THE ROLE OF AFFORDANCES IN THE DEINSTITUTIONALIZATION OF A DYSFUNCTIONAL HEALTH MANAGEMENT INFORMATION SYSTEM IN KENYA: AN IDENTITY WORK PERSPECTIVE[1]

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Improving the state of citizens' health is an urgent priority in many low and middle income countries (LMICs), and health management information systems (HMIS) are widely seen as valuable tools for pursuing this priority. Yet, the potential of HMIS has been difficult to materialize in the LMIC context since routines and practices that work against effective use of HMIS are often deeply embedded in historical institutions and, consequently, are difficult to change. Using a longitudinal case study of HMIS in Kenya, we investigate the crucial role of identity work as a mechanism that links information technology (IT) affordances to institutions. In particular, our study revealed four types of identity work (disruptive, legitimizing, reinforcing, and transformative) that, through different affordances, led to distinct institutional consequences in terms of either maintaining or deinstitutionalizing existing dysfunctional HMIS-related routines and practices. We demonstrate the importance of context for theorizing the societal and development impact of IT and the role of IT materiality in influencing deinstitutionalization.

Keywords: Health information systems, information technology, institutional theory, deinstitutionalization, affordances, identities, healthcare, LMICs

Introduction

Health information systems (HIS) include a variety of systems (Braa and Sahay 2012) that can potentially aid governments

of low and middle income countries (LMICs) and their development partners in reforming healthcare systems and improving people's health status (Venkatesh, Rai et al. 2016). Such systems include electronic medical record (EMR) and electronic health record (EHR) systems for managing patients' medical records, which are relatively novel in several LMICs but are expected to increase in significance in the future for promoting safety, quality, and efficiency of care (Findikoglu and Watson-Manheim 2016; Goh et al. 2011).

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The appendices for this paper are located in the "Online Supplements" section of *MIS Quarterly*'s website (https://misq.org).

In this work, we focus on health management information systems (HMIS), a type of system that is used to collect primarily aggregate data from healthcare providers (e.g., primary care clinics and hospitals) and manage it in order to monitor the spread of diseases and utilization of healthcare resources (Wolf et al. 2004). The study of the implementation and use of HMIS has been an active area of research since the 1980s. Findings from various LMICs (e.g., Kelly and Noonan 2017; Noir and Walsham 2007) are, for the most part, consistent with results in mainstream IS research, in that they link suboptimal and unexpected consequences of IS implementation to the norms and values of local institutional and cultural contexts (Dobson and Nicholson 2017; Miscione 2007; Silva and Hirschheim 2007; Venkatesh, Zhang, and Sykes 2011). However, such an institutional analysis tends to ignore, or at least minimize, the role of information technology (IT), particularly its material features, in enabling or constraining processes of deinstitutionalization, that is, in changing practices that are deeply rooted in local norms and values. We build on existing research on the impact of IT on institutions (Gawer and Phillips 2013; Rajao and Hayes 2009) and argue that one useful way of understanding how IT can contribute to deinstitutionalization is by analyzing the relationship between IT affordances and human agency in bringing up organizational and social change. Drawing on the relational view of affordances, we conceptualize affordances as goal-oriented possibilities for actions that users realize through their interactions with a technology (Majchrzak and Markus 2013; Markus and Silver 2008). Specifically, our aim is to *better understand how the possibilities for action that arise from users' interactions with the HMIS may influence the deinstitutionalization of historically embedded work and technical practices.*

Limited research about the linkage between affordances and institutions (Hultin and Mähring 2014) leaves unexplored the mechanisms through which affordances may influence deinstitutionalization. We address this gap based on the analysis of data from a case study spanning four decades of HMIS implementation and use in Kenya and offer the following contributions. First, we reveal how affordances influence deinstitutionalization through the mechanism of *identity work*. Identity work is a process by which actors either maintain or restructure their identities (Alvesson and Willmott 2002). By redefining their identities, actors may also change their institutionalized practices (Kyratsis et al. 2017; Lok 2010). We thus propose identity work as a powerful theoretical device to understand the influence of affordances on deinstitutionalization. Second, the contextually rich case study in Kenya allowed us to theorize about the implications of context (Johns 2006; Sahay et al. 2017) for users' identification with a technology, the affordances that

are implicated in their identity work, and the resulting ramifications for the deinstitutionalization of existing practices.

A closer look at the relationship between IT affordances and deinstitutionalization is particularly relevant in the context of organizations that have adopted flexible IT systems (i.e., advanced software-based technologies that are "customizable and adaptable to the needs of developers and users," Leonardi 2011, p. 148). New software-based technologies, such as the cloud, mobile computing, and big data, provide the potential of challenging existing institutions, particularly through redefining information flows and processes of participation and governance. Understanding how these new technologies may contribute to deinstitutionalizing and replacing arguably not so efficient data management practices can be particularly valuable for improving healthcare in LMICs. Through such an understanding, we hope to enable HMIS to become more relevant for addressing existing healthcare system challenges, particularly in relation to improving information use for strengthening local action.

HMIS and Institutions in LMICs ▪▪▪▪

Research shows that despite their different historical backgrounds and national healthcare systems, many LMICs share some commonalities in the adoption and use of HMIS (Kimaro and Nhampossa 2005; Sæbø et al. 2011; Sahay et al. 2009). Different and, to a certain extent, conflicting assumptions and values motivate the main actors involved with HMIS. On one hand, national ministries and international development agencies[2] promote the creation and use of vertical HMIS to track the performance of national healthcare programs (e.g., HIV/AIDS, malaria) based largely on managerialist assumptions (Chilundo and Aanestad 2004; Kimaro and Sahay 2007). On the other hand, because these systems are usually not well integrated with the national HMIS, healthcare workers are often overloaded with capturing duplicate data required across multiple healthcare programs. Health information is usually held at the national level in central databases, not readily available to local healthcare managers and workers (Sahay et al. 2010; Smith et al. 2008). As a result, field-level staff consider data-related work as a secondary, bureaucratic task (Chilundo and Aanestad 2004) and cannot see its value in relation to their primary work of providing patient-based care.

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[2]Many initiatives to strengthen HMIS in various LMICs are sponsored by international development agencies such as the World Bank, NORAD (Norwegian Agency for Development), DANIDA (Danish International Development Agency), DFID (UK Department of Foreign International Development), and CDC (U.S. Centers for Disease Control).

Given the scarce resources in most LMICs, it is often difficult for healthcare managers and workers to achieve healthcare service performance targets mandated in monitoring plans (Mekonnen and Sahay 2008). Failing to achieve set targets may lead to sanctions such as people being transferred or even terminated. Field workers often try to deal with this threat through work-arounds that include misreporting or non-reporting (Noir and Walsham 2007) or even active resistance. For example, in a case study of mHealth in India, Mukherjee (2015) provides an account of field nurses going on strike against the introduction of SMS reporting that they perceived to be increasing administrators' control and surveillance of their work.

