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## Health Information Systems and Accountability in Kenya: A Structuration Theory Perspective

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### Abstract:

Health information systems (HIS) in most low- and middle-income countries (LMICs) have been often implemented under the international pressure of accounting for healthcare investments. The idea behind robust and efficient HIS is that health information can allow healthcare managers and providers to better plan and monitor health services, which may translate into better health outcomes. Yet, researchers have often criticized the use of HIS as accountability tools as being counterproductive by making health information more meaningful to national governments and international agencies than those in charge of local health services. In this paper, I analyze how HIS influence the emergence of local accountability practices and their consequences for healthcare provision. I build a theoretical perspective from structuration theory and integrate it with the technology domain of HIS. I use this perspective to analyze a case study of HIS in Kenya. This study raises implications for the use of structuration theory in understanding accountability and the role of IT materiality in processes of structuration. It contributes to a better understanding of how HIS can foster improved healthcare and human development. It also contributes to the understanding of IS as means not just for governing people's behavior but also of socialization through which users can negotiate multiple accountability goals.

**Keywords:** Health Information Systems, Information Technology, Accountability, Healthcare, Africa, Structuration Theory.

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## 1 Introduction

Development programs often feature accountability and good governance at their center (Bangura & Larbi, 2006; Djelic & Sahlin, 2006) in order to fight corruption, mismanagement, and inefficient bureaucracies (Drori, 2006; Hood, 2000; Lynn, 2006). Most development programs are more likely to support the social and economic development of a country if they hold policymakers and civil servants accountable for their actions (Ciborra, 2005; Ciborra & Navarra, 2005).

In the health sector, assumptions about the benefits of accountability have driven policymakers to implement health information systems (HIS) in various low- and middle-income countries (LMICs). HIS provide health information that can ideally allow healthcare managers and providers to plan and monitor health services, which may translate into better health outcomes. Yet, the literature on HIS in LMICs has criticized the counterproductive effect that HIS has on achieving accountability (Madon, Krishna, & Michael, 2010). Many donor agencies and governments mostly use HIS to monitor health programs and money invested in healthcare. According to both academics and practitioners, accountability fragments HIS and causes healthcare providers to insufficiently use information to improve healthcare services at the point of delivery (Sahay, Saebo, Mekonnen, & Gizaw, 2010; Smith, Madon, Anifalaje, Lazarro-Malecela, & Michael, 2008).

Recent research has mainly considered accountability as a managerialist concept translated into LMICs from Western nations through international policy reforms and imported information systems. As a result, local actors struggle to fully understand and internalize accountability (Ciborra & Navarra, 2005). In the health sector specifically, healthcare providers primarily account for results to gain legitimacy for further funding or to avoid sanctions. However, with this approach, the gap between HIS outputs (e.g., number of patients admitted to hospitals) and ideal performance outputs (e.g., improved health service use) widens (Noir & Walsham, 2007). Just because one knows how many patients use the health service does not necessarily mean one will know how to ensure that there are enough healthcare resources (e.g., hospital beds) to cater for the needs of service users. Narrowing the gap between HIS outputs and ideal outputs requires a greater understanding of the value of health information in accounting for results and improving decision making in the health service. A more productive use of health information depends on how local HIS users legitimize accountability in their day-to-day work.

Thus, in this paper, I explain how HIS influence how healthcare managers and providers enact accountability and how such influence affects the way they use information when delivering health services. In particular, I address the following questions:

**RQ1:** How does accountability acquire legitimacy and become enacted locally?

**RQ2:** How do the capabilities of HIS mediate the enactment of accountability?

I conducted an interpretive study about HIS in Kenya. Based on the insights gained from the findings, I make the following contributions. First, I integrate the notion of materiality in structuration theory. In this way, I considerably sharpen the theoretical perspective of structuration theory to better understand how IT relates to the socio-organizational context. More specifically, I adopt structuration theory as a sensitizing lens to understand the recursive relationship between social structures and agency and its implications for the reproduction of accountability. Acknowledging the limitations of structuration theory in understanding material agency (Jones, 1999; Jones & Karsten, 2008; Silva, 2007), I build on Sewell's (1992) work on structuration theory and adopt the notion of "interpretive flexibility" to account for the material features of HIS in processes of structuration. I use the framework to analyze the findings.

Second, I increase our understanding of how HIS can foster development by taking a human development perspective that considers healthcare and access to information fundamental human rights (Andrade & Urquhart, 2009; Silva & Westrup, 2009; Zheng, 2009). Traditionally, a neoliberal logic has influenced the use of ICT for development and in the provision of healthcare (Madon, 2009; Navarra & Cornford, 2009; Schuppan, 2009). Under this logic, national governments and international development agencies use HIS to monitor the economic return of healthcare interventions and promote an efficient use of resources. By taking a human development perspective, I shift attention from the funders to the recipients of healthcare and examine how healthcare managers can use HIS to address the needs of their communities.

Finally, with this paper, I contribute to further explaining how information systems mediate the enactment of accountability. Most IS research focuses on accountability as a means to control behavior (Constantinides, 2011; Doolin, 2003; Vieira da Cunha, Carugati, & Leclercq-Vandelannoitte, 2015). I take

a sociological perspective on accountability (Roberts, 1991) and unveil how IS mediate the socializing effects of accountability.

This paper proceeds as follows. In Sections 2 and 3, I review the literatures on IS and accountability and the role of HIS in enforcing accountability. In Section 4, I examine the theoretical framework. In Section 5, I illustrate the research method. In Section 6, I describe the case study and, in Section 7, analyze it. In Section 8, I discuss the findings and the paper's implications. Finally, in Section 9, I conclude the paper.

## 2 Information Systems and Accountability

Accountability is “a social relationship in which an actor feels an obligation to explain and to justify his or her conduct to some significant other” (Bovens, 2005, p. 184). Organizations often use information systems as a means of control and surveillance to hold people accountable for their actions (e.g., through monitoring quantitative measures of processes and outcomes) (Constantinides, 2011; Doolin, 1998). Researchers have criticized using information systems to monitor performance for providing false representations of work—often because one cannot realistically achieve the targets that managers pressure workers to achieve. As a result, employees often misreport data about performance, which can mislead decision makers (Vieira da Cunha et al., 2015). Similar problems have affected HIS in LMICs where health workers have misreported data in order to escape reprimand for missing targets (Kimaro & Sahay, 2007; Noir & Walsham, 2007).

Thus, accurate information for decision making not only depends on system quality as other studies suggest (Li, Peters, Richardson, & Watson, 2012) but also concerns behavioral norms that regulate how individuals can use IS to account for results. Individuals do not always resist norms that legitimize accountability. Recent research has documented the role of IS in making actors' actions more visible and, therefore, accountable to the work of their team or organization members (Constantinides, 2011; Doolin, 2003). Accordingly, actors become self-disciplined subjects and more aware of the consequences of their actions and less likely to repeat mistakes (Doolin, 1998). By interacting with an information system, users internalize norms of behavior inscribed in its design. An example of such norms could be the “efficient use of clinical resources” by medical staff in a hospital. By mediating discourses and meanings that characterize everyday life in an organization, information systems contribute to individuals' internalizing norms that hold them accountable for their behavior (Doolin, 1998).

Even though recent research has acknowledged the role of IS in mediating the meanings and behaviors of accountability, it still privileges an individualizing form of accountability (Roberts, 1991) whereby IS reinforce norms of control by making individuals more visible to the “invisible power” of management. Thus, IS mediates objective representations of individuals' performance through which they seek to stand out and isolate themselves from their peers (Roberts, 1991). In contrast, through dialogue and learning from one another's experience, individuals enact a socializing form of accountability. Dialogue is more likely to occur and produce socializing effects when individuals lack a difference in power (Roberts, 2001). For example, from conducting a study on primary care, Madon and Krishna (2017) found that actors understood the importance of accounting for expenditure and resources through social learning and knowledge sharing. The IS literature has overlooked such a socializing form of accountability, which can be particularly useful in understanding how IS can contribute to making decentralized work accountable not just through control (Bloom, Garicano, Sadun, & Van Reenen, 2014) but also through social interactions and learning.

## 3 Bureaucratic and Democratic Accountabilities in the Context of HIS

The literature distinguishes different forms of accountability. In relation to IS in the health sector specifically, one can recognize *hierarchical* or *bureaucratic* forms of accountability (Lupson & Partington, 2011; Yang, 2012) through which funding and regulatory bodies expect IT systems to work as monitoring tools with a view to minimizing error in clinical practice (Bloomfield & McLean, 2003; Davidson & Chismar, 2007; Doolin, 2004; Jensen, Kjærgaard, & Svejvig, 2009) and improving the distribution and allocation of resources (Madon et al., 2010; Noir & Walsham, 2007). In return, by using IS to be more accountable, health professionals and managers gain legitimacy to qualify for further funding.

“Bureaucratic accountability for performance” (Lupson & Partington, 2011, p. 912) is a form of “upward” accountability (Baur & Schmitz, 2012) that controls for performance and limits individuals' actions. For example, tensions can arise between funders' expectations of budgetary limitations to professional action and the “autonomous exercise of professional judgment” that clinical professional bodies expect

(Freeman, McWilliam, MacKinnon, DeLuca, & Rappolt, 2009). Another major downside of bureaucratic accountability is that it “reduces accountability to mere financial accounting without fully involving those affected by their activities” (Baur & Schmitz, 2012, p. 14). In this way, the day-by-day added value of local practices becomes invisible behind macro-numerical representations (Keevers, Treleaven, Sykes, & Darcy, 2012). In the health context, using IS to account for results at the national level undermines efforts to be more accountable to beneficiaries (in particular, healthcare providers and patients).

