementing and maintaining a regional database in EAC. Institutional work lens facilitates the study to analyse the set of activities by actors in introducing and maintaining new structures within their setting while undermining emerging threats through the three phases of weaving alliances. The construct helps to unpack the process of weaving alliances with specific attention to the forms of institutional work engaged by actors, their strategies and micro activities. In addition, it allows viewing the process of weaving of alliances as comprising of political, social and technical activities, with actors engaged in introducing new structures, maintaining them and resisting emerging pressures (P. Wang & Swanson, 2008).

In addition, the study attempts to understand how shared ICT capabilities emerge and co-evolve with actors as they continued to align diverse stakeholders in a fragmented HIS context. I use the term shared ICT capabilities to denote the possibility of a user or group of users to perform set of actions on an object or process such as database, mobile or text editor (Hanseth & Lyytinen, 2010). Braa et al. (2017) in their study of adopting information systems in Indonesia describe how district dashboards were used as the means of getting different stakeholders to discuss and reach a consensus in integrating and sharing health data without disturbing the underlying systems too much. They argue that order could emerge around shared ICT capabilities such as dashboards through various feedback mechanisms, and incremental and evolutionary approaches allowing for learning among stakeholders.

3 | RESEARCH APPROACH

3.1 | Research setting

A longitudinal HIS project in East African Community from 2014 to 2019 is the empirical setting for this study. The project involved the implementation of a regional database in the community with five partner states: the Republic of Burundi, Kenya, Rwanda, the United Republic of Tanzania, and the Republic of Uganda, with South Sudan joining in later stages. I use the term partner states to refer to the participating countries in the community. The implementation of the regional database aimed at facilitating communication and health information dissemination among partner states and act as a catalyst to progress made towards key global, regional and national commitments.

3.2 | Research design, data collection and analysis

This study takes an interpretivism standpoint and employs a qualitative research approach allowing for a rich understanding of the phenomenon in a specific social context (Orlikowski & Baroudi, 1991; Walsham, 2006). Specifically, an action research study was conducted involving an iterative process of joint participation in diagnosis, action planning and execution, evaluation and knowledge dissemination (Baskerville, 1997; Checkland & Holwell, 1998). Action research approach allowed for studying complex social process by introducing changes in the social process and observing the effects of the changes (Avison, Lau, Myers, & Nielsen, 1999; Baskerville, 1997). As a result, knowledge was generated on a wide range of issues in a participative process together with stakeholders, linked to, but not limited to the processes of system development,
The reported project is part of the global action research HISP project coordinated by the University of Oslo (UiO), Norway. HISP initiatives have been ongoing for the past two decades and involves software development and country implementation of District Health Information Software 2 (DHIS 2) in more than 80 countries in Africa, Asia and South America (Sahay, 2019).

I was involved in the project as part of the UiO team, first as an implementer and later as a researcher investigating the reported phenomenon. I participated in various activities such as partner state assessment, harmonisation of regional indicators and their definitions and targets, designing and developing the regional database. I facilitated capacity building sessions which involved the development of training materials, user training, user support and system troubleshooting. The work exposed me to the complex processes of forging alliances with diverse stakeholders and harmonisation in information fragmented settings. I have continued to maintain close contact with the bloc by providing remote support whenever necessary, thus becoming a “trusted” partner. For example, in 2018, I was invited by the regional health department to disseminate the project’s findings in an international exhibition attended by high-level officials such as the EAC heads of state, high-level public officials, international partners and other guests.