To summarize, in LMICs, institutional norms/values informing the design and use of HMIS for mere data reporting from the local to the national level are often at odds with norms of strengthening patient care. The competing norms and values often lead to different forms of local user resistance (Currie 2012) and, consequently, to suboptimal use of data. In addition, due to institutionalized beliefs and norms that have favored the status quo rather than change, attempts to restructure the HMIS have often failed or have not led to anticipated improvements in the use of data to improve healthcare (Kimaro and Sahay 2007; Latifov and Sahay 2013).

Although existing studies have been useful in informing us on how HMIS implementations and use relate to institutions (Chilundo and Aanestad 2004; Kimaro and Sahay 2007; Noir and Walsham 2007), less is known about how the technical features of HMIS link to users' actions. For example, some studies have shown how the use of flexible standards can help accommodate information requirements at different levels of the administrative hierarchy (e.g., healthcare facility, district, province, and national) and align interests of various HMIS stakeholders (Braa et al. 2007); however, they have failed to offer detailed accounts of how changes in the technical features of HMIS can affect the deinstitutionalization of taken-for-granted behaviors and practices. In the next sections, we explain how we can better understand the role of the HMIS as it pertains to the deinstitutionalization of users' routines and practices. We do so by focusing on the relationship between affordances and identity work.

Identity Work and Affordances in Processes of Deinstitutionalization ▄▄

The Deinstitutionalization of IT Systems and Associated Practices

Institutions are socially constructed systems of rules, norms,

and meanings that regulate social actors' behavior (Berger and Luckmann 1991) and influence the adoption and institutionalization of new IT systems (Baptista 2009; Berente and Yoo 2012). Institutions are difficult but not impossible to change. In particular, the deinstitutionalization of existing IT systems and their associated practices is a fundamental step toward achieving institutional change (Creed et al. 2010; Jensen et al. 2009; Lawrence and Suddaby 2006). According to Oliver (1992), deinstitutionalization is "the process by which the legitimacy of an established or institutionalized organizational practice erodes or discontinues" (p. 564). This process involves the problematization of existing practices as being damaging or ineffective (Maguire and Hardy 2009) by emphasizing the coexistence of *multiple* rationalities or logics (i.e., the cultural resources and norms that shape the way individuals perceive their social reality and guide their behaviors and decisions; Friedland and Alford 1991). After gathering consciousness of the effect of competing logics on their routines, a case may be made for a new institutional order (Benson 1977; Seo and Creed 2002; Thornton and Ocasio 2008).

While *efficiency* considerations are often invoked to delegitimize existing practices and IT systems, many of these endure over time, notwithstanding their apparent limitations and inefficiencies (Avgerou 2000; Dobson and Nicholson 2017; Mignerat and Rivard 2012). Attempts to discontinue institutionalized information systems require the disruption of the practices that hold them together. This disruption *cannot rest on mere (in)efficiency arguments*, but involves the much harder task of undermining sanctions, moral foundations, and beliefs supporting the IT systems and related taken-for-granted behaviors (Lawrence and Suddaby 2006).

The concept of deinstitutionalization thus provides a useful perspective on how actors can erode existing taken-for-granted practices and beliefs through modernizing HMIS. Most of all, we can achieve a greater understanding of the role of HMIS in processes of deinstitutionalization by focusing on how the materiality of IT influences institutions and practices. Research has found that new IT systems incorporate "models, rationales, assumptions and bodies of knowledge" (Labatut et al. 2012, p. 64). When adopted in use, the material features and boundaries of a new technology contribute to shaping a new institutional logic (Gawer and Phillips 2013) that may destabilize an institutional order and induce users to question established routines and practices (Rajao and Hayes 2009). For example, Raviola and Norbäck (2013) found how the inscriptions of a technology may influence institutions by shaping the meanings that users assign to its adoption and their actions. Yet, in this and other studies (e.g., Gawer and Phillips 2013; Gosain 2004), the account of the material features of a technology in influencing change is limited to the

norms and meanings that the technology embodies and represents with little consideration of the possibilities for action that it can open up. We thus bring in the concept of affordances to account for the relationship between the material features of IT and institutions (Hultin and Mähring 2014). We then show that identity work can provide useful insights on how affordances link to processes of deinstitutionalization.

The Relational View of Affordances

The notion of affordances helps us to understand how the material features of an IT relate to human agency. On one hand, human agency encompasses both the expected and unexpected use of a technology (Boudreau and Robey 2005). On the other hand, IT artifacts—including hardware, software, and data—can display agency by acting, to some degree, independently of users' interpretations, owing to their material features (Robey et al. 2013).

The affordance perspective falls under the critical realist strand of sociomateriality (Leonardi 2013; Mutch 2013) as opposed to the agential realist perspective of sociomateriality (Orlikowski 2007). The agential realist perspective of sociomateriality considers material objects intricately intertwined with human agency, inseparable from each other (Orlikowski and Scott 2015). This perspective blends technology, people, norms, and institutions (Cecez-Kecmanovic et al. 2014) to the extent that it is difficult to distinguish the effect of material agency from the effect of human agency and institutions. Given our focus on the impact of IT materiality on deinstitutionalization, we need a perspective that, in contrast with the agential realist tradition of sociomateriality, can account for the influence of material agency without blurring the boundaries (at least analytically) between the social and the material. In this respect, an affordance perspective, in line with the critical realist perspective of sociomateriality, is particularly suitable for this study because it suggests that material agency can be viewed as a separate entity from human agency (Robey et al. 2013).

Based on Gibson's (1977) theory of affordances, Markus and Silver (2008) defined affordances as the "possibilities for goal-oriented action [given] to specified user groups by technical objects" (p. 622). Affordances are not just expressions of either the properties of a technology or its users, but account for *the relation* between them (Hutchby 2001; Majchrzak and Markus 2013). An IT system may have multiple features in its design, but those that are relevant to understanding IT usage and its consequences are those that are seen as useful to the user in achieving his/her goal or satisfying a need within a specific task environment. By lacking a desired affordance, the materiality of a technology

then becomes a constraint to the performance of a desired activity (Leonardi 2011; Volkoff and Strong 2013).

We consider affordances to be a useful perspective to account for the relationship between the material features of an IT and institutions for two reasons. First, institutions shape users' goals and the actions to achieve them, thereby contributing to the affordances that emerge from users' interaction with a technology (Hultin and Mähring 2014). Second, these affordances are possibilities for action that may produce diversity of practices (Hultin and Mähring 2014) and, potentially, influence institutions. However, *the concept of affordances alone cannot tell us how the possibilities for action arising from users' interaction with a technology might influence institutions* (i.e., whether they are more or less likely to maintain or disrupt practices and the institutions that hold them in place). We thus propose to combine the notion of affordances with that of identity work. As discussed in the next section, identity work is a form of institutional work (Creed et al. 2010; Lawrence and Suddaby 2006; Lok 2010), that is, through maintaining or restructuring their identities, users have an impact on institutions. In addition, users' perceptions of their identities in relation to a technology influence how they choose to engage with a technology (Alvarez 2008; Labatut et al. 2012) and, therefore, the realization of a specific set of affordances. For these reasons, identity work can be a useful theoretical device to understand how the realization of affordances might lead to deinstitutionalization.