The debate over bureaucratic accountability is particularly heated in the context of international aid in LMICs. On the one hand, powerful stakeholders such as donor agencies and national governments exercise a lot of pressure to ensure financial and performance accountability (Mekonnen & Sahay, 2008; Piotti, Chilundo, & Sahay, 2006; Smith et al., 2008). On the other hand, bureaucratic accountability often limits healthcare professionals. They often contest the use of HIS to monitor their performance and claim that they serve more the needs of funding bodies, government bureaucrats, and health managers rather than the needs of health professionals and their patients (Madon et al., 2010). Thus, health workers in charge of collecting data often prioritize the care of patients over data reporting, which reduces the effectiveness of HIS in performance monitoring (Chilundo & Aanestad, 2004; Piotti et al., 2006).

Hence, available studies suggest that bureaucratic accountability has increased the legitimacy of HIS as monitoring tools that reward national governments with funding. Yet, it has decreased the legitimacy of HIS among its main users such as health workers and, therefore, reduced the effectiveness of HIS in addressing the needs of local communities.

The controversial effects of bureaucratic accountability have raised the need to revisit the role of HIS in favor of “democratic” accountability (Madon et al., 2010). “Democratic” accountability is a political and socializing form of accountability (Lupson & Partington, 2011; Mulgan, 2000; Pina, Torres, & Acerete, 2007; Roberts, 1996). It requires public service workers to interact with one another and engage with the public to cater for citizens’ needs and concerns (Brinkerhoff, 2004; Madon & Krishna, 2017).

According to previous research, devolution and a decentralized HIS are two main factors that can enable “democratic” or “downward” accountability in the health sector (Madon et al., 2010). With devolution, local health authorities have more autonomy in how they use local resources to meet the needs of their communities. A decentralized HIS can equip local authorities with the necessary tools to capture and analyze data locally. Yet, we seem to lack empirical studies that show how a decentralized HIS, matched with devolution, leads to a more democratic form of accountability that enables a productive use of information in health service management. The case study I analyze demonstrates how centralized and decentralized practices of accountability may coexist, which adds to the complexity of the impact of HIS on health service planning and management.

## 4 Structuration Theory

Scholars in the IS field have used Giddens's (1979, 1984) structuration theory mainly to understand how users’ interactions with IT evolve, these interactions’ organizational implications, and how we can try to deal with their intended and unintended consequences (Barley, 1986; Jones & Karsten, 2008; Pozzebon & Pinsonneault, 2005). Researchers have also used structuration theory to understand processes of stability and change of social practices in relation to ICTs in cross-cultural global/local settings (Sarker & Sahay, 2003; Schultze & Orlikowski, 2004; Walsham, 2002).

One of the major tenets of structuration theory adopted in IS research is the notion of “duality of structure” whereby structure is both the medium and outcome of human interaction (Giddens, 1979, 1984). Structures are the “rules and resources, recursively implicated in the reproduction of social systems” (Giddens, 1984, p. 377). Structures have only a “virtual existence” that becomes instantiated in action. They are the principles that pattern human practices and exist only as recursive enactments (Giddens, 1984). On the one hand, social structures condition agency. On the other hand, actors reflexively monitor their actions and have the capability to “make a difference” or produce an effect (Giddens, 1984, p. 15) by mobilizing existing stocks of resources, norms, and knowledge (“modalities”; that is, the linkages between social structures and agency) that transform structures of domination, legitimation, and signification, respectively. In this sense, structures both constrain and enable. Reflexive monitoring implies the knowledgeability of actors who “know a great deal about the conditions and consequences of what they do in their day-to-day lives” (Giddens, 1984, p. 281). It also reflects the purposive character of human agency whereby actors always know the intentions of their actions.

This study builds on previous work on structuration theory that views technology as embodying norms and rules that human actors recursively enact through their actions (Orlikowski, 1992; Walsham, 2002). In so doing, actors may reinforce or change social structures while they reproduce or reinvent the technology's structural properties. In other words, "IS are drawn on to provide meaning, to exercise power, and to legitimize actions" (Walsham, 2002, p. 362). Yet, researchers have criticized the view of social structures as enduring within the materiality of technology for being incompatible with the virtual character of Giddens's structures (Jones & Karsten, 2008). Because I examine how HIS capabilities mediate the enactment of accountability, I account for the role of IT materiality in expanding this social phenomenon.

Sociomateriality is one perspective that focuses on understanding how IT materiality constitutes social practices. There are two ontological positions of sociomateriality (Cecez-Kecmanovic, Galliers, Henfridsson, Newell, & Vidgen, 2014). The first one builds on Barad's "agential realism" and considers the material and the social as intricately related. What is social is also material and vice versa, and the two become constitutively entangled to generate "sociomaterial practices" (Orlikowski, 2007). The second one builds on critical realism to consider the material and the social as two discrete entities that constitute each other through their interaction (Leonardi, 2013; Mutch, 2013). Yet, one can use neither perspective to account for the recursive instantiation of social structures in action and reflexivity as structuration theory does. Actors do not only reflexively monitor their actions and the actions of others but also expect their actions to be monitored (Giddens, 1984). Through reflexive monitoring, actors constantly seek justification for their actions in accordance with "what is normal and expected" (Giddens, 1984, p. 30). Structures of domination, legitimation, and signification hold actors accountable by ensuring that their behavior is socially acceptable. For these reasons, structuration theory is a good foundation for this study; therefore, we need a way to integrate materiality into structuration theory.

In order to overcome the undertheorization of materiality in structuration theory, Sewell (1992) proposes that "allocative resources"—which, according to Giddens are material and implicated in the reproduction of social structures—are "actual" rather than "virtual". Based on this definition of resources, structures retain their virtual quality in the form of rules and norms while resources are the outcomes and means of structures. Only by accessing resources can agents enact rules and norms. For example, from the material resources of a factory, such as its assembly line, one can infer the rules that govern work in a capitalist society (Sewell, 2005).

Sewell's reconceptualization of "allocative resources" is a first step towards acknowledging that structuration processes can implicate the structural properties of IT, which are material and, therefore, non-virtual. Similar to the factory in Sewell's example, a technology has material features that constitute the meanings users associate with it and, therefore, influence how users use the technology (Doherty, Coombs, & Loan-Clarke, 2006). Thus, the materiality of technology has an impact on society by contributing to shaping users' intentions to use it in a certain way. In particular, a technology's "interpretive flexibility" defines the degree to which it shapes the social structures, such as norms, rules, and meanings emerging from its enactments (Bijker, 1987; Orlikowski, 1992, 2000). Interpretive flexibility refers to the extent to which the material features of an IT "might limit its ability to be interpreted flexibly" (Doherty et al., 2006, p. 569), which, as a result, limits the ways one can use IT and the impact it can have on society. Thus, interpretive flexibility determines the extent to which users can draw on the norms and values of their surrounding institutional context to interpret a technology (Orlikowski, 1992). On the one hand, the material features of an IT constitute the meanings that are recursively implicated in its use and the consequent reproduction of social structures. On the other hand, the social domain, which comprises norms, rules, and other resources, influence how users interpret and use an IT in the boundaries of its material features.

In summary, building on Sewell's conceptualization of the materiality of allocative resources in structuration theory, I adopt the notion of "interpretive flexibility" to better account for the materiality of technology in processes of structuration. Under this perspective, the material features of HIS define the rules and norms implicated in the reproduction of social practices that perform accountability. While actors reflexively monitor their situation and actions, the interpretive flexibility of the HIS marks the boundaries in which the technology domain (i.e., the material features of a technology) and the social domain (i.e., power relations, norms, and meaning systems of a social context) mutually interact and shape users' interpretations of the HIS. Users' interpretations will then influence how the HIS is implicated in the reproduction of structures (domination, legitimation, signification) and the consequent enactment of accountability either through means of control (bureaucratic accountability) or through socialization and the sharing of knowledge, norms, and values (democratic accountability). Figure 1 illustrates the structural perspective I adopted in analyzing the case study of HIS in Kenya.