Data collection was conducted through interviews and participant observation (Cornford & Smithson, 2005). Semi-structured interviews were conducted with interviewees selected based on their position in their respective organisations and their roles in the project. Table 1 below summarises the nature of the participants interviewed in this study. Consent was requested from respondents before the interviews ensuring, among other things, their privacy and anonymity. When allowed, a recording of the interview was taken. Some of the conducted interviews consisted of planned and deliberate interaction between the researcher and the subject; I considered them as formal interviews. However, much often, the interviews conducted in this study were more ad-hoc without planned appointments, thus conducting semi-structured interviews with a prepared outline acting as a guideline but not rigorously following it. I regarded them as informal interviews. For example, spaces in-between attending a technical meeting or when travelling together with regional and country officials provided opportunities for free and open discussions. This approach was found to be useful in providing a nuanced understanding of the phenomenon and exploring emerging topics as participants were more comfortable to share their opinions and views. Data collection was also conducted through participant observation facilitating the understanding of the participant’s actions and viewpoints instead of what they say they do or did. In addition, document review was conducted, such as reviewing national and health programme strategic plans, ICT policies, meeting summaries, workshop reports and email correspondence. Other documents identified during field visits were collected and reviewed, giving insights to the existing practices at the regional and national level.

The processes of data collection and analysis were woven together instead of using a sequential approach. The analysis approach used for this study had two levels. First, data analysis was conducted during fieldwork visits and when back from fieldwork. This allowed for discussions of emerging events and topics jointly with my supervisors and colleagues, pursuing theoretical explanations of the phenomenon. Overall, Braun and Clarke’s (2006) thematic analysis guided the data analysis process allowing for rich and an in-depth account of the data (Braun & Clarke, 2006, 2013). Based on the iterative process of reviewing collected data, different themes were identified and discussed, linking them to the theoretical constructs drawn from institutional theory. Forms of institutional work engaged by the actors emerged from analysing the data while informed by the theory. Preliminary results were published and presented in workshops and international conference (Senyoni & Braa, 2017). Secondly, I had time to reflect on this experience and compliment with other ones from my involvement in implementing HIS at the national level in Tanzania, Somalia, South Sudan and Indonesia. Together, the two levels informed me and incrementally developed practical and theoretical principles towards building a model illustrating the process of weaving alliances.

## TABLE 1

| Designation of interviewees | No. of interviews |
|----------------------------|------------------|
| 7 National and 1 regional HIS officers | 8 |
| National programme managers: 2 MCH, 1 AIDS | 3 |
| 6 National and 2 regional ICT/e-health officers | 8 |
| 2 Senior managers in national MoH and 1 regional health department | 3 |
| National Bureau of Statistics officers | 1 |
| ALMA technical officer | 1 |

## 4 IMPLEMENTING A REGIONAL DATABASE

I present the implementation of a project in the EAC, a regional economic bloc, aiming at strengthening cooperation and encouraging regional integration among partner states. While the project involved various processes and complexities, I will primarily focus on efforts towards weaving alliances unfolding through three phases: standardisation, evolving and stabilisation.
4.1 Project context

In 2013 partner states of the EAC agreed to strengthen efforts towards addressing common health concerns around the region and accelerate performance towards attaining the Millennium Development Goals (MDG). One initiative was to implement a regional database for sharing information across the partner state’s borders and promote knowledge sharing for maternal and child health care. UiO was engaged in providing technical assistance for the project through the EAC health department as they had experience in implementing national HIS in several countries in Africa and Asia, and had worked on a similar project with the West African Health Organization (WAHO). At the time, EAC had not developed a regional guideline for MCH. The implementation of the database to house pertinent national data on MCH indicators was seen as an opportunity for harmonisation and coordination among partner states.

4.2 Standardisation in implementing the regional database (2014–2016)

To kick off the process, the EAC health department with UiO carried out an assessment of the national e-readiness capacity to implement the regional database. The assessment, among other activities, included fieldwork to all partner states aimed at identifying existing infrastructure, resources and potential stakeholders to engage with. Some of the key stakeholders include officials from the ministries of health, health sciences universities, health research institutions, implementing partners and donors. When possible, meetings with high-level officials in the ministries of health such as permanent secretaries were conducted to discuss the plans for regional harmonisation and establishing the regional database.

The assessment, among other things, highlighted the disparity among partner states in the collected information, available infrastructures and existing HIS. For example, a key indicator in postnatal care which tracks visits of mothers and new-borns within 48 hours after the delivery was routinely collected by only one country while others tracked the visits within 6 or 9 days. Two partner states did not collect the indicator at all. Despite the differences, similarities were also observed within the bloc. For example, at the time DHIS 2 was the preferred system to collect, collate and analyse routine health data in the ministries of health of all partner states except for Burundi (Senyoni & Braa, 2017).