Affordances, Identities, and Deinstitutionalization

Identities characterize the set of meanings that we use to make sense of our actions in relation to specific situations (Weber and Glynn 2006; Weick 1995). It is through the enactment of specific roles in situated settings that we make our identities function and have an impact on the world. Identities have been conceptualized in different ways, including personal identity (Callero 2003), professional identity (McGivern et al. 2015), and organizational identity (Kodeih and Greenwood 2014). Our focus is on professional and organizational identities. Professional identity refers to an individual's definition of his or her self as a member of a profession (Chreim et al. 2007). Individuals that share the same professional identity are united by common professional values, customs, and norms (McDonald et al. 2009). Organizational identity concerns how individuals see themselves as an organizational collective in response to the question: "Who are we as an organization?" Answers to this question depend on individuals' perception of the features, competences, and practices of their organization as a whole or organizational unit (e.g., a department or division) (Albert and Whetten 1985; Boudreau et al. 2014).
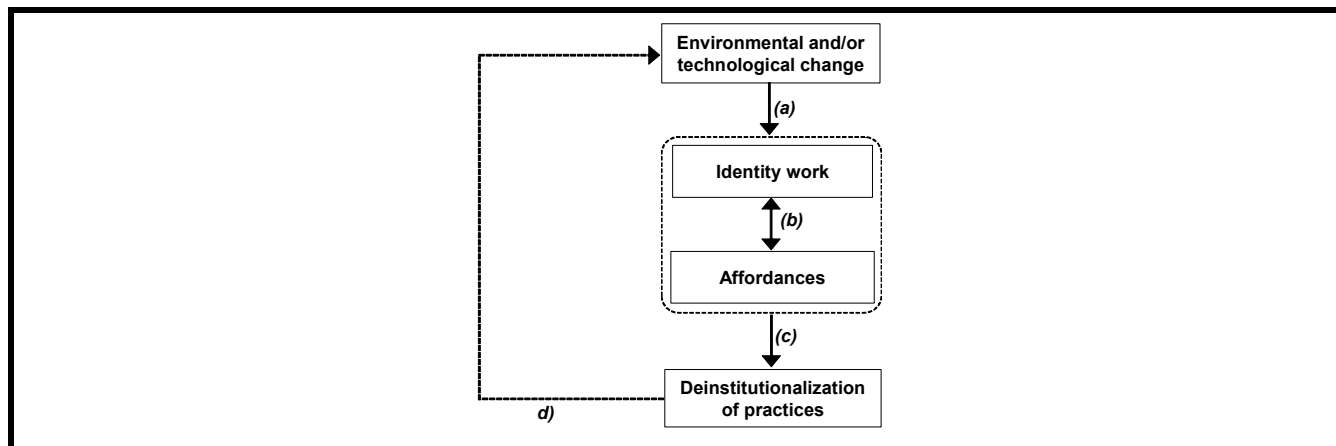
Figure 1. Identity Work and Affordances as Means of Deinstitutionalization

Identities are not fixed entities but are subject to "identity work," a process by which individuals "continuously form, repair, maintain, strengthen, or revise the constructions of their 'self' that are productive of a precarious sense of coherence and distinctiveness" (Alvesson and Willmott 2002, p. 626). Identity work results from the collective effort of individuals (Boudreau et al. 2014; Cerulo 1997) who consciously enact and negotiate their selves (Ibarra 1999) "through talk and action" (Watson 2008, p. 130). It often occurs when individuals perceive the tension between their professional or organizational identity ("who we are") and their social identity, that is, how other people, outside their profession or organization, perceive them ("who they think we are") (Boudreau et al. 2014; Creed et al. 2010; Watson 2008).

Social identities embody other people's expectations of what members of a profession or organization should be and how they should behave; thus, in some sense, social identities are a reflection of institutions. Individuals can either reconstruct their professional identities to realign their practices with new institutional logics (Kyratsis et al. 2017) or engage in identity work to protect their identities and practices from institutional change (Lok 2010). Likewise, at the organizational level, individuals may either resist change when they perceive it as a threat to their organizational identity (Gioia et al. 2013) or adjust their practices, and possibly restructure their organizational identity, when they perceive change as an opportunity to enhance their organizational status (Kodeih and Greenwood 2014).

Lok (2010) suggests that only by focusing on identity work can one fully grasp changes in meanings and identities attached to an institutionalized practice. Hence, identity work is central to processes of deinstitutionalization. In spite of the

impact that identity work can have on institutions, only recently have scholars started to study how IT is implicated in identity work (Boudreau et al. 2014). Most of this research has focused on the individual level and has highlighted how identities play an important role in the way in which users assimilate IT into their practices (Mishra et al. 2012). Some users might choose to protect the meanings, practices, and interests attached to their professional identity from the adoption of a new IT (Alvarez 2008; Jensen et al. 2009; Lamb and Davidson 2005). Others can develop a strong sense of identification with an IT (Carter and Grover 2015) and view the possibilities for action arising from their interaction with new technologies as an opportunity to construct a new professional identity (Labatut et al. 2012). Fewer studies have analyzed how organizational identities can influence the configuration of IT-related processes (Tyworth 2014) and have pointed to the difficulties of organizations in restructuring their identities to accommodate IT-enabled change (Tripsas 2009).

Because actors can become change agents by redefining their identities (Creed et al. 2010), we can potentially unveil the theoretical mechanisms by which affordances come to be constitutive of professional and organizational identities and, as a result, influence processes of deinstitutionalization. The above theoretical perspective is summarized in Figure 1.

Users might perceive changes in technology or the environment either as a threat to or opportunity for the performance of their professional and organizational identities. In some cases, they become conscious of a misalignment between their social identity (what others expect them to be) and their own sense of self as members of a profession or organization. This assessment triggers identity work (arrow a), which represents the "means of identity construction" (Lok 2010, p. 1311), that is, the activities users accomplish to modify, repair, or main-

Figure 2. HMIS in Kenya (1980–2008)
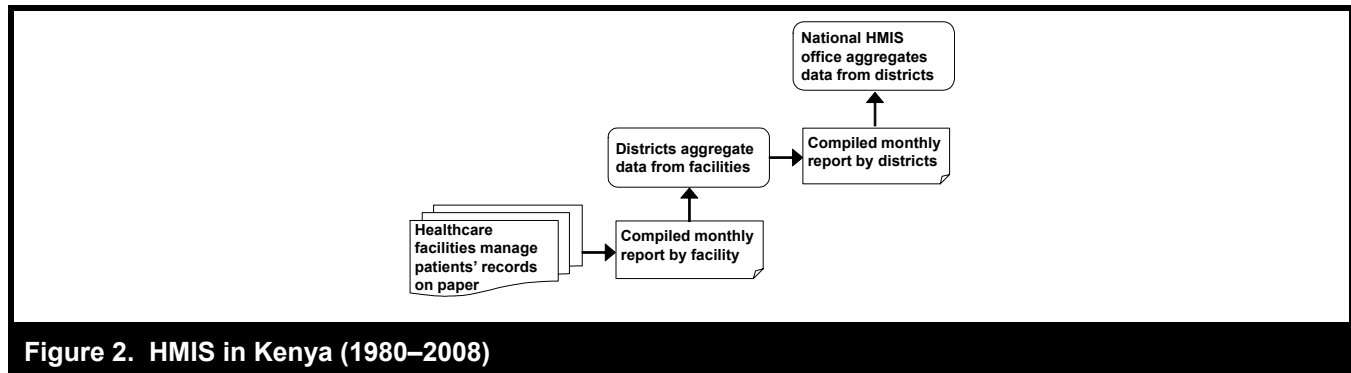
tain their identities (Alvesson and Willmott 2002). Examples of these activities are self-narrations (Brown 2015; Kyratsis et al. 2017), such as explicit and implicit accounts of self-identification (Lok 2010) and role claims and use (Creed et al. 2010; Leung et al. 2014). We posit that affordances (i.e., the possibilities for goal-oriented actions that users perceive through their interaction with a technology) can be seen as either an opportunity for or a constraint to identity change and, therefore, play a part in the way users review their identities through identity work (arrow b). Users' identity work and the affordances it generates can potentially influence the deinstitutionalization of practices through which users adapt to change (arrows c and d).