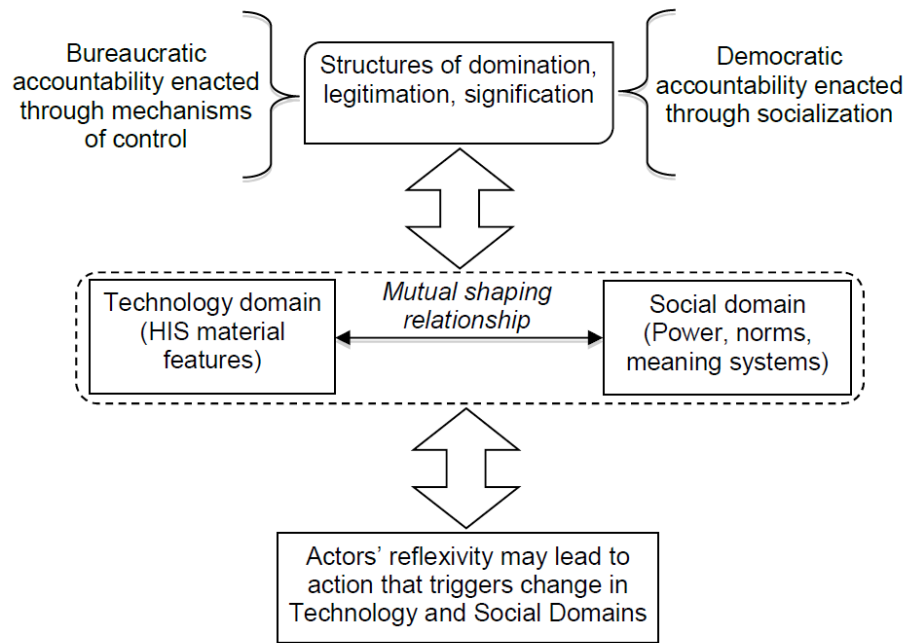


Figure 1. A Structuration Theory Model of IS-mediated Accountability

## 5 Research Method

### 5.1 Data Collection

For this paper, I conducted a case study on the Ministry of Health's information systems in Kenya. I collected data from interviews and documents between 2007 and 2015. Between 2007 and 2008, I collected a sample of 38 semi-structured interviews and held four unstructured interviews with four senior officials of the Government of Kenya. I selected informants from the Ministry of Health and the Government of Kenya based on the relevance of their role in relation to health sector reforms and the restructuring of health information systems. Further, I selected individuals who had worked in the Ministry of Health as early as possible given the importance of obtaining historical accounts.

In the Ministry of Health, the sample of informants included individuals in different organizational roles, such as HIS officers, medical officers who occupied a managerial role, and senior government officers. I selected these individuals as part of a "comprehensive sampling" strategy (Miles & Huberman, 1994, p. 38) in order to obtain a more systematic view of the evolution of the information systems and gather diversified perceptions of institutional and technological changes and their implications for working practices and management structures.

In 2011, I also interviewed six informants from international donor agencies over the phone in order to gain the perspective of the main international actors involved in implementing health sector reforms and HIS in Kenya. In 2015, I conducted eight phone interviews with the users of a new decentralized HIS, DHIS2. Table 1 shows the total number of interviews.

I integrated primary data from the interviews with a sample of approximately 6,000 pages of documents that I obtained from the archives of the Ministry of Health. These documents included government policy documents, minutes of meetings, letters, and HIS reports that covered from 1977 to 2008. I also collected relevant international agencies' policy and project documents available from the Internet. With respect to interviews, documents were a valuable historical source of information for tracing past events and practices that the memory of informants could not recall.

**Table 1. Overview of Interviews**

Participants	2007	2008	2011	2015	Totals
Two multilateral donor agencies			3		3
Three bilateral donor agencies			3		3
Senior government officers	1	3			4
HIS officers		19		7	26
IT officers		3			3
Medical officers		16		1	17
<b>Total</b>	<b>1</b>	<b>41</b>	<b>6</b>	<b>8</b>	<b>56</b>

## 5.2 Data Analysis

I transcribed and coded the interviews and relevant documentary extracts. Based on the key ideas of an inductive methodology (Birks, Fernandez, Levina, & Nasirin, 2013; Glaser & Strauss, 1967; Sarker, Lau, & Sahay, 2000; Urquhart, Lehmann, & Myers, 2010), I used the structuration theory framework as Figure 1 shows as a guide, and I conducted the coding while remaining open to emergent phenomena (Zietsma & Lawrence, 2010). Through “open coding”, I inductively constructed codes by identifying concepts inferred from the data (Glaser & Strauss, 1967; Orlikowski, 1993; Strauss & Corbin, 1990).

Finally, I used “axial coding” to organize codes under a more comprehensive scheme of recurring themes or common categories (Strauss & Corbin, 1990). Second-order codes included themes such as power (which represents the availability and mobilization of resources), norms, and meaning systems, technology features, and structures of domination, legitimation, and signification. I then analyzed relevant data based on an interpretive approach. Interpretive research acquires knowledge of reality by analyzing meanings that people assign to events, speeches, documents, and artefacts (Klein & Myers, 1999). It is useful in understanding both the context in which information systems are situated and the processes through which information systems influence and are influenced by context (Walsham, 1993, 2006). Thus, under this perspective, one can unravel the complex interaction between multiple actors, context, and technology. I used the interpreted data to piece together a narrative of events that told the story of how accountability gained legitimacy. The Appendix summarizes the coding scheme.

## 6 Case Study

Until 2010, the health information system in Kenya was mainly paper based. Health facilities collected data and then sent data reports to the district level. Districts would aggregate these data on summary forms and send them to the national level. International donor organizations funded ad hoc information systems in specialized programs such as immunization and HIV/AIDS to control how their money was spent. Thus, they increased the workload of health staff in charge of collecting data (HIS, 1980).

The end of President Arap Moi’s undemocratic and corrupted regime after the General Elections of 2002 boosted donors’ confidence and spending in Kenya. Higher donor contributions to the country’s health sector increased donors’ demand for health information to account for results. Regardless of a new policy to integrate health information systems under the Division of Health Management Information Systems (HMIS) in the Ministry of Health (Ministry of Health, 1997, p. 43), donor organizations intensified their support to health programs’ information systems. As a result, districts reported data only to the national level and did not see the value of the information collected. In order to improve the use of health information at the district level, in 2010, the Ministry of Health started implementing a new decentralized district health information system (DHIS2). The government rolled out DHIS2 to all 47 county governments created after the devolution reform of 2010.

Against the backdrop of these events, in the case study that follows, I analyze the processes through which HIS users enacted accountability in the national program of immunization. I then focus on the enactment of accountability following the implementation of DHIS2 in 2010. Because all levels of the Ministry of Health used the system, I narrate the experience of HIS users both at county and national level. Users at the national level include HIS officers at the Division of HMIS and other national health programs.



## 6.1 The Information System of the Program of Immunization

Towards the end of the 1990s, the WHO recommended that all countries set up efficient information systems for disease surveillance and routine immunization monitoring (WHO, 1992). Thus, information became a key asset for the planning of activities of the program of immunization in Kenya. In this regard, one of their plans of action stressed the importance of data “in guiding decisions” (KEPI, 1996a, p. 1).

Most officers who worked in the program in the 1990s confirmed that, after the start of donor-funded polio campaigns, they experienced an increase in the demand for information to plan for immunization and disease-surveillance activities. The vaccines manager said that they wanted to improve the quality of their service through better monitoring their performance and supplies:

*We wanted to improve quality of service giving kids potent vaccines.... We also used to have a lot of wastages..., so we wanted to be more accountable with the supplies that we were using, especially the vaccines and also...the syringes and needles.*

Yet, in one meeting, it was noted that the reporting rates from the districts were very low and that the program’s management was not using information (KEPI, 1996b). An HIS officer for the program stressed how he and other HIS officers tried to improve the performance of the information system in order to convince their managers of the value of information for the monitoring and planning of the program’s activities:

*Over time we have been able to improve on the timeliness and [completeness] of data from the districts. This helped the managers and the users of these data to really accept what we have been doing.*

In particular, the program intensified supervision at the districts in order to exhort them to send data reports to the national level as a HIS officer suggested:

*There was a quarterly meeting where every district could be put on the screen, these are your reports this is how you are performing let us know what’s happening.*

The program received little funding from the Ministry of Health and, for the most part, depended on donor funding. Therefore, when donor agencies cut their contributions to immunization to focus on other health priorities (e.g., HIV/AIDS) (KEPI, 2001), the program struggled to supply districts with resources essential for the functioning of the information system, such as data-reporting forms (KEPI, 1998).

In 2001, donor funding for immunization was revived thanks to the Global Alliance for Vaccines and Immunization (GAVI). GAVI released funding to Kenya through a “performance-based grant program” (GAVI, 2007), which contributed to strengthening the monitoring and evaluation system through a data quality audit (DQA) (GAVI, 2004). A HIS officer described the new funding scheme as:

*A reward system whereby districts get slightly more funds if they report more children so that they can reach many others. It makes sure that every child that is immunized is reported; if they [don’t], they would have problems with funds.*

Various HIS officers said that donor agencies, such as WHO, UNICEF, and GAVI, were the major consumers of immunization data. In an interview, the program manager confirmed that GAVI joined other donor partners as the main drivers of the program’s activities and its information system. She added that the start of GAVI’s DQA put more pressure on the program to strengthen their information system:

*GAVI put on an auditing reward system in 2004 as there was a shame in the country that data management was not good enough and this incentive was a driver for us to improve our data management.*

In order to improve data management and the timeliness of data from the field, the program manager led the introduction of standard operating procedures (SOPs), which shifted data-entry duties from 78 districts to eight provinces in the country. The reduction of workload from 78 to eight reports, she said, cut delays in reporting. One year later, in 2004, the provinces started using a new system, EPI-Info, to enter data received from the districts into a computer and send them to the program’s data-management unit.