Between 2014 and 2015, four (4) regional workshops were conducted to facilitate the implementation of the regional database by focusing on harmonising the observed disparities and build capacity among partner states. The meeting involved health management information systems (HMIS) and ICT/eHealth technical experts from all partner states, staff from EAC health department, UiO and selected implementing partners. The implementing partners were either directly involved in the project or had experience in establishing regional databases; such as the African Leaders’ Malaria Alliance (ALMA). The regional workshops were characterised by continuous discussions and negotiations aiming at reaching a common consensus among diverse interests. In between the physical meetings, other mechanisms (both formal and informal) were used for discussions and communication of new developments; thus, sustaining the generated momentum.

The selection of indicators to track at the region level went through an iterative process involving identifying key indicators, data sources, reporting frequency and establishing a common understanding of what the indicator tracks and targets to achieve. Forty four indicators were endorsed from the initial proposed list of 120 indicators. They included indicators covering MCH spectrum, that is, from pre-pregnancy to child health and family planning. Some indicators were introduced to control data quality, for example, completeness rates of submitted forms. Estimates of the population were included to support indicator coverage calculations. Inclusion of indicators in the proposed list depend primarily on their availability across partner states. However, when a key indicator was not collected in some or all partner states, a proxy indicator was proposed and agreed. For example, a key indicator to monitor and improve maternal health, deliveries by the skilled attendant was not available in some of the partner states thus a proxy indicator which captured deliveries in the health facility was used instead, despite significant differences between the two.

The harmonisation process required all members to reach a common consensus and endorse agreed decisions prior to proceeding into subsequent activities. For example, during the process of indicator harmonisation, the technical experts from one partner state failed to attend a regional meeting. The regional team and UiO had to visit the partner state and accommodate their insights in the implementation of the regional database, such as mapping their indicators into the regional database. The decisions reached by partner states included but not limited to the selection of indicators, reporting frequency and levels to include in the regional database, design of the database, database management and data policy.

DHIS 2 was selected as the preferred software to build the regional database, tapping to the existing knowledge and skill within the bloc. In the design of the database, a participatory approach was used to inform the design and development stages. A series of presentations of the system’s prototypes during the regional meeting allowed members with diverse backgrounds to understand the design approach and provide feedback and recommendations for the subsequent prototypes. See Senyoni and Braa (2017) for an account of this early part of the project.
Evolving through implementation of regional scorecard (2016–2017)

Along the same time as the regional database was developed, a parallel initiative started with the aim of strengthening information dissemination as well as sharing country performance towards improving MCH. Development of a regional scorecard was proposed. A scorecard is a visual tool comprising of key information that can be monitored at a glance (Kaplan & Norton, 2005). Usually, scorecard utilises the traffic light colour code illustrating the performance of measured indicators against the set target. For example, the red colour indicates poor performance; green colour indicates good performance and yellow colour indicates progress being made. At the time, ALMA was using similar visualisation technique to demonstrate the performance of malaria indicators towards the reduction and elimination of malaria in Africa (Figure 1).

The scorecard was implemented within the regional DHIS 2 instance. The first regional scorecard had 11 indicators from the 44 indicators collected by the regional database. For each indicator, a common baseline and targets had to be negotiated and agreed among partner states. Data from international surveys were preferred to populate the scorecard indicators instead of data from routine national HMIS, as one interviewee from the regional level said in one of the regional meetings to develop the scorecard.

"Data from surveys are easily accepted by ministers because they come from world-known sources...We have a problem using data from the national systems; some indicators have more than 100% coverage."