Research Method

Case Study Background

The research is based on the case study of the national HMIS in Kenya. Since its creation in 1974 (HMIS 2002), the Kenyan HMIS has been plagued with various problems, not dissimilar to other LMICs such as untimely, fragmented, and incomplete data reporting, and minimal local-level usage of information (Sahay et al. 2010; Smith et al. 2008). The HMIS encompassed various types of health data: morbidity of out-patients and inpatients, mortality, healthcare facilities work-load, and healthcare resources utilization including the provision of treatments (e.g., number of children immunized). Our primary focus of analysis was the Medical Records Officers (MROs) and Health Records Information Officers (HRIOs) in two different settings: one, the local level of the HMIS encompassing hospital, district, and county HMIS of-fices, where MROs and, subsequently, HRIOs, were involved in the collection and reporting of health data; and two, the national HMIS office in charge of collecting and analyzing health information for purposes of centralized planning. We studied the professional identities of MROs/HRIOs at the local level and the organizational identity of the national HMIS office in two major eras.

The first era, spanning from 1980 to 1994, was related to (1) the creation of new HMIS posts for MROs and their role in promoting the use of the HMIS at the hospitals and (2) the creation of the national HMIS office and its role in reinforcing the use of information at the national level, regardless of the information needs of users at the local level. As depicted in Figure 2, in this era, the healthcare facilities[3] were managing patients' records through a paper-based record management system that was difficult to customize and, therefore, inflexible.

Healthcare workers at the healthcare facilities would extract data from patients' records, post them to a tally sheet, and send a monthly data report to the district medical office. Here, district MROs would aggregate data from healthcare facilities and then send them to the national HMIS office in Nairobi every month. While the healthcare facilities were simply in charge of collecting data and sending them to the district level, the districts were assigned the task of reporting data to the national level with limited engagement or under-standing of how they could use the data they were collecting; their participation may be best characterized as *passive* (HIS 1987).

Between the first and second era, from 1994 to 2008, there was a transition period that marked significant changes in the healthcare sector. First, in 1995, MROs could qualify as HRIOs and be recognized with wider responsibilities in health information management across various departments of the Ministry of Health.[4] Second, following the introduction of performance-based management, in 2000, the national HMIS office was made responsible for healthcare sector monitoring

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[3]Healthcare facilities include primary healthcare providers and secondary healthcare providers (subdistrict, district, and provincial hospitals).

[4]In 1990, the new diploma qualification of Health Records and Information Officers (HRIOs) was introduced. The first batch of HRIOs graduated in 1992. In 1995, the government approved a new scheme of service of HRIOs, containing a formal description of the new role.
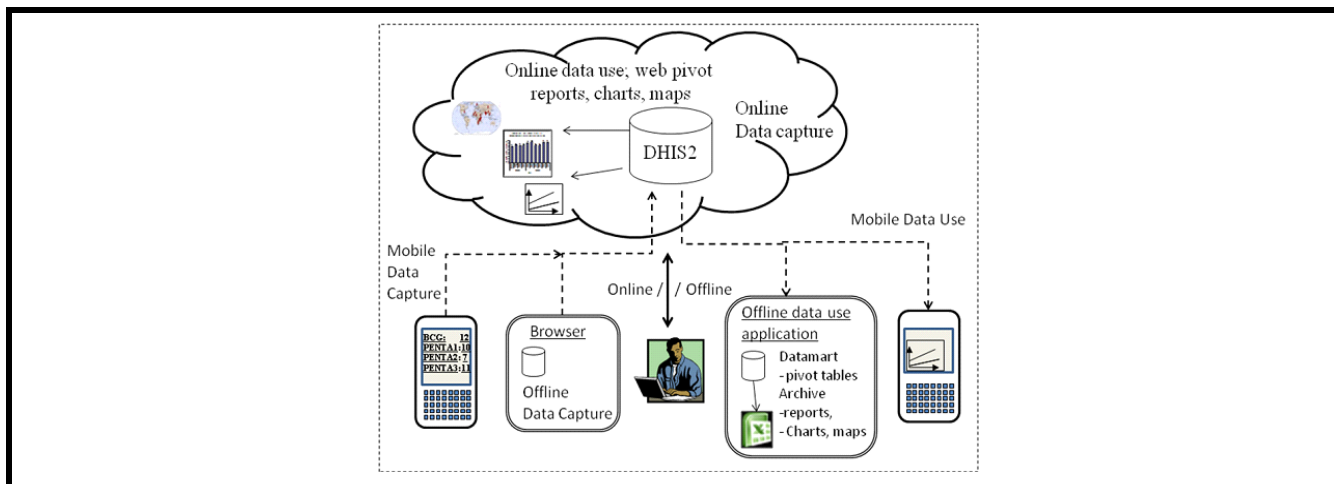
Figure 3. DHIS2 Architecture (Figure 3 from "Developing Decentralised Health Information Systems in Developing Countries—Cases from Sierra Leone and Kenya," E. K. Kossi, J. I. Sæbø, J. Braa, M. M. Jalloh, and A. Manya, *The Journal of Community Informatics* (9:2), 2013)

and evaluation. During this period, there were no significant changes to the HMIS until 2008 when, following the HMIS assessment by the World Health Organization's Health Metrics Network (HMN), the Ministry decided to implement a new decentralized HMIS.

These events led to the second era that spanned the period from 2009 to date and saw the shift to DHIS2 (District Health Information System – Version 2), a web-based HMIS on the cloud (Figure 3) that was highly customizable thanks to its flexible design. In this era, we focused on the role of this new system in enabling the deinstitutionalization of data management practices that promoted the use of information mostly at the national level, regardless of the information needs of users at the local level.

In this era, after the implementation of DHIS2, a restructuring of government institutions in 2010 led to the devolution of power from the national government to 47 newly created counties that replaced the eight provinces and 149 districts in the country. Because counties were divided into subcounties, subcounty HRIOs replaced district HRIOs in collating and validating healthcare facilities' data collected on paper forms before entering them into DHIS2. There were few EMRs/EHRs in Kenya and these were not integrated with the HMIS. This explains why data were fed manually into DHIS2. HRIOs at national and county levels could access the data stored on a national server and use them to support healthcare sector monitoring (at the national level) and healthcare service delivery (at the county level). Our focus in this era was on (1) county HRIOs, who could access and use the data in DHIS2 to advise county governors on the delivery of health-

care services and (2) HRIOs at the national level, who could also access DHIS2 and use the data to support the planning and monitoring of national healthcare programs and services.