Following these changes, one program officer suggested that, by 2008, the usage of information for the planning and management of the program’s activities had become a consolidated practice. Another officer recognized the importance of the program manager who involved HIS officers in the planning of the program’s activities:

*The head brings us together and during the planning she allows each person professionally to express your skills within your area of adjudication.*

One medical officer and qualified epidemiologist, a member of the program management team, stressed the importance of data to make decisions:

*We have to decide...when there is a threat of a disease...or, as a vaccination program, we also want to know how many children we are able to reach. Data management informs our decision in many ways.*

After the Division of HMIS took charge of health sector monitoring (HMIS, 2005), all health programs had to integrate their information systems (HIS, 2000). Yet, like other health programs, the program of immunization was reluctant to integrate its data-management system with the Division of HMIS because it relied on data from the districts to account for donor funding. Thus, there were conflicts over who should manage the data as reported in an official document from the Ministry of Health:

*The District Public Health Nurse preferred to do his own data management of [immunization] data and therefore pressured the supervisory team to set up the HMIS software separately on his computer. He cited the lack of confidence in the [district HIS officer] as the main reason. Thus, data is now being managed separately. (Ministry of Health, 2006)*

## 6.2 The HIS after the Implementation of DHIS2 and Devolution

Because the Division of HMIS and national health programs were the main users of health data, health workers and managers on the field did not fully appreciate the value of health information for their work. Thus, in 2010, with the technical assistance of the University of Oslo, the Ministry of Health and its donor partners supported the implementation of a district health information system (DHIS2) with the expectation that it would increase the use of information in health services management at the local level (Karuri, Waiganjo, Orwa, & Many, 2014). DHIS2 was a cloud data-management application for collecting and analyzing health data. Given the limited internet connectivity, the system had a local data mart for offline data entry. A central server could store data when online (Many, Braa, Øverland, Titlestad, & Mumo, 2013).

After devolution in 2010, the Government of Kenya created 47 counties that replaced the districts and provinces. Each county government was responsible for supporting DHIS2 in their own area and had full autonomy in using health data to manage their own services. Data collected at health facilities were entered into DHIS2 at subcounty and county levels and made accessible to all HIS users in the country.

Some participants argued that certain counties were still behind in the use of data. Others suggested that those counties with the means to support DHIS2 and make it function were using data more actively. Some HIS officers seemed to value the role of health information in health service management more than others as one county HIS officer suggested:

*I have a passion for my profession [compared to others whose] mindset is about earning a salary.... Some people do not care about monitoring information, but what I care is the use of information, the impact it has.*

Some HIS officers recalled how hard it was to be involved in health management teams before devolution. By contrast, after devolution, the impact of DHIS2 and the use of health information were more evident in those counties where HIS officers and health management teams worked hand-in-hand as a national HIS officer suggested:

*There are counties where our [HIS] officers are doing very well...in guiding the whole staff [on] how to use indicators and [ensuring] that [anyone] in the county [knows that] indicators are part of everyday life.*

A medical officer in charge of health informatics at the national level said that DHIS2 got medical officers and other users more interested in health data not only by giving unlimited data access but also improving data consistency:

*DHIS helped to use the data at the point of collection. It worked well, it was easy, people started to be interested in the data.... [Consistency has improved]. Even if the data is poor quality, it is all the same.... Data improve confidence in the things we say.*

Available statistical evidence that indicates that, as at September, 2013, data entries into the system had increased from 880,600 to 1,254,993 in the previous 30 days also demonstrates the growing interest in

DHIS2 (Karuri et al., 2014). Most county HIS officers confirmed that their managers were using data in health service management.

HIS officers at the Division of HMIS and other national health programs could customize their reporting forms into DHIS2. County and subcounty HIS officers would then use DHIS2 to key in data directly into the reporting forms. National HIS officers could access these data directly on the national server and use the pivot tables of DHIS2 to analyze and use the data in order to comply with their obligation to report to the Ministry of Health and international donor agencies. Thus, they had to make sure that data entered into DHIS2 met certain quality standards. A national HIS officer working for the Division of HMIS said:

*We have to report both at the national and international level... We need to...[provide] [data quality] guidelines [to the counties].*

Counties experienced pressure to provide the national level with the information needed to account for the distribution of resources in the health service. In this regard, a national HIS officer said:

*Counties increased information use because, at the national level, there is demand for evidence. The national level wants to see in the DHIS whether malaria has been reported and from which facility.*

A national HIS officer working for the Division of HMIS stated that some county administrators did not fully appreciate the value of indicators in health sector planning:

*Politicians do not understand [the] meaning of indicators. It is an issue of accountability: how do you account for that money spent? They get a block of money...but they do not know whether it is for preventive or curative services. For example, now we have a problem of cholera; ...because...politicians...did not take time to plan, they were given inadequate budget to [prevent the epidemics].*

Other counties questioned the value of the information that they were asked to collect as a medical officer at the Ministry of Health reported as explained in this quote by a medical officer:

*Some of the counties would question why they are collecting so many indicators.... Some of the donors work just in some areas.... Counties who do not have malaria at all, [they have to report] national indicators [of malaria].*

Table 2 summarizes findings of the case study. I provide a structural analysis of these findings in Section 7.

**Table 2. Summary of Findings**

	<b>Program of immunization</b>	<b>DHIS2</b>
Key events	WHO recommended LMICs set up efficient IS (1990s) GAVI performance-based grant program (2001)	Adoption of DHIS2 and decentralization of HIS (2010) Devolution and the creation of 47 counties (2010)
Main actors	Program/HIS officers Program manager	County HIS officers County administrators National HIS officers
Actions	Before GAVI, HIS officers sought to improve data reporting to convince management of the value of information. After GAVI the program manager felt the pressure to strengthen the IS.	Counties with more resources used data to manage their services. Counties questioned the value of the national indicators they have to report.
Outcomes	Epi-Info software and SOPs were implemented. Consolidated use of information for planning and managing program's activities.	Some county administrators did not use information for planning.

## 7 Structural Analysis

In this section, I conduct structural analysis of the case study that I illustrate above. I focus on accountability practices and how they emerged and evolved from the interplay between the technology and social domain of the HIS. The theoretical framework I used in the analysis comprises: agency (users' actions), social domain (power, norms, and meanings), technology domain (the material features of the HIS), and the structures (domination, legitimation, and signification) that underpin the enactment of accountability.

## 7.1 Bureaucratic Accountability: The Case of the Program of Immunization

After the WHO recommended that LMICs strengthen routine immunization information systems and diseases surveillance, the assumption that data is important in guiding decisions became one of the key drivers of the program of immunization's activities. Increased demand for information to plan for immunization campaigns and disease surveillance triggered the reflexivity of program officers, who, as the vaccines manager explained, realized the need to strengthen their monitoring systems in order to account for medical supplies. The fact that some program officers recognized the need to be more accountable reflects that they had internalized accountability in their practices.

In particular, HIS officers vowed to improve the performance of their information system to demonstrate how they could use data to monitor their program's activities and convince their managers of the value of information—an example of structures of signification that support a socializing form of accountability (Roberts, 1991) where the use of HIS to monitor performance mediates the constitution of social relations between HIS officers and their managers. Such social relations can support the local enactment of accountability. In addition, HIS officers were keen to improve data reporting on their program's outcomes and activities to make their managers accept "what they had been doing". This finding exemplifies how the interests of a social group can mediate the social construction of accountability objectives (Anifalaje, 2012; Topp, Chipukuma, & Hanefeld, 2015).

Most of all, poor funding from the Ministry of Health and management's lack of legitimacy of health information underscore the weak response from local institutions to implement the goals of international organizations, such as the WHO that drove national immunization programs around the world to set up information systems in the first place. As a result, the internationally driven HIS lacked institutional support at the local level, which highlights the tension between formal governance (i.e., what policy documents document) and informal governance (i.e., how policy goals are translated (or are not translated) into action) (Brinkerhoff & Bossert, 2014). In this case, the Ministry of Health did not support immunization, which amplified the individualizing effects of bureaucratic accountability.

More specifically, lack of support enhanced the reflexivity of HIS officers who engaged in a series of activities meant to exhort districts to improve the timeliness and completeness of data reports. One of these activities was to provide feedback to districts about their reporting rates in order to strengthen manual reporting systems. The power differential between HIS officers and districts represented an obstacle to their constructing and sharing common accountability objectives through socialization (Brinkerhoff & Bossert, 2014; Lodenstein, Dieleman, Gerretsen, & Broerse, 2017). Indeed, HIS officers engaged with the districts merely to impose the enactment of bureaucratic accountability. As a result, these actors used the HIS to enact just one mechanism of accountability—"answerability" (Topp et al., 2015)—but neglected enforcement mechanisms (Brinkerhoff, 2004; Topp et al., 2015). Whereas answerability involves providing information about one's performance, enforcement mechanisms sanction health authorities and providers for not meeting performance expectations.

An example of an enforcement mechanism is the performance-based grant that GAVI started in 2001. This new scheme of funding represented a source of power that legitimized donor support for the program's information system. It also set in place new structures of domination and legitimation by tying funding to performance. Under this new funding regime, showing results was a norm that districts had to follow in order to obtain funding. In this example, management did not exercise its "invisible" power (Roberts, 1991) only through resource allocations but also through the mediation of rules and norms. In this way, structures of domination are interlinked with structures of legitimation, which are instantiated through the normative sanctioning of social practices (Giddens, 1984).