Information sharing among the partner states was encouraged to allow the process of learning by doing and interacting. Decisions reached were based on a collective agreement. To ensure acceptability of the tool across the region, stable prototypes of the regional scorecard were shared with the high-level officials and policymakers for approval and endorsement. Feedback and inputs were incorporated and shared across the bloc members. In March 2015, the first regional scorecard on MCH was launched in a meeting with over 700 participants including ministers of health, members of regional and national parliament and development partners. The tool informed the leaders of the progress made towards reducing maternal and child mortality and the gaps required to be addressed. This prompted leaders to commit support as illustrated by extracted text from the jointly signed communique.

"...Cognizant of the progress made by EAC partner states towards improving the health of women, new-born, children and adolescents as shown in the regional RMNCAH scorecard."
“Realising the need to accelerate and sustain progress in women’s and children’s health post-2015 within the context of the Sustainable Development Goals (SDGs).”

“We, the Ministers of health and Parliament from EAC partner states now commit ourselves to...implement the RMNCAH scorecard to ensure accountability for results and resources to improve women and children’s health in the region.”

While the implementation of the regional scorecard was not part of the original plans in the implementation of the regional database, its development and implementation were essential in sustaining the project’s initial generated momentum, involving new stakeholders not realised in the initial project activities.

### 4.4 Stabilisation through scaling (2017–2019)

The production of the regional scorecard continued annually with the subsequent versions used in regional and national meetings and parliament sessions. Integration with new health programme enabled the regional database and scorecard to expand and cover other indicators such as indicators from HIV, TB, human resource and finance. The latest regional scorecard covered 18 indicators with some indicators drawing data directly from routine national HMIS. When funding challenges emerged and derailed some of the initiatives planned by the EAC health department, the tool was seen of eminent value, and its production continued. As South Sudan later joined EAC, they were seamlessly integrated into the regional scorecard with plans set for full integration with the regional database at a later stage. As one interviewee from the regional level commented:

“(Regionally) scorecard is a policy no longer a project...Partners are looking at it as an efficient and effective accountability tool for monitoring both results and resources across the partner states.”

The use of regional database and scorecard to monitor key indicators scaled from regional level to national and sub-national level within the bloc. For example, Kenya implemented scorecard at the national and sub-national level for MCH with technical assistance from its neighbouring countries. In addition, Burundi was supported by EAC and UiO to reconfigure its HMIS and use DHIS2 ensuring sustainable integration with the regional database (Figure 2).

The use of the regional scorecard also scaled horizontally to other neighbouring regional blocs. For example, the Southern African Development Community (SADC) reached out to the EAC and expressed their interests to deploy similar strategies in addressing the Sexual and Reproductive Health and Rights (SRHS) in the region. This resulted in UiO and EAC working together to assist SADC in developing framework towards the use of regional scorecard.