Data Collection

The first author conducted 56 interviews in Kenya: 38 semi-structured interviews and 4 unstructured interviews with 3 senior officials of the Government of Kenya during 2 field trips between 2007 and 2008; 6 phone interviews with international aid agencies' representatives in 2011; and 8 phone interviews with users of DHIS2 (the currently used platform for the national HMIS in Kenya) in 2015. The final era of the case study was also based, partly, on the actual involvement of the third author's research group in the implementation of DHIS2. Table 1 shows the breakdown of the types of officers interviewed and timing of the interviews.

Some of the HRIOs interviewed had previously served at the districts before being deployed at the national level, as shown in Appendix A. The posting of county HRIOs at the time of the interview is shown in Appendix B. Among the HRIOs interviewed, some started as MROs and progressively qualified as HRIOs. Some HRIOs also earned other higher educational qualifications, as shown in Table 2.

Interview data from HRIOs were particularly relevant for our purpose as they informed interpretations around the creation and development of the HMIS over the years. Medical officers interviewed were filling managerial roles at the Ministry of Health's headquarters and provided their view

Table 1. Summary of Interviews	2007	2008	2011	2015	Totals
Five international aid agencies			6		6
Senior Government Officials	1	3			4
HRIOs		17		4	21
County HRIOs				3	3
Statistical Officer		1			1
Data Manager		1			1
IT officers		3			3
Medical officers		16		1	17
Total	1	41	6	8	56

Table 2. Qualifications of HRIOs between 1980–2015	1980-1989	1990-1999	2000-2008	2009-2015	Dates N/A
Started work as MROs	13	2			
Qualified or started work as HRIOs		7	7		7
Earned a B.Sc. degree			1	4	
Earned a M.Sc. degree			2	5	
Earned a Ph.D. degree				1	

about the functioning of the HMIS in support of healthcare planning and management. These officers were different from the hospital doctors mentioned in the first era of the case study. The IT officers provided key information about the technical features of the IT systems used in the national HMIS office. In this regard, given the importance of constructing the narrative based on first-hand experiences to the extent possible, interview participants were selected based on their engagement with the HMIS. Interview lengths varied, ranging from 60 to 90 minutes. Interviews were tape-recorded and, subsequently, transcribed in an electronic format for the analysis.

Secondary data drawn from approximately 6,000 pages of documents taken from the Ministry of Health's archives supplemented the primary data. These included government policy documents, minutes of meetings, letters, and reports around the HMIS covering the period from 1977 to 2008. Relevant international agencies' policy and project documents available from the Internet were also collected. Significant documentary extracts were converted to an electronic format and then imported in NVIVO 10 together with interview transcripts and notes. Documents were a valuable historical source of information for tracing past events and practices that the memory of informants could not recall such as the implementation of the District Health Management Information

Systems (DHMIS) in the early 1990s. In addition, it was possible to infer meanings that actors attributed to events, practices, and the HMIS, and identify how these meanings were changed or reinforced over time. For example, whereas in the 1980s, some users viewed health information as intimately connected to the practice of medicine, in the 2000s, health information became widely associated with healthcare sector performance monitoring.

Interpretive Approach to Analysis

The case study was analyzed following an interpretive approach (Walsham 1993; Sarker et al. 2018) wherein the researcher gains an understanding of the situation by interpreting meanings that different people assign to events, speeches, documents, and artifacts. Our data analysis was informed by some of the key ideas underlying an inductive methodology (Birks et al. 2013; Glaser and Strauss 1967; Sarker et al. 2000; Urquhart et al. 2010) as well as the relevant principles of conducting interpretive research (Klein and Myers 1999).

First, we applied the principle of "contextualization" in order to understand both the context in which the HMIS was situated and the processes that influenced and were influenced

by context (Walsham 1993). Thus, we familiarized ourselves with the data and constructed a narrative focusing on major events and processes covering about four decades characterizing the healthcare sector and HMIS reforms in Kenya.

Second, we searched for data that could provide further detail and understanding of the events and processes identified in the narrative. We were guided by the principle of the hermeneutic circle, acknowledging that "all human understanding is achieved through the interdependent meaning of parts and the whole that they form" (Klein and Myers 1999, p. 72). We first undertook open coding to get to know the data intimately (Glaser and Strauss 1967). The constant comparative process implicit in such coding is consistent with the principle of the hermeneutic circle (Birks et al. 2013). This coding process led to the identification of the key patterns of meaning and practices that characterized the identities and identity work of different actors through both their explicit (self-) and indirect (self-) identifications (Alvesson and Willmott 2002; Lok 2010). Based on our initial conceptualization of affordances as the means by which users review their identities (see Figure 1), in the coding of data, we identified the function that affordances assumed as means of identity work and their outcomes, in terms of either maintaining or changing institutionalized practices. Examples of our coding together with a summary of categories of (self-) identification and identity work based on previous work in the literature are shown in Appendix C.

Whenever the transcripts of data raised questions regarding the label of concepts and categories, the sequence of events or the relationship between categories and concepts, relevant data were deliberately identified through theoretical sampling (Glaser and Strauss 1967) and reanalyzed until there were no apparent anomalies (Sarker and Lee 2006). It is important to note that there was a constant tension between the local meanings (say, our understanding of a part of one respondent's interview) versus the global meanings (i.e., our overall understanding of the situation), and this required us to make informed interpretive guesses regarding, for example, why deinstitutionalization had not been possible in the first era but occurred subsequently. An initial guess we made, based on our empirical material, was that the customization of DHIS2 with standardized data reports was an attempt by the national HMIS office to reinforce vertical data management routines that could undermine decentralization. Yet, that did not quite fit in coherently with our data, which pointed to an increased understanding of the value of data at the county level. Our (subsequent) interpretive guess about the role of HRIOs' identity work in enabling a more productive use of information among county administrators helped resolve the apparent anomaly in our interpretation and ensured a level of harmony with the data. In this way, we attempted to remain consistent with the principle of the hermeneutic circle.

Next, we drew upon our theoretical sensitivity, specifically the literature on IT affordances and identities, to weave together a mid-range integrative framework that represented the empirical patterns consistent with the principle of abstraction and generalization (Klein and Myers 1999). In other words, our work did not start from a blank slate in terms of theoretical ideas, but, much like many interpretive studies in the literature, through the interaction of the empirical material with initial theoretical ideas, we were able to discern insights from the case that are penetrative and not obvious at the surface.

Finally, throughout our analysis, we applied the interpretative principle of "suspicion" (Klein and Myers 1999) by remaining vigilant about possible biases in participants' narratives. For example, a recurrent claim in various official documents was that the national HMIS office fed the Ministry of Health with data to support healthcare sector planning. Yet, as other participants highlighted in the interviews, there was little interest in data among the Ministry's officials. We thus interpreted this claim as a rhetorical strategy through which the national HMIS office argued for more resources in a context where poor financial and institutional support challenged its identity and survival.