Acknowledging that the immunization information system was underperforming, the program's manager (whose reflexivity was prompted by the pressure to qualify for funding) set in place a series of actions meant to improve data management. As a result, provinces implemented the Epi-Info software and standard operating procedures (SOPs) to improve the timeliness and, possibly, the accuracy of data reports. Arguably, SOPs were a means the program manager could use to control data reporting from the field. The program manager's engagement in strengthening the immunization information system shows that management had started to value information in decision making and had finally internalized accountability in its practices. Socializing activities such as management's involvement of HIS officers in discussing accountability objectives and the belief that data should inform management's decisions also demonstrate the reinforcement of structures of signification in support of accountability. Here, socialization strengthened a centralized reporting of data to monitor performance, which is part of bureaucratic accountability (Brinkerhoff,

2004; Topp et al., 2015). By contrast, the shift of donor funding to other health priorities and the program's reluctance to collaborate with the Division of HMIS on integrating the HIS demonstrate how competition over scarce resources can inhibit socializing forms of accountability (Lodenstein et al., 2017). As a result, health sector managers risk not achieving accountability goals such as monitoring and improving health sector performance. Tensions over the control of information resulted from conflicting priorities of donor agencies that contradicted internationally driven reforms by sponsoring the information systems of multiple health programs and, by so doing, amplified the individualizing effects of bureaucratic accountability (Roberts, 1991). Figure 2 summarizes the processes of structuration that I analyze above.

## 7.2 HIS Decentralization and Democratic Accountability: The Case of DHIS2

The poor legitimacy of health information at the lower levels of the health system constituted one main driving factor for why the Ministry of Health, with the support of donor agencies, implemented the new decentralized information system, DHIS2. The Ministry of Health and donor agencies believed that, by decentralizing the HIS, the use of health information for the management and provision of local health services would increase. Thus, after devolution and the creation of counties, DHIS2 changed the way HIS users collected and managed health information. New structures of domination emerged, which gave county governments control over their own health data to manage health services locally. The case study shows how differences in power represented by an unequal distribution of resources enabled some counties to benefit from DHIS2 more than others. County HIS officers drew on new norms that legitimized indicators as “being part of everyday life” in order to drive the use of health information for decision making at the county level. Now that county governments relied on DHIS2 to manage their own health services, normative behaviors that legitimized the use of indicators reproduced new structures of legitimation through which county HIS officers became fully involved in the work of health management teams (HMTs). Devolution and the decentralization of the HIS reduced the power distance and facilitated the dialogue between county HIS officers and health management teams, who were working “hand-in-hand” and, therefore, enacted accountability through acts of socialization.

Other issues emerged in relation to the meaning systems that underpinned the adoption of DHIS2. First, as one county HIS officer suggested, HIS officers had different mindsets about using health information, and not everyone valued the impact of information on health service management in the same way. Second, a medical officer assumed that unlimited data access and improved data consistency that resulted from using DHIS2 triggered the reflexivity of medical officers and other users who became more interested in and could better understand health data. Therefore, DHIS2 mediated a socializing form of accountability whereby various groups of users, not just HIS officers, learned how they could use data to provide evidence about health interventions.

These findings point to a mutual shaping relationship between the social and technology domain. On the one hand, power in the form of availability of resources, together with norms and meaning systems that value the use of health information, influenced the extent to which county users effectively engaged with DHIS2 in health service management. On the other hand, new norms and meanings that drove the use of DHIS2 were related to the opportunities that the material features of the new system offered. In particular, norms and meanings that emerged from users' interactions with DHIS2 contributed to their enacting accountability through acts of socialization. As a result, as some HIS officers reported, a new structure of signification that represented the internalization of accountability into county managers' practices emerged. County managers used information to plan and manage local health services, which resulted in “democratic accountability”. In contrast to “bureaucratic accountability”, “democratic accountability” can increase local decision makers' interests in health information and their ability to value and use data to improve the delivery of health services to their citizens (Madon et al., 2010). With bureaucratic accountability, actors use information to satisfy the needs of their superiors; with democratic accountability, local health authorities and providers are held accountable to the needs of service users and, in particular, the poor (Brinkerhoff, 2004). Thus, democratic accountability can contribute to development since it helps service providers to understand and act on the challenges that affect the health system in order to provide better healthcare to service users. In particular, the case study demonstrates that HIS officers and county managers could achieve democratic accountability through the acts of socialization that DHIS2 facilitated and through which they could collaborate and better understand the needs of the health system.

The case study also shows that counties were not only using information locally but had to comply with structures of domination and legitimation that governed the use of DHIS2 to account for resources at the

national level. Thanks to the new system, national HIS officers could customize data reports in DHIS2, access data collected in the counties directly on the national server, and use pivot tables to improve data analysis. The importance of these data in complying with national and international reporting obligations prompted the reflexivity of the national HIS officers that provided counties with quality standards (or norms). In turn, these officers gained the power to dictate how they should collect and report data. One medical officer pointed to the lack of confidence in the capacity of some county administrators to understand the meaning of indicators in health sector planning. Lack of confidence in the ability of political actors to understand health matters can constitute a barrier to dialogue and socializing forms of accountability (Lodenstein et al., 2017), which explains why no structures of signification could adequately support the enactment of accountability in some of these counties. More specifically, the fact that some county administrators did not use information for budgeting demonstrates that their practices did not internalize accountability. I argue that the lack of structures of signification in support of accountability in part resulted from the reflexivity of county administrators concerning the utility of indicators in addressing the needs of donor agencies rather than local health service users. Most of all, national HIS officers could customize DHIS2 due to its flexibility to satisfy the information needs of the Division of HMIS and other national health programs. As a result, the decentralization of the HIS did not reduce the power distance between the national level and the lower levels of the health systems. Counties perceived indicators as irrelevant because they were not involved in their design, which is another barrier to socialization (Lodenstein et al., 2017) and the enactment of democratic accountability. Figure 3 summarizes the analysis of the main structuration processes after the implementation of DHIS2.

## 8 Discussion

Accountability is a major driver of the deployment and use of HIS. In analyzing a case study about HIS in Kenya, I identify two types of accountability: bureaucratic and democratic. In this section, I explain in more detail how HIS influence the enactment of accountability. In particular, I answer the paper's research questions by unveiling the processes through which accountability acquires legitimacy and is enacted locally and by demonstrating how the HIS capabilities mediate the enactment of accountability. I then discuss the study's major implications.

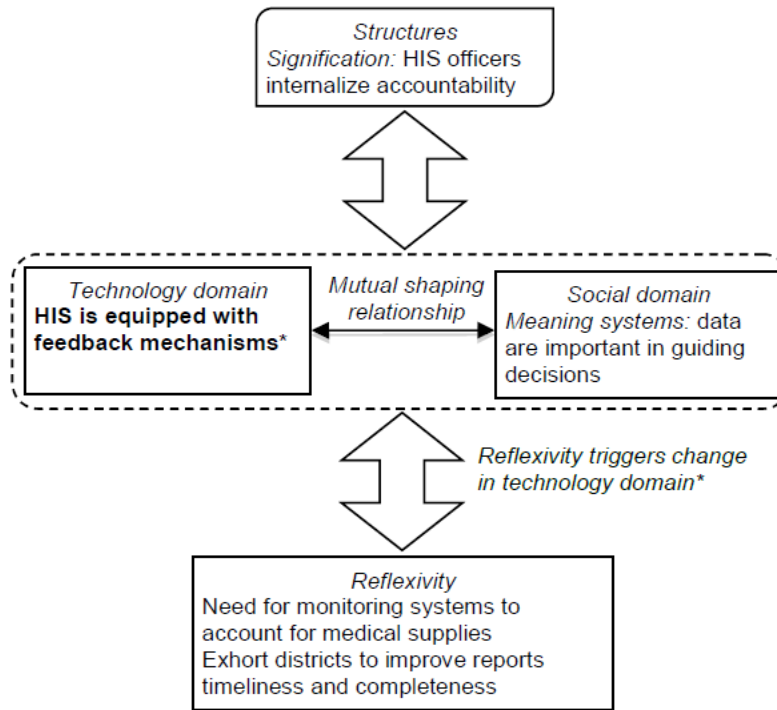
### 8.1 The Enactment of Bureaucratic Accountability at the Program of Immunization

In this section, I discuss the processes through which actors internalized accountability and the role of the HIS in mediating bureaucratic accountability in the program of immunization. First, the alignment of structures of domination (power and resources), legitimation (norms), and signification (meaning systems) was necessary for actors to legitimize accountability. For example, some officers at the program of immunization interpreted accountability as a means to account for results and resources in order to better plan activities. The meanings that these officers associated with accountability represent structures of signification through which they integrated accountability in their practices. Yet, not until donor intervention intensified did management also internalize accountability but with the intermediation of other structures, such as resources and norms that reproduced structures of domination and legitimation. Here, accountability acquired different meanings that legitimized new behavioral norms, such as "demonstrate results to access funding".