### The EAC Regional Integrated RMNCAH and HIV/AIDS Scorecard - 2018

| Partner State          | Health Outcomes | Pre-Pregnancy | Pregnancy | Birth | Postnatal | Infant | Finance | Human Resource | HIV/AIDS, STIs and TB |
|------------------------|-----------------|---------------|-----------|-------|-----------|--------|---------|----------------|------------------------|
|                       | Maternal Mortality Rate | Under 5 Mortality Rate | New-born Mortality Rate | Contraceptive Prevalence Rate | ANC HIV+ women receiving test | % ANC screened for syphilis | Facility Delivery Rate | Adolanced (Pregnant) Rate | PNC mother (In 2 days) | PNC Baby (In 2 days) | DPT3/Perc | Relevant | CoVERAGE | Total Health Expenditure per 10000 | Density of Skilled Personnel (1/10000) | % of people living with HIV who know their status | % of people currently receiving ARV therapy | % of people cured or treated for TB |
| Burundi                | 334.6           | 38.0          | 33.0      | 36.0   | 68.0      | 67.0   | 34.7    | 64.0↑       | 10.0       | 15.0     | 23.0    | 48.0↑    | 44.0↑     | 84.0   | 94.0   | 96.0↑         | 96.0↑       | 96.0   | 96.0↑         | 96.0↑       |
| Kenya                  | 362.0           | 32.0          | 22.0      | 28.0   | 72.0      | 72.0   | 62.0↑   | 76.0↑       | 16.0       | 32.9     | 35.6    | 99.0    | 97.0    | 24.0    | 75.0   | 83.0  | 96.0↑         | 96.0↑       | 96.0   | 96.0↑         | 96.0↑       |
| Rwanda                 | 320.0           | 56.0          | 20.0      | 38.0   | 73.0      | 73.0   | 51.0↑   | 83.0↑       | 15.0       | 45.0    | 56.0    | 67.0    | 54.0   | 15.0   | 99.0   | 90.0   | 90.0↑         | 90.0↑       | 90.0   | 90.0↑         | 90.0↑       |
| South Sudan           | 258.0           | 33.0          | 36.0      | 38.0   | 57.0      | 57.0   | 42.0↑   | 63.0↑       | 15.0      | 90.0   | 12.0    | 90.0   | 90.0↑   | 15.0   | 9.0    | 90.0  | 90.0↑         | 90.0↑       | 90.0   | 90.0↑         | 90.0↑       |
| United Republic of Tanzania | 298.0         | 67.0          | 25.0      | 34.0   | 72.0      | 72.0   | 62.0↑   | 68.0↑       | 9.0       | 40.0    | 45.0   | 90.0    | 90.0↑   | 16.0   | 75.0   | 89.0  | 96.0↑         | 96.0↑       | 96.0   | 96.0↑         | 96.0↑       |
| Uganda                | 336.0           | 64.0          | 27.0      | 29.0   | 76.0      | 76.0   | 55.0↑   | 55.0↑       | 15.0      | 90.0   | 12.0    | 90.0    | 90.0↑   | 15.0   | 9.0    | 90.0  | 90.0↑         | 90.0↑       | 90.0   | 90.0↑         | 90.0↑       |
| EAC Regional Average | 404.6           | 67.3          | 26.5      | 37.5   | 68.9      | 68.9   | 52.9    | 63.0↑       | 15.0      | 63.0    | 13.0   | 85.6    | 85.6↑   | 15.0   | 9.0    | 90.0  | 90.0↑         | 90.0↑       | 90.0   | 90.0↑         | 90.0↑       |

**FIGURE 2** EAC regional scorecard. Retrieved from https://healthdata.eac.int

![The EAC Regional Integrated RMNCAH and HIV/AIDS Scorecard - 2018](https://healthdata.eac.int)
5 | ANALYSIS

In the following section, I analyse the study through the three phases: standardisation, evolving and stabilisation identifying the forms of institutional work and the emergence of novel shared ICT capabilities facilitating the process of weaving alliances in the context of fragmented HIS.

5.1 | Standardisation phase

The introduction of the regional database and indicators required new alliances to be formed and existing strengthened. Kale and Singh (2009) identified the initial phase as mostly characterised by selection or identification of partnership and their potentials which might have a positive influence on alliance formation and performance. The initial assessment conducted to all partner states highlighted disparity among partner states at different levels, for example, data collection tools, existing infrastructures and available resources. The diversity of resources and skills provided a space whereby actor could form collaboration by sharing knowledge and skills. However, forging such alliances required harmonisation work to align stakeholders with diverse interests (Braa et al., 2007). For example, the officials from the EAC health department together with the UiO team worked closely with partner states and iteratively negotiated the list of indicators to be used for monitoring performance at the regional level. The process, while intensive and challenging, allowed for reaching consensus among competing interests. For example, an agreement of using a proxy indicator which captured deliveries in the health facilities instead of the recommended deliveries by the skilled attendant illustrates the importance of accommodating competing interests from multi-stakeholders in the process of realising a shared goal.

More importantly, in the standardisation phase, the actors engaged with the technical experts and other resourceful implementing partners from partner states in extracting the necessary information in the design and development of the regional database. The use of physical meeting complemented with other means of communication and iterative participatory design helped bridge the knowledge gap among stakeholders. The objective was to establish a common and shared understanding among stakeholders not necessarily having the same goals. Braa et al. (2004) characterised this process as “intense process of action” and “time-consuming and incremental process” requiring tinkering and knowledgeable actors (Lawrence et al., 2011).