Case Study Findings: Narrative and Interpretation

The objective of our case study interpretation is to understand the deinstitutionalization of ineffective use of information that, arguably, arose from a vertical HMIS in Kenya. Before the new decentralized system DHIS2 was implemented, the HMIS in Kenya was not integrated at the various levels of the healthcare system. As a consequence, it promoted the use of information exclusively by national officials and international development agencies (rather than by local users), who could not use information meaningfully to improve healthcare (Sahay et al. 2010; Smith et al. 2008). We note that decentralization does not necessarily imply fragmentation. As the story of DHIS2 will demonstrate, decentralization through an integrated web-based information system can promote the widespread use of health information across all levels and also programs of the healthcare system. Yet, in order to decentralize, there was first a need to erode norms and practices that promoted the use of health information predominantly at the national level. In our analysis, we focused on the role of affordances related to identity work to better understand how deinstitutionalization of these norms and practices occurred.

First Era: Failed Deinstitutionalization of Ineffective Use of Information (1980–1994)

The Disruptive Identity Work of Medical Records Officers at the Hospitals

This section focuses on MROs and their role in strengthening HMIS in Kenya. Initially, MROs were mainly in charge of administrative tasks such as booking patients' appointments and filing patients' records in hospitals (Kenyatta National Hospital 1985). Yet, after 1980, they were deployed in HMIS offices both at the national and district levels (HIS 1985, 1986) and thus became responsible for aggregating and reporting data to the national HMIS office. While information became an integral part of MROs' formal job responsibilities, in a letter in 1984, an MRO suggested that "medical records personnel" and "health information personnel" (Ministry of Health 1984) were equivalent for practical purposes, indicating that a new identity of health records and information officers was taking shape:

> I don't find any way in which we can separate the medical records personnel and the health information personnel … the medical records maintained and analyzed by the medical records personnel are the source of health information … the two are complementary.

This suggests that, even though some MROs were not directly involved with the HMIS, they were still an important source of health information through the patients' records they were managing. An HRIO who took office as an MRO in the early 1980s echoed this same feeling, suggesting that health information and their cadre were mutually dependent and one could not exist without the other:

> When we started operating in the hospitals, we had nothing to do with information, we were only processing patients' documentation. But then, with time, information has become part of the health records and information personnel [to such an extent that] one cannot do without the other.

Some HRIOs identified themselves as "custodians of health information," which also reflects the intimate connection between their identity and information. However, several HRIOs complained about the low level of recognition of their profession in the HMIS, particularly, when they started their career as MROs in hospitals. An HRIO recalled her frustration of working as an MRO at a hospital as follows:

> Out of the [Medical Training Center in 1992], as we went to hospitals, information was never taken seriously … people [at the hospital] knew a doctor, a nurse, the laboratory technician, a cleaner … for them [health information] was paperwork …. We [as Medical Records Officers] understood the power of information [and] how it [could be used] to make decisions.

Thus, the negative perception of MROs as performing "paperwork" at the hospitals, namely, their social identity, posed a threat to their professional identity as the experts who understood "the power of information." The same HRIO further confirmed the lack of legitimacy of her profession through this account about MROs being denied access to data:

> We asked for a computer in a hospital, but they did not understand … why [we needed] a computer …. [One computer] was in the doctor office … doing nothing. We were desperate to be given data … but people did not take us seriously.

MROs responded to this threat through an identity-protection response directed toward distinguishing their threatened identity in a positive way. This was achieved by changing attitudes of those people who are a potential source of threat to their identity (Petriglieri 2011, p. 648). In this respect, the affordances that MROs realized, such as retrieving and compiling data, can be considered *means for attitude change* by which MROs attempted to change doctors' attitudes toward information and justify the need for more resources in data management. For example, an HRIO, who had also worked as an MRO in a hospital, said:

> If you cannot convince the medical doctor in charge of the [hospital of the value of information], you may not get resources. So [we tried to change] their attitude [toward information in order for them to say]: "Oh, [a computer] is necessary! Let us also allocate some money [for it]." With the easy retrieval of information and easy compilation of data, they appreciated that this computer was necessary.

Another HRIO suggested that MROs' attempt to advocate an attitude change toward information prompted some doctors to be more reliant on data to manage hospital services:

> Doctors in charge of the hospitals never used to care about information. We [as MROs] used to tell them that without health service data, it was hard for them to understand what patients in that area were suffering from …. We would show them how the data could be used to see the finances and man-hours used to treat the first 10 causes of morbidity. Those

doctors who were able to use those data could manage the service very effectively.

This also suggests that some doctors had the ability to problematize ineffective use of information in managing hospital services. Therefore, we consider the support of leadership conversant with data to be a key enabler of MROs' disruptive identity work. To summarize, we label MROs' identity-protection response as *disruptive identity work* and the affordances that it generates as means for attitude change. These affordances were found to change attitudes that threatened users' identity and, consequently, tended to disrupt institutionalized practices such as *ineffective use of information* among doctors.

The Legitimizing Identity Work of the National HMIS Office

The national HMIS office was created in 1980 as the central statistical unit within the Ministry of Health to produce statistical information for healthcare sector planning and management (Ejiogu 1980; HIS 1980; Population Council 1978). Various official documents identified the national HMIS office as the center for information "responsible for all health information within the Ministry of Health" (HIS 1981):

> [The national HMIS office], being the center for information in the Ministry, should be allowed to control all the data files from other departments and programs (HIS 1992b).

The national HMIS office's identity as the center for information entailed a centralized control and production of information through the realization of certain affordances that some HRIOs described as collecting and compiling data reports from the districts. Yet, incomplete reporting due to poor availability of reporting forms (HIS 1987) and the adoption of Clarion (Grafton and Permaloff 1991), an unfriendly and inefficient database application, caused delays in the production of the HMIS annual reports. An HRIO said:

> [Clarion] is very cumbersome, it is based on DOS, even operating it used to be a problem for most of us. Before you access it there is always a problem … [to export and analyze the data, we had to call and wait for one of the two programmers based at the Ministry of Finance].

Thus, technical and financial constraints (HIS 1987) hindered the national HMIS office's function as the center for information, as implied by an HRIO:

> Until two years ago, we were not functioning, we had no forms, we had no communications systems to the districts, I mean, it is like we were here waiting for the information … and everybody used to complain in nearly all the meetings that [the national HMIS office] was not working.

A medical officer and former head of the national HMIS office suggested that they *lacked financial and institutional support* mainly because the Ministry of Health did not see the need for the information they were producing:

> The Ministry of Health had not made the information system as a core business. They did not see the need [to] come for the information and hence they were not putting enough resources into the information system.

In particular, other departments in the Ministry perceived the national HMIS office as unnecessary for the production of information despite its struggle to become the center of excellence for information. The former head of the national HMIS office said:

> Planning was collecting the same data, the health sector [department] was doing the same. So, you see, the [national HMIS office] had become redundant [because it was not supported. By contrast, we wanted] to make sure that we had an information center of excellence [catering for] reliability of data, timeliness, report writing, and information sharing.