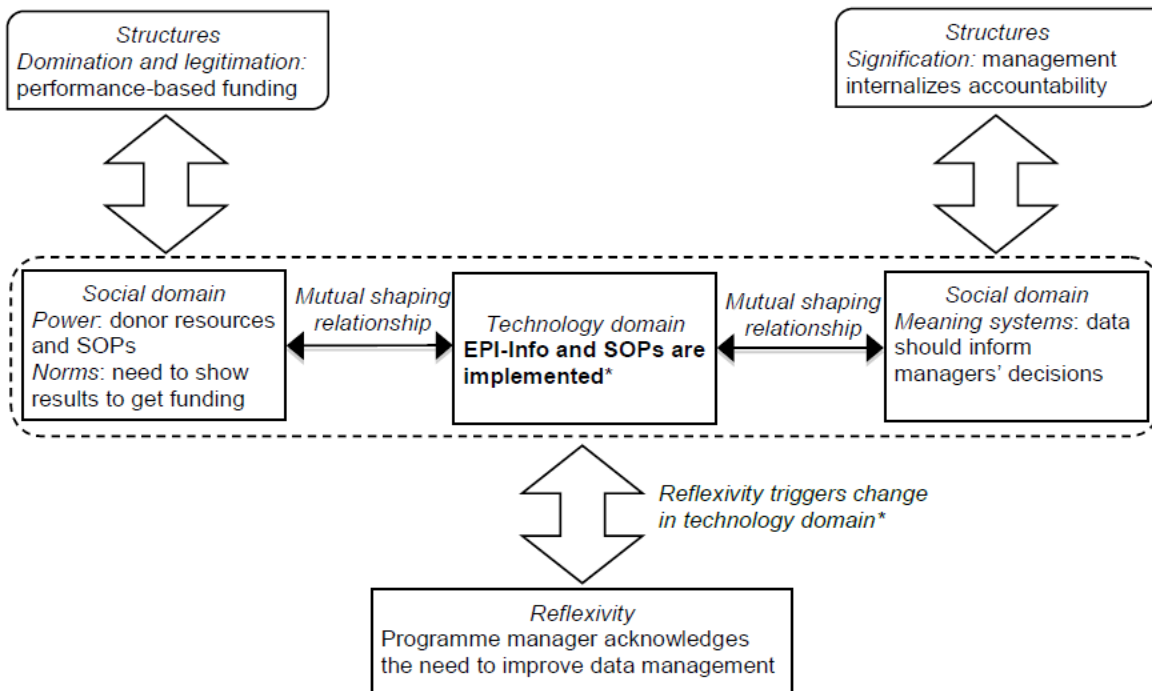
Second, actors' interests played an important role in the way they interpreted and internalized accountability, which shows the social nature of accountability (Anifalaje, 2012; Topp et al., 2015). For example, HIS officers in the program of immunization developed meaning systems that legitimized accountability during a time when the program received inadequate funding in order to demonstrate the importance of their role. By contrast, structures of domination and legitimation, such as tying funding to performance, spurred management's interest in using health information to account for results.

Therefore, interests of different groups of actors and social structures should be aligned to mediate the enactment of accountability. In particular, the case study shows how actors' socialization can be both a means and outcome of the alignment between social structures to achieve common accountability goals. For example, HIS officers at the program of immunization engaged in acts of socialization to convince management of the value of data to account for the program's performance, whereas management started to involve HIS officers in discussing accountability objectives only after having legitimized accountability.

**Figure 2a. HIS officers internalize bureaucratic accountability**



**Figure 2b. Programme managers internalize bureaucratic accountability**



**Figure 2. The Enactment of Bureaucratic Accountability at the Program of Immunization**

Figure 3a. County officers internalize democratic accountability

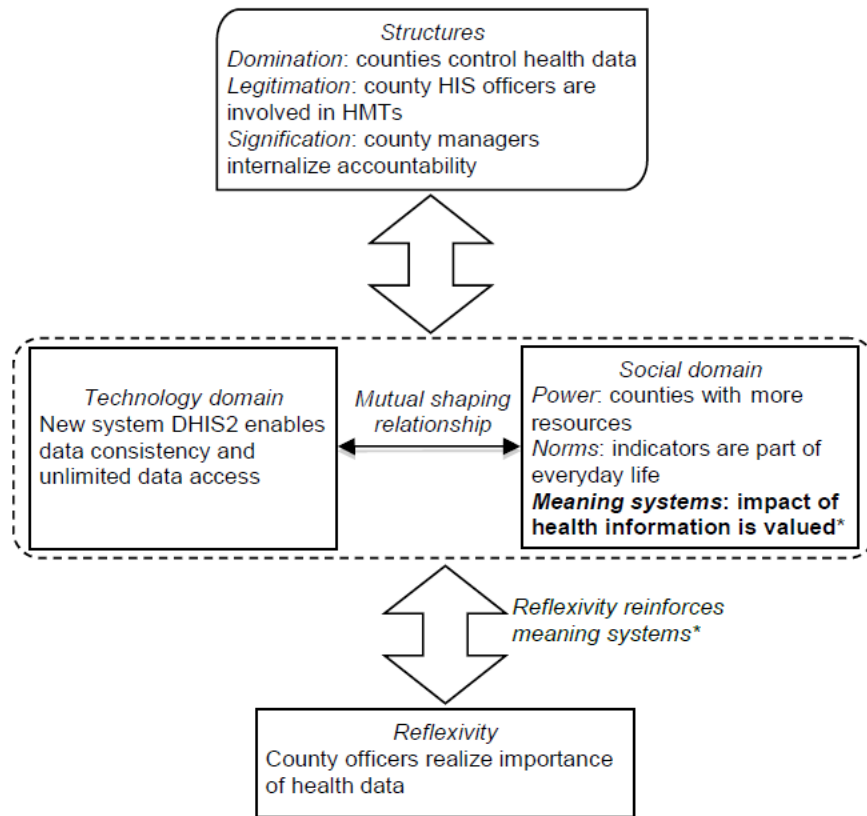


Figure 3b. Tension between national HIS officers and county administrators over bureaucratic accountability

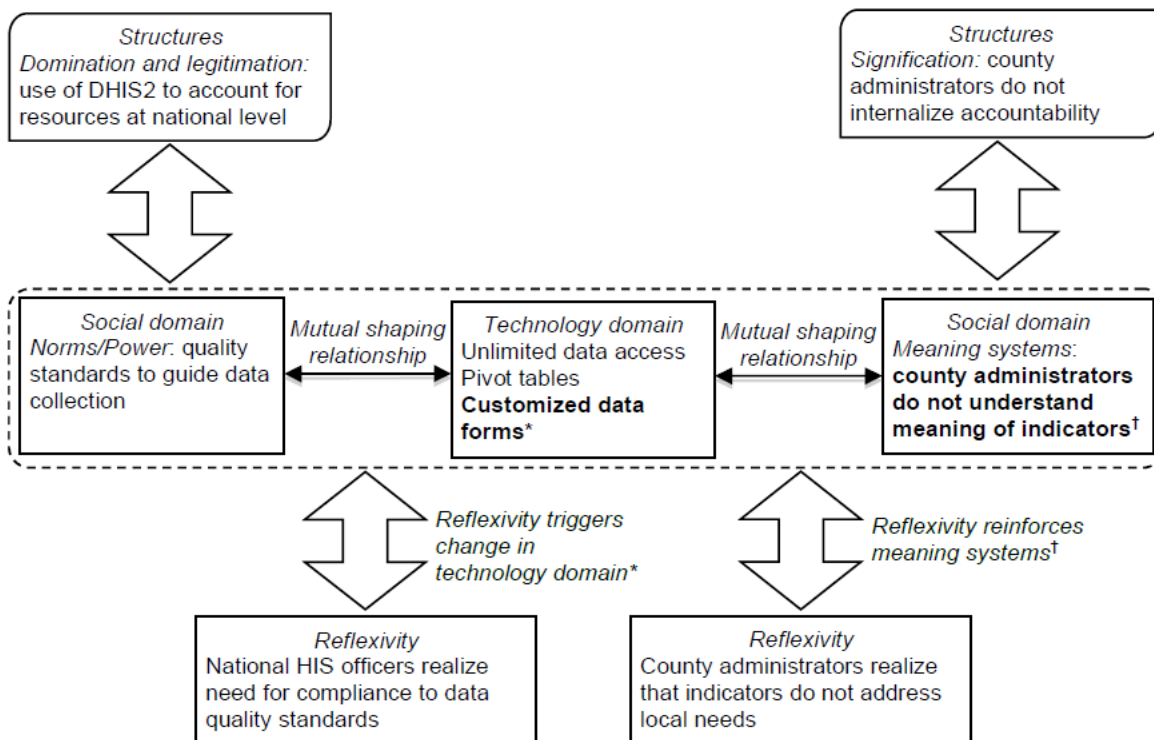


Figure 3. The Enactment of Democratic and Bureaucratic Accountability with DHIS2



In contrast, when the interests and social structures that mediate accountability are not aligned, the individualizing effects of bureaucratic accountability are amplified. As a result, actors will find it difficult to achieve common accountability goals. In particular, in the case study, I found that tensions between formal accountability goals of international policies and informal accountability goals of national governments and donor agencies often resulted in an uneven support to the HIS and limited dialogue among these stakeholders. For example, whereas the program of immunization did not receive much support from the Ministry of Health, donor agencies provided most of the funding for its HIS. Yet, conflicting priorities among donor agencies, such as accounting for the performance of individual health programs, contradicted the accountability objectives of international (and national) policies. This contradiction worsened competition over scarce resources and limited “socialization” and hampered the donor agencies and the Ministry of Health from achieving common accountability goals. While local actors cope with little institutional support and few resources, they may resort to actions that can limit socialization among stakeholders, particularly across the national and lower levels of a health system. For example, HIS officers at the program of immunization leveraged their power mainly to exhort districts to report information to the national level without putting in place enforcement mechanisms to sanction actors who did not meet immunization targets or showing them how they could use data to achieve those targets. An example of enforcement mechanisms is GAVI’s performance-based grant that rewarded performance by tying funding to results and mediated the realization of legitimation structures through which management internalized bureaucratic accountability.