Managing exceptions was another form of institutional work engaged by the actors in facilitating buy-in from all participating stakeholders. Reaching unanimous decisions was essential in order to proceed to the following activities. When it was not possible to have unanimous decisions, additional efforts were undertaken. For example, a special meeting was arranged to incorporate views from one country after their delegates failed to secure permission to attend a regional working session for the designing of the regional database. This aspect illustrates how actors need to be sensitive in handling diverse stakeholders during the standardisation process. As one national technical expert elaborates in an interview.

“Collaboration enhances innovation and progress...it provides a common direction and encourages lower-performing countries to step up.”

Underscoring existing structures is another form of institutional work used by the actors in the standardisation phase. The partner states had guidelines and policies for managing and monitoring the health sector, such as national indicator list with targets and baselines. However, in the process of implementing the regional database and scorecard, existing reporting formats, regulations and policies at the national level were undermined while new ones introduced, allowing for collaboration among partner states.

During the standardisation phases, the regional database prototypes and harmonised indicators were observed to anchor shared interests from stakeholders and facilitate in aligning them. As they emerge, they both allowed accommodation of multiple views from diverse stakeholders while facilitating mutual learning and information sharing. For example, the regional database prototypes allowed users to understand the significance of requested data and how they will be visualised through maps and charts beyond their borders while the design team could receive feedback from users and understand nuances of local information use. Similarly, through the comparison of the indicator collected by each partner state, members could identify gaps within national systems from the “gold” standards prompting them to engage in internal discussions for future improvement in their national systems.

5.2 | Evolving phase

Hughes (1994) argues that, if not sustained, the momentum achieved in the introduction of systems might be broken and lost, causing the implementation to wane and fail. This suggests that actors should be open and aware of new opportunities for sustaining the initial generated momentum (Hughes, 1994; Kale & Singh, 2009). The study illustrates actors engaged in repositioning as a form of institutional work: forming new alliances which were not foreseen in the beginning. Actors were open to new opportunities and engaged them when they emerge, resulting in
taking new direction while maintaining the initial goals. For example, the implementation of the regional scorecard presented a new avenue for forging alliance with new stakeholders such as policymakers. Through the interaction with high-level managers and policymakers, the use of regional database and scorecard across partner states was strengthened with new opportunities emerging. In addition, the forged alliances facilitate the integration of the regional tools into the regional and national routines, sustaining earlier generated momentum.

Another form of institutional work engaged by actors in this phase was advocacy. Raising awareness through information dissemination and continuous engagement with stakeholders in meeting and workshops were predominantly observed during the evolving phase. Parallel with weaving new alliances, continuous training and capacity building sessions were conducted, attracting attention towards the initiative and encouraged other stakeholders to join in. For example, actors presented in the regional and country workshops, conferences and meeting facilitating the dissemination of information and sharing of knowledge acquired in the previous phase.

The use of dashboard and scorecard emerged as the shared ICT capabilities among stakeholders facilitating the integration process among fragmented HIS. The emerged shared ICT capabilities provided means for communicating performance and highlighting areas which required immediate attention. For example, the ministers and members of parliament committed to providing more resources towards improving MCH after viewing their countries performance through the regional scorecard.

5.3 Stabilisation phase

In the stabilisation phase, scaling work takes place with the formed alliances reinforcing themselves while pulling in new stakeholders. Project scaling in both directions, that is, horizontally and vertically, is observed. Horizontally, the project expanded to include indicators from other health programmes, such as HIV, STI, TB and other departments such as finance and human resource. Similarly, the regional scorecard was recognised as an integrated regional health monitoring tool no longer a monitoring tool for only one health programme. This underlines the strategic approach of first weaving alliances which are "low hanging fruits" in terms of being both useful and easy to achieve with the hindsight of extending them in the future. Vertically, the development and use of scorecard and dashboards to monitor organisational performance trickled down to the national and sub-national level in the partner states.