Therefore, the social identity of the national HMIS office (i.e., how other departments in the Ministry perceived them) did not reflect what the HMIS office wanted to be but represented a threat to its desired organizational identity as the center for information. As in the previous case of MROs in the hospitals, MROs at the national HMIS office enacted an identity-protection response directed toward changing the negative attitudes that threatened their identity. First, they enacted this type of identity work through "role claiming and use" (Creed et al. 2010, p. 1355). Specifically, they claimed their role as the data bank for all types of data in order to request more resources and to be turned into a more independent organizational unit of the Ministry (HIS 1992a). Second, they persevered in the collection and reporting of data to demonstrate to the Ministry's senior officials the importance of "the most needed information for planning purposes" (HIS 1992a, p. 4) and prove their value as the information service provider of the Ministry of Health ("what we are"), as implied by two HRIOs:

> We have worked for many years to enable the "gurus" in this Ministry to understand what we are

[by showing] them [the information services] we can provide, how we can use the data we have collected … to [prove disease incidence and prevalence].

I remember once, a HMIS officer with a team [told planners of the Ministry of Health]: "I can place the information [you need to justify] the budget." So they came back and collected the data to justify their request.

Yet, the information produced was dysfunctional because it was too outdated to be used for healthcare sector planning and seen as burdensome by district users. This issue was raised in a meeting about the set up of a District Health Management Information System (DHMIS) (Ministry of Health 1991):

When it was learned that a district is endeavoring to compile reports for each of the four quarters of 1991, they were informed that reports are to be prepared for only the most recent quarter for which data is available—not for multiple back quarters (DHMIS Task Force 1992, p. 1).

This suggests that MROs at the national HMIS office were not fully aware of the value of the information they produced. The affordances they realized as part of their identity work, such as collecting and compiling data reports, were merely directed toward demonstrating the value of their existence as the center for information to others and less likely to lead to changes in attitudes toward information and data management routines. We define this type of identity work as *legitimizing* and distinguish it from the disruptive identity work of MROs at the districts as the national HMIS office's attempt to justify its existence by ceremonially performing its threatened identity. Indeed, the affordances generated (e.g., collecting and compiling data reports) through *legitimizing identity work* were just *means for identity survival* that aided the ceremonial performance of the national HMIS office's identity and the consequent inefficient production of health information. Such information could not be used effectively for healthcare planning and had no value for those collecting data in the healthcare service. As a result, the affordances that users realized as part of legitimizing identity work contributed to constraining the disruptive identity work of MROs at the hospitals and their attempt to deinstitutionalize ineffective use of information at the local level.

Second Era: Deinstitutionalization of Ineffective Use of Information (Since 2009)

The second era followed a period of transition between 1994 and 2008, which marked significant changes in the healthcare sector. First, in 1995, MROs could qualify as HRIOs and be recognized with wider responsibilities in health information management across the Ministry of Health. Second, following the introduction of performance-based management, in 2000, the national HMIS office was made responsible for healthcare sector monitoring and evaluation. In 2008, following the HMIS assessment by the Health Metrics Network (HMN), a secretariat of the World Health Organization, the Ministry decided to implement DHIS2, a decentralized HMIS software. The adoption of this new system was expected to increase the use of data at the local level.

The Reinforcing Identity Work of the National HMIS Office

DHIS2 is a web-based, open source software application developed by the University of Oslo and their partners under the HISP (Health Information Systems Program) research and development network ongoing since the mid-1990s. Following its success in several states in India and in the extremely resource-constrained setting of Sierra Leone, the University of Oslo software team moved to Kenya in October 2010 to initiate the development and implementation of DHIS2 as a new decentralized HMIS. To address the challenge of limited Internet, they developed the new concept of *semi-online deployment*, whereby features were implemented directly on the online server and made available for all users. This helped to generate feedback and the impetus to create more features and functionalities, which included, among others, optimizing data entry (offline/online entry), automatic generation and download of data mart for offline generation of Excel pivot tables, customized reports, and dashboards (Braa and Sahay 2012). From March 2011 through September 2011, DHIS2 was successfully rolled out to all eight provinces and districts in Kenya, where users could log in to access or enter data by using modems or local area networks (LANs).

After the devolution of power in 2010, the 47 county governments were created, each with full autonomy in planning and managing their healthcare services, hiring HRIOs, and supplying healthcare facilities with data collection forms. Collected data were now entered into DHIS2 in the counties and made directly available to the national server. By this time, the national HMIS office had taken on the new role as monitoring and evaluation unit of the Ministry of Health. Therefore, increased county autonomy through the use of this web-based tool raised concerns that the national HMIS office could lose power and control over the information collected compared to when it acted as a controlling agent over data reporting. An HRIO said:

Some [counties] are still not working …. [Compared to] when we used to have great power and

force [over] them to report, that autonomy in terms of reporting [to] the national level sometimes is positive and sometimes is negative.

HRIOs at the national HMIS office perceived the loss of control over data as a threat to their social status and identity. Instead of changing attitudes, HRIOs reacted with a different type of identity-protection response aimed at reinforcing their social status against change (Kira and Balkin 2014; Kirchner 2013). Through this *reinforcing identity work*, HRIOs at the national HMIS office reclaimed their role as the central repository of all health data to reduce the threat of IS fragmentation and potential loss of control over health information, as suggested by an HRIO:

> We did not want fragmentation …. Counties are managing health information, but the main central repository still remains at the central level … they have to send all the data to the national level.

As part of reinforcing identity work, the national HMIS office centralized the revision and standardization of data collection forms. This activity was possible thanks to international funding, as pointed out by some HRIOs, and the flexible design of DHIS2 that was customized to include all indicators in the standardized forms:

> DHIS has centralized and standardized the [reporting forms]. The people at the [national HMIS office] can control the [reporting forms]. So the only [reporting forms] that we use are approved by the Ministry [through the national HMIS office].

Artifacts, such as data collection forms, can be representative of a work environment and have meanings that people attach to their identities (Boudreau et al. 2014). By overseeing the revision and standardization of data collection forms, the national HMIS office could control the information that was reported and, therefore, consolidate their status as the central repository of all health data. Reinforcing identity work was thus an identity-protection response that, through self-reinforcing processes between identity and technology, could preserve the status quo and strengthen old routines against change (Tripsas 2009). In particular, the possibility of reporting data through a single channel linked to a central data repository can be considered to be *means for identity reinforcement* because it strengthened the power of HRIOs as the controllers of health information at the national level. An HRIO said:

> [DHIS2] has [benefitted] our profession … because of a [more] efficient and effective way of data management. All information is reported through a single channel. [This gives] more power to health

information officers … for controlling the information other than when we [used to have] many … parallel reporting systems.

Such affordances reproduced routines of vertical data reporting that were fully entrenched in the local centralized structures of county governments as reflected in this interview of a medical officer:

> [There is the tendency toward] central local control [characterizing] a struggle [for power] …. People are not very used to decentralization. They are too used to reporting data …. People still set accountings without using the health information [and prepare] budgets without referring to DHIS.

This evidence appears to suggest that, in spite of the implementation of DHIS2 and devolution, some counties were still not using information in healthcare management effectively. We next show how, by interacting with DHIS2, the information officers enacted a different type of identity work that led to the deinstitutionalization of such ineffective use of information in some counties.