Finally, the case of the program of immunization offers a few examples of how HIS capabilities can mediate accountability. First, it shows how the meanings attached to accountability influenced technological innovation by shaping local actors’ idea of a functioning HIS. For example, management’s internalization of bureaucratic accountability drove how national HIS officers inscribed rules such as SOPs in the HIS design. These rules enabled the decentralization of routines and simple data reporting tasks (Bloom et al., 2014) while allowing the central level to enact structures of domination and keep control over the information collected. In addition, the HIS mediated the constitution of social relations between HIS officers and managers in the program of immunization, which potentially could support the local enactment of bureaucratic accountability. In Section 8.2, in discussing DHIS2, I provide further examples about the role of HIS in mediating accountability.

## **8.2 The Role of DHIS2 Capabilities in Mediating the Tension between Bureaucratic and Democratic Accountability**

The role of IT materiality in mediating socializing forms of accountability was particularly evident in the case of DHIS2 and the enactment of democratic accountability. Like bureaucratic accountability, democratic accountability benefitted from the alignment between structures of domination (resources at county level), legitimation (e.g., legitimacy of monitoring indicators as “part of everyday life”), and signification (belief in the positive impact of information on health service management). In particular, democratic accountability was possible thanks to devolution and the decentralization of the HIS, which reduced the power distance and increased dialogue among groups of users (e.g., HIS officers and Health Management Teams). DHIS2 mediated socialization among different groups of users by providing unlimited data access and improving data consistency, which, for example, increased medical officers’ interest in health information. Thus, DHIS2 participated in users’ constructing norms and meaning systems (Doolin, 1998, 2003) through which they valued the use of data in health service management and potentially gained a greater understanding of the health system’s and patients’ needs.

In addition to democratic accountability, the digital capabilities of DHIS2 could accommodate bureaucratic accountability as well, which was possible thanks to the higher interpretive flexibility (Orlikowski, 1992) of the new computerized system compared to the previous paper-based system. For example, national HIS officers integrated customized reporting forms and quality standards in DHIS2 to dictate how counties should use the software to collect and report data. In this way, national HIS officers could use DHIS2 to enact bureaucratic accountability in order to account for health sector performance at the national level.

Bureaucratic accountability and democratic accountability have different objectives. Whereas the former focuses on accounting for performance against set targets, the latter focuses on accounting for the needs of health service users (Brinkerhoff, 2004). Yet, the case study shows that these objectives should not be in conflict with but complement each other. Indeed, dialogue and socialization across the national and lower levels of the health system can ensure that bureaucratic accountability does not hamper democratic accountability.

For example, from the case study, I found a misalignment between structures of domination/legitimation and structures of signification. Whereas the former sustained bureaucratic accountability at the national level, the latter represented county administrators' view of these indicators as serving the needs of donor agencies rather than the healthcare needs of their communities. One possible cause for this misalignment was national HIS officers' lack of confidence in county administrators' understanding of data to the extent that dialogue between these groups of actors may have been difficult. In addition, the new features of DHIS2 mediated the tension between bureaucratic and democratic accountability by maintaining the power distance between national and county users of the HIS. The consequent lack of socialization between these two groups of users and, in particular, the lack of involvement of county users in designing monitoring indicators may have jeopardized democratic accountability. Together with the example of enforcement mechanisms in the program of immunization, these findings stress the importance of a two-way communication system and the presence of both answerability and enforcement mechanisms (Brinkerhoff, 2004) across the national and lower levels of the health system to ensure that individuals use information to improve the health service.

### 8.3 Implications for the Integration of IT Materiality in Structuration Theory

This paper has several implications. The first concerns the integration of materiality into a structuration theory perspective. The paper demonstrates how structuration theory is still a useful perspective for studying the linkage between IT materiality and socio-organizational processes and, in particular, for understanding how IS mediate legitimation, power, and meaning structures. Structuration theory assumes that actors hold themselves accountable by reflexively monitoring their own and other people's actions to make sure that they conform to socially acceptable behaviors. By focusing on the different modalities through which HIS users reproduced structures of domination, legitimation, and signification, I identify different assumptions by which users interpreted and legitimized accountability. For example, one county officer mentioned how much he valued the use of health information in health service management. Such a view of information can influence the use of HIS to account for health service users' needs in contrast with national HIS officers' use of the HIS to account for health sector performance.

Yet, Giddens' structuration theory overlooks how the enduring materiality of IT may affect social structures (Jones & Karsten, 2008). I address this limitation by using Sewell's conceptualization of "allocative resources" as material (Sewell, 1992, 2005) and argue that, in addition to virtual structures, processes of structuration also implicate the material features of IT. In particular, I adopt the notion of interpretive flexibility (Doherty et al., 2006) to show how the material features of a technology can act as the boundaries in which users can interpret a technology while they draw on the social structures of their institutional environment. Under this perspective, materiality influences processes of structuration by shaping the meanings that users associate with a technology and users' intended use of a technology.

Sociomateriality and the structuration theory perspective as developed in this paper differ, and one can use them to study different aspects of accountability. For example, one can use the focus on sociomaterial practices as a "constitutive entanglement" (Orlikowski & Scott, 2008) to understand how sociomaterial practices, such as "anonymity", blur the boundaries between users' identities and their material-discursive interactions on social media, which challenges transparency and accountability (Scott & Orlikowski, 2014). In this paper, I focus on a different aspect of accountability; that is, how IT materiality and, more specifically, HIS capabilities mediate the enactment and legitimacy of accountability. Answers to this question require a different lens that, as opposed to sociomateriality, does not conflate the material with the social but considers them as two discrete entities. The critical realist version of sociomateriality (Leonardi, 2013; Mutch, 2013) and its view of the material and social as two distinct entities could serve this purpose if it conceptualized social structures. Through the notion of "interpretive flexibility", the case study shows how the material features of the HIS shape the rules, norms, and meanings implicated in the reproduction of social structures that legitimize accountability. For example, DHIS2 mediated the construction of norms and meaning systems (Doolin, 1998, 2003) through which users could better understand the value of data in health service management locally. Therefore, processes of structuration that supported a decentralized use of health information and the consequent enactment of democratic accountability implicated the enduring part of an IT—in this case, the capabilities of DHIS2.

### 8.4 Implications for Understanding the Role of ICT in Fostering Development

The second implication concerns the role of flexible Web-based technologies in making a difference for development (e.g., Jha, Pinsonneault, & Dubé, 2016; Monteiro & Hanseth, 1996). In particular, this study

contributes to explaining how HIS, with a flexible IT design, can foster development by facilitating democratic accountability (i.e., by increasing local decision makers' interests in health information and their ability of valuing and using data to improve the delivery of health services to their citizens). Evidence regarding the use of DHIS2 in the counties demonstrates how the materiality of flexible IT participates in the construction of norms and meaning systems through which users value the use of data. By doing so, flexible IT mediates the socialization among different groups of HIS users who can gain a greater understanding of the challenges of the health system and account for health service users' needs.

This study also contributes to the debate about the role of devolution and decentralized HIS in fostering development (Madon et al., 2010). In particular, I show how the flexible design of a decentralized HIS can lead to the co-existence of both bureaucratic and democratic accountabilities, which adds to the complexity of the impact of HIS on health service management. While previous research has stressed the need to balance between centrally controlled and decentralized healthcare information infrastructures (Rodon & Silva, 2015), the case study that I explore in this paper demonstrates the conflicts that may arise if such a balance is not achieved. In particular, the case of DHIS2 shows how flexible HIS can be re-adapted to serve the interests and information needs of actors at the central level and reproduce structures of domination that favor bureaucratic accountability. These structures might limit the socialization among actors of the health system, which can put democratic accountability at risk and undermine a better use of information to address the healthcare and development needs of local communities. These findings highlight the complexity of LMICs' contexts for being characterized by power, legitimacy, and meaning structures that are often misaligned and reflect competing accountability goals. Ideally, ICT can foster development by mediating and rebalancing the tension between conflicting social structures and accountabilities. In particular, HIS should be designed in a way that can foster dialogue and socialization across the different levels of the health system so that the goals of bureaucratic and democratic accountabilities do not conflict with but complement each other.

Earlier studies suggest that using HIS to promote bureaucratic accountability through the monitoring of national health targets and funding can have controversial effects for development (Ciborra, 2005; Noir & Walsham, 2007). Research attributes such controversial effects to the political nature of ICT4D programs, particularly when they are meant to "enforce" values that are alien to local contexts (Andrade & Urquhart, 2012; Sahay, Monteiro, & Aanestad, 2009; Walsham & Sahay, 1999). Through analyzing bureaucratic accountability in the program of immunization, I add to this research by showing how the negative development impact of HIS is due to the individualizing effects of bureaucratic accountability (Roberts, 1991) that the tension between formal policy objectives and multiple agencies in LMICs amplify. ICT in fostering development needs to balance these different agencies because, in particular, of the social nature of accountability whereby interests mediate accountability goals. While I primarily focus on bureaucratic and democratic accountability in the health sector in this study, social accountabilities can also elude the development impact of ICT (Miscione, 2007). Social accountabilities often relate to practices of social protection that hold individuals accountable to their community but that can have negative effects on public health. An example is "widow inheritance" whereby a family or clan member can inherit the widow of a man who may have died of AIDS, which increases the risk of contagion (Okeyo & Allen, 1994). Further research could investigate how ICT-based mobilization programs can improve healthcare and development outcomes by mediating the goals and effects of social accountabilities.