Embedding and routinising was another form of institutional work engaged by the actors to ensure introduced structures persists through time. Jepperson (1991) argues that even for a highly institutional phenomenon such as democracy in western countries, there is a need for placing social structures to ensure their reproduction. Establishment of guidelines and policy at the regional level ensured the sustainability of the regional database and scorecard and provided guidance when new members joined the community. By routinising the practices in the organisation, the use of the system continued over time, creating an enduring element (Lawrence & Suddaby, 2006). Resource commitment, high level of trust and ownership, and endorsement from political and high-level managers are some of the elements observed in this phase, signifying a strong buy-in within and across organisations. Organisational actors, who once were passive, took a central role in promoting the system seeking new alliances. For example, officials from EAC, once passive in the project, took the central role in promoting the regional tools such as presenting them to other regional blocs.

In this phase, the use of the regional dashboards and scorecard continued as novel shared ICT, facilitating the legitimacy of the implemented system. Implementing actors continued to use them in disseminating the progress made within the bloc and to other stakeholders outside the bloc opening up for opportunities to forge new alliances while strengthening the existing ones. For example, SADC was made aware and started similar initiative using existing skills and experience from neighbouring regional bloc and UiO.

6 DISCUSSION

6.1 Conceptualising weaving alliances in HIS

In this study, a process model is developed describing the process of weaving alliances unfolding through three phases: standardisation, evolving and stabilisation. The implementation of the regional database to monitor key indicators among partner states required forging of new alliance and strengthening existing ones. Through the study, several alliances were formed with others being more prominent in certain phases. However, the alliances between partner states remained as the backbone of the regional database implementation. The coming together of partner states to address common challenges in improving MCH care problematise the need for a regional database which in turn initiated the process of weaving alliances among partner states. With each phase of weaving alliances, different forms of institutional work are observed taking place within an institutional context, shaped by existing structures. The model of weaving alliances highlights the set of activities engaged by actors at the beginning of the project are not necessarily the same required in maintaining or scaling the project. However, with each phase, actors build on the work performed in the previous phase. Importantly, the model illustrates the need to identify and engage key stakeholders in each phase. For example, forming alliances with the technical team and engaging them to develop a working solution provided a space for mutual learning to occur and
knowledge sharing in the first phase. Similarly, involving decision-makers in the follow-up phases proved to be a strategic approach for generating momentum necessary to sustain the implementation of the regional database.

The study illustrates how actors with limited power to influence top-down decisions, working together to establish a network influencing others to join and participate. As the network of alliances increased, the agency of the network became more visible, prompting other stakeholders to join in such as the TB, STI and HIV health programmes. The scaling of the tools enabled their use and production to continue even when funding challenges emerged. Importantly, the study highlights the need to understand the social and technical skills necessary by the actors to form associations, construct normative meaning systems and advocate for new structures turning an individual institutional work into collective institutional work. This provides valuable insights on how certain solutions can mature in a volatile environment and the dynamics behind them (Lawrence & Suddaby, 2006).

Jepperson (1991) argues that some amount of work by individuals or a group of actors is required to maintain and bolster even highly institutional structures. Initially, the phases in weaving alliances started as sequential with standardisation as a necessary first phase, followed by evolving and stabilisation. However, as the project progresses and accommodates new stakeholders, previous phases are revisited. For example, the integration of new health programmes in the regional database required revisiting the standardisation phases by the implementing actors. Similarly, the stabilisation phase does not necessarily indicate the final phase in the process of weaving alliance; rather, new phases might emerge, potentially characterised as evolving phases followed by another stabilisation phase as actors continue to engage in new and existing forms of institutional work to reposition their interests against emerging alliances or pressures. Figure 3 below schematically describes the conceptualisation of weaving alliance related to the implementation of HIS in developing countries. The forward arrows illustrate the initial transition of phases from standardisation to stabilisation and the feedback arrow illustrated the iterative and non-linear nature of the phases as earlier decisions are revisited. For example, accommodating new health programmes and new partner states in the project required revisiting earlier phases such as the standardisation phase.