The Transformative Identity Work of HRIOs at the Counties

Manya et al. (2013) reported that, in February 2012, a total of 361 unique users from all over Kenya had logged on to the system and the country had an active core group of 500 to 600 users. This translated to 40% to 50% of all registered users (1,351), indicating a deepening of the routine use of the system. Users could, with a single application, access and analyze data offline by downloading data from the DHIS2 central server and storing them in a datamart (database for processed data) on their local computer. The datamart was then used to populate a pre-designed Excel pivot table for analysis purposes (Manya et al. 2013). HRIOs working at the counties said that with the new system they could "access data anywhere, anytime" and "perform relatively complex analysis" of health data. Such affordances empowered HRIOs by giving them more time to analyze data and enabling them to advise their county heads on healthcare services management, as suggested below:

> We are empowered, we are able to do things that we were not able to do before. [Now with DHIS2] I am able to do analysis … and discover the pattern in the data. I have the time to look at the data whereas [with the manual system] most of the time was dedicated to data entry. Now [HRIOs help managers] understand the indicators and … come up with interventions.

Compared to the previous three instances of identity work, we can see that, this time, users were not faced with a threat to their identities and, therefore, did not need to engage in identity-protection responses. On the contrary, thanks to the affordances they realized through DHIS2, HRIOs could use their skills and expertise to advise healthcare managers in the counties and enhance their role performance. Therefore, by taking advantage of the opportunities from devolution and the new IT system, HRIOs at the counties engaged in an identity-restructuring response (Petriglieri 2011). We define this identity response as *transformative identity work* because enhanced role performance can lead to the formation of new identities. In particular, the affordances that HRIOs realized within the context of transformative identity work functioned as *means for identity change* by which HRIOs could restructure their identity as professionals for health information management, as supported by an HRIO:

> DHIS has had very much [impact] on [HRIOs] profession. [In] other days we used to be manual. Now, you can guide the health sector, you can guide everybody, you can know what is happening, you can easily identify the gap [by comparing] national indicators. DHIS has made work much easier [from the point of view of] a professional for health information management.

Therefore, transformative identity work is about changing one's identity through the affordances that users realize with the new system. Knowledge and skills are important in defining the identity of individuals (i.e., individuals "are" what they are capable of doing; Alvesson and Willmott 2002). Thus, by identifying themselves as those who are responsible for and know information to advise healthcare managers, HRIOs were claiming a professional identity of health information experts that they could perform owing to DHIS2, as explained by an HRIO:

> In some counties [HRIOs are] assistants to the Medical Office Head .... HRIOs are the ones that know information [and] are responsible for health information. In monthly and quarterly [review meetings], they look at the data and they … analyze [and] compare … indicators [and prepare] some [work plans] based on information.

Identity changes are often associated with the disruption and, therefore, deinstitutionalization of old practices (Creed et al. 2010; Lok 2010). We can now see that the transformative identity work of HRIOs contributed to the deinstitutionalization of ineffective use of information among county administrators, who, thanks to the support of HRIOs acting as information managers, could now "talk health," that is, they were able to use health information in managing healthcare service resources. An HRIO said:

> Counties [have started] talking health because they have a vibrant and active information manager. [Those counties] where our information officers … have a say in the county parliament [and] in budgeting are doing very well in terms of reporting. They know where they have problems [and] where they tap their money.

Three major environmental factors enabled the transformative identity work of HRIOs and its impact on deinstitutionalization. The first factor is the *availability of resources*. Some counties were left without the skills and resources to run the HMIS because, according to an HRIO, some HRIOs did not want to be deployed in remote areas. The second factor is *the support of a county leader who was conversant with health information*, which, according to an HRIO, determined the extent to which county administrators listened to HRIOs. Finally, the third factor is *the accessibility to new education opportunities* for HRIOs, who, as explained by a medical officer, became "more open to data sharing … and collaboration … with other cadres" after earning a bachelor's or master's degree.

Discussion

An Identity Work Perspective on the Role of Affordances in Deinstitutionalization

The literature acknowledged that IT innovation does not always result in changes in institutionalized practices (Avgerou 2000; Latifov and Sahay 2013; Miscione 2007), and this prompted us to investigate how the possibilities for action that arise from users' interactions with the HMIS may influence the deinstitutionalization of deeply and historically embedded work and technical practices.

As summarized in Table 3, the case study analysis revealed four types of identity work. The way affordances were implicated in these different types of identity work played a crucial role in influencing whether and how users problematized and disrupted ineffective use of information. After illustrating the four types of identity work, in the discussion that follows, we explain the role of environmental conditions and the materiality of technology in influencing these different types of identity work and their affordances. In particular, in the comparative analysis of the two eras, we found that the *concepts of tight and loose coupling* were useful in explaining how the degree of flexibility of the IT design influenced, in

Table 3. Summary of Findings				
	First Era (1980–1994): Failed Deinstitutionalization of Ineffective Use of Information		**Second Era (2009–Ongoing): Deinstitutionalization of Ineffective Use of Information**	
Key Actors	**MROs at Hospitals**	**National HMIS Office**	**National HMIS Office**	**County HRIOs**
Technology	Inflexible IT: manual reporting system with tally and summary sheets.	Inflexible IT: manual reporting system and DOS-based Clarion database.	Flexible IT: mobile Internet, central server on the cloud, offline data mart.	Flexible IT: mobile Internet, central server on the cloud, offline data mart.
Affordances	Retrieving and compiling data.	Collecting and compiling data reports.	Reporting data through a single channel.	Accessing data anywhere, anytime; performing complex analysis.
Types of Identity Work	Disruptive: attempt to distinguish identity in a positive way by changing attitudes that threatened identity.	Legitimizing: attempt to justify one's existence by ceremonially performing threatened identity.	Reinforcing: attempt to protect identity by reinforcing social status against change.	Transformative: attempt to modify identity by taking advantage of opportunities from the environment and technological change.
Function of affordances as means of identity work	Means for attitude change: changed attitudes that threatened identity.	Means for identity survival: enabled ceremonial performance of identity.	Means for identity reinforcement: bolstered identity by strengthening old routines.	Means for identity change: enhanced role performance and shaped new identity.
Environmental conditions*	Support from leaders (doctors) conversant with data enabled identity work.	Discontinuous institutional and financial support constrained identity work.	Institutional and financial support and a flexible IT system enabled identity work.	Resources, higher education qualifications, leadership, and a flexible IT system enabled identity work.
Outcomes	Some doctors problematized ineffective use of information in managing hospital services.	Production of dysfunctional information at the national level. This constrained deinstitutionalization of ineffective use of information at the local level.	Reinforced data reporting to the national level. This constrained deinstitutionalization of ineffective use of information at the local level.	Deinstitutionalization of ineffective use of information in some counties.
	Tight coupling between types of identity work due to inflexible IT exacerbated the constraints of legitimizing identity work on the deinstitutionalization potential of disruptive identity work.		Loose coupling between types of identity work due to flexible IT mitigated the constraints of reinforcing identity work on the deinstitutionalization potential of transformative identity work.	

*Shift in environmental conditions between first and second era: national HMIS office in charge of healthcare sector performance monitoring