## 8.5 Implications for IS and Accountability

Recent IS research has mainly focused on the role of IS in holding people accountable and self-disciplined by making their behavior more visible (Constantinides, 2011; Doolin, 1998; Vance, Lowry, & Eggett, 2013). This bureaucratic view of accountability as reinforcing norms of control contrasts with a socializing form of accountability (Roberts, 1991) where actors socially construct accountability in relation to their interests (Anifalaje, 2012) and enact accountability through social acts and learning encounters (Madon & Krishna, 2017). The IS literature has overlooked such a socializing form of accountability and has mainly focused on the individualizing effects of accountability. This study fills this gap by showing how IS can mediate the socializing effects of accountability.

As the case study shows, individuals can interpret accountability in different ways. For example, in the context of healthcare, some actors may interpret accountability as a way to account for resources and performance and others may interpret it as a way to account for patients' needs. IS contributes to the construction of social relations among actors and mediates the norms and meaning systems through which users understand what accountability involves and share and negotiate accountability goals.

My findings also show that the interests of different groups of actors, such as HIS officers and managers in the program of immunization, influence the enactment of accountability. Thus, a system design meant to enhance the perception of accountability (Vance et al., 2013) may work for some users but not for others. By showing how IS can mediate the interests and meanings actors associate with accountability, I contribute to a greater understanding of how IS can rebalance multiple organizational and professional accountabilities (Yekel, 2001). A closer look at how IS mediate the social construction of accountability can explain, for example, why some healthcare professionals are more likely to accept the use of IS to monitor their performance than others (Doolin, 2004; Gabe, Exworthy, Jones, & Smith, 2012; Wainwright & Waring, 2007).

A final implication of this study concerns the role of IS as an “answerability mechanism” (Brinkerhoff, 2004) that supplies information about employees’ performance and, thereby, contributes to making employees’ work more visible and subject to management’s control (Roberts, 1991). The case study suggests that using IS as answerability mechanisms might contribute to distorted representations of performance (Vieira da Cunha et al., 2015). Future research should investigate how one could better integrate enforcement and feedback mechanisms into IS to ensure that individuals actually use information to improve performance. Performance management could be more effective if organizations used IS as a means of socialization and learning (Scott, 2015) to enact “accountability for improvement” instead of “accountability for control” (Brinkerhoff, 2004).

## 9 Conclusion

In this study, I draw on structuration theory to understand how accountability acquires legitimacy and becomes enacted locally. In analyzing a case study of Kenya, I reveal the role of social structures, such as norms, meaning systems, and resources, in mediating users’ interpretation and legitimation of accountability. Through this process of legitimation, local actors attach meanings to accountability, which, in turn, influence their representation of how the HIS should be designed and used. One important implication from my findings concerns the role of materiality in processes of structuration and, in particular, how HIS capabilities mediate the enactment of accountability. In addition, I consider HIS not just as a means for controlling performance but also as a means of socialization through which healthcare authorities and providers can account for the needs of health service users. This study acknowledges the complexity of HIS characterized by centralized and decentralized forms of governance (Rodon & Silva, 2015) and the challenge for HIS to mediate among competing accountability goals.

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## Appendix

**Table A1. Program of Immunization Coding Scheme**

Themes	Interpretation	Exemplary quotes
<b>Structures</b>		
Domination/legitimation	Funding is tied to performance.	<i>Performance-based grant.</i>
Signification	The use of information for the planning and management of program's activities is a consolidated practice.	<i>The head brings us together and during the planning she allows each person professionally to express your skills within your area of adjudication. (Interview)</i>
	Accountability is internalized.	<i>We wanted to improve quality of service giving kids potent vaccines.... We also used to have a lot of wastages... so we wanted to be more accountable with the supplies that we were using, especially the vaccines and also... the syringes and needles. (Interview)</i>
Technology domain	Epi-Info is implemented.	<i>One year later, in 2004, the provinces started using a new system, EPI-Info, to enter data received from the districts into a computer and send them to the program's data management unit. (Interview)</i>
	Manual reporting systems are equipped with feedback mechanisms.	<i>There was a quarterly meeting where every district could be put on the screen, these are your reports this is how you are performing let us know what's happening. (Interview)</i>
<b>Social domain</b>		
Power	New rules—standard operating procedures (SOPs).	<i>The program manager led the introduction of standard operating procedures (SOPs), which shifted data entry duties from 78 districts to eight provinces in the country.</i>
	Donors are the main funders of programs' activities and M&E.	<i>Before consumption data and logistics data monitoring were donor driven, later GAVI [was the main consumer of data]. (Interview)</i>
Norms	Changes in norms, performance-based monitoring (reward systems).	<i>A reward system whereby districts get slightly more funds if they report more children so that they can reach many others. It makes sure that every child that is immunized is reported; if they [don't], they would have problems with funds. (Interview)</i>
Meaning Systems	Assumption that data are needed to guide decisions.	<i>EPI target disease surveillance data are needed for guiding decisions. (KEPI, 1996a)</i>
Reflexive agency	Belief that decisions have to be informed by data.	<i>We have to decide...when there is a threat of a disease ...or, as a vaccination program, we also want to know how many children we are able to reach.... Data management informs our decision in many ways. (Interview)</i>
	HIS officers tried to change norms about information. This is how they internalized accountability.	<i>Over time we have been able to improve on the timeliness and [completeness] of data from the districts. This helped the managers and the users of these data to really accept what we have been doing. (Interview)</i>
	Pressure to improve IS performance.	<i>GAVI put on an auditing reward system in 2004 as there was a shame in the country that data management was not good enough and this incentive was a driver for us to improve our data management. (Interview)</i>

Table A2. DHIS2 Coding Scheme

Themes	Interpretation	Exemplary quotes
<b>Structures</b>		
Domination	Counties have more control over health information, which they can use to account for their own services.	<i>Each county became responsible for supporting DHIS2 in their own area and had full autonomy. (Interview)</i>
	Bureaucratic accountability: national HIS officers use DHIS to account for healthcare resources.	<i>Counties increased information use because, at the national level, there is demand for evidence. (Interview)</i>
Legitimation	Legitimacy of HIS at the counties: HIS officers and HMTs work "hand-in-hand".	<i>Today a [HIS] officer is a member of the district management team...by virtue of him having the information. (Interview)</i>
	Bureaucratic accountability: national and international reporting obligations.	<i>[At the Division of HMIS] we have to report at the national level and international levels. (Interview)</i>
Signification	Local administrators do not enact accountability.	<i>Politicians do not understand [the] meaning of indicators. It is an issue of accountability: how do you account for that money spent? They get a block of money...but they do not know whether it is for preventive or curative services. For example, now we have a problem of cholera, ...because...politicians...did not take time to plan, they were given inadequate budget to [prevent the epidemics]. (Interview)</i>
	Democratic accountability: use data for health service management.	<i>The managers [in my county] use the data for decision making. (Interview)</i>
Technology domain	DHIS2 features.	<i>DHIS2 is a cloud data management application for the collection and analysis of health data. Given the limited internet connectivity, the system is equipped with a local data mart for offline data entry. Data can be stored on a central server when online. (Manya et al., 2013)</i>
	Legitimation of health information is sustained by DHIS2.	<i>DHIS helped to use the data at the point of collection. ...It worked well, it was easy, [consistency has improved]. Even if the data is poor quality it is all the same.... Data improve confidence in the things we say. (Interview)</i>
<b>Social domain</b>		
Power	Resources.	<i>Some participants argued that some counties were still behind in the use of data. Others suggested that those counties with the means to support DHIS2 were using data more actively.</i>
Norms	Indicators are part of everyday life.	<i>There are counties where our [HIS] officers are doing very well...in guiding the whole staff [on] how to use indicators and [ensuring] that [anyone] in the county [knows that] indicators are part of everyday life. (Interview)</i>
Meaning systems	Lack of understanding of health information requirements.	<i>The politicians [at the counties] do not understand importance of information. (Interview)</i>
	Mindset about use of health information for health service management.	<i>I have a passion for my profession [compared to others whose] mindset is about earning a salary.... Some people do not care about monitoring information, but what I care is the use of information, the impact it has. (Interview)</i>
	National HIS officers realize need for compliance to data quality standards.	<i>We have to report both at the national and international level.... We need to... [provide data quality] guidelines [to the counties]. (Interview)</i>

**Table A2. DHIS2 Coding Scheme**

<b>Reflexive agency</b>	Realization that information collected does not address local needs.	<i>Some of the counties would question why they are collecting so many indicators.... Some of the donors work just in some areas.... Counties who do not have malaria at all, [they have to report] national indicators [of malaria]. (Interview).</i>
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## About the Authors

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