6.2 Shared ICT capabilities as a niche for integration

The study makes another contribution by providing detailed insights on how actors discursively established a shared understanding among stakeholders in a landscape characterised by information systems fragmentation and limited coordination. Through the three phases, the regional database prototypes, indicators, dashboard and scorecard were used and become the shared ICT capabilities, providing a common platform for diverse stakeholders to engage in dialogue during the integration process.

Importantly, the study highlights how the shared ICT capabilities emerge and evolve over time and space, engaging different stakeholders and requiring different approaches. For example, the use of participatory design and iterative discussions proved essential for the emergence of shared ICT capabilities, such as the use of regional scorecard. Furthermore, the shared ICT capabilities anchored interests and actively engage stakeholders in discussions, resulting in common consensus among competing interests. For example, opting to use the deliveries in the health facility indicator allowed all members to participate in the discussions while encouraging them to harmonise their national systems. In the latter phases, the dashboards and scorecards were central in communicating and relaying information to high-level managers on the regional and national performance and areas requiring an immediate attention, prompting for commitment to be made and resources to be allocated.

Braa et al. (2007) highlight how shared ICT capabilities evolve from a new standard into a system of standards and emphasise the need for crafting them to be adaptive to the local context. Similarly, our study provides insight on how the shared ICT capabilities evolved, shaping the discourse among stakeholders while being shaped by local knowledge allowing for new alliances to be formed and existing ones strengthened. In
particular, the shared ICT capabilities played a central role as both goals, object and outcome, facilitating the institutional work of weaving alliance among stakeholders with diverse interests. With several contested interests emerging in the pursuit of establishing the regional database, shared ICT capabilities such as the use of dashboards and scorecard emerged, linking together contested interests and providing a dialogue among diverse stakeholders.

I compare the emergence of shared ICT capabilities as the tip of an iceberg, visible and anchoring interests from all member states; however, obscuring them to the ongoing, intensive, dynamic interactions and activities of harmonising and integrating with national systems. Similarly, the use of flexible information technologies (such as DHIS2 for this study) allowed for accommodation of new stakeholders and their interests. For example, new indicators were added seamlessly into the regional database and scorecard when new stakeholders joined, such as a new country or health programme.

7 | CONCLUSION

This study aimed at establishing a better understanding of the processes of weaving alliances in the context of HIS implementation. A process model has been developed, which illustrates how weaving alliance unfolds through three phases: standardisation, evolving, and stabilisation. The discussion provides insight into the different forms of institutional work and the emergence of shared ICT capabilities in weaving alliances. Previous research emphasises the importance of establishing networks, which allows for learning and sharing experience, thereby producing sustainable solutions (Braa et al., 2004; Kaasbøll et al., 2019). This study extends these arguments by providing a holistic perspective of weaving alliances in a fragmented context.

Practically, the study offers practitioners insights into the process of weaving alliance in introducing and sustaining ICT4D solutions in developing countries. Furthermore, it illustrates how shared ICT capabilities, such as regional dashboards and scorecards, can be used to maintain a continuous discourse among stakeholders in a fragmented HIS landscape. The study has some limitation which I hope can inspire future research. First, the study has illustrated the usefulness of the framework in the context of EAC, and HIS; thus, requiring further research to show its value in other context and platforms. Specifically, it would be interesting to explore the framework progress following the stabilisation phase. Another area of research interest is of understanding the nature and characteristics of innovations or potential challenges in initiating the process of weaving alliances in HIS context.

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ORCID

Wilfred F. Senyoni https://orcid.org/0000-0001-6030-6050

ENDNOTE

1 Longer legs refer to the enduring aspect of an information systems to continue receiving attention and favourable decisions from its stakeholders long after the initial adoption phase (Wang & Swanson, 2008).

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**AUTHOR BIOGRAPHY**

Mr. Wilfred Senyoni is a PhD candidate at the department of informatics, University of Oslo, Norway researching in health information systems. His research interests include the design, development, integration, use and sustainability of health information systems in developing countries. His academic work is empirically grounded primarily within an action research framework employed by the HISP network by working closely with health programme, data managers and policy makers. He has more than 10 years’ experience with information systems implementation in developing countries involving diverse stakeholders from government institutions, universities, donors etc.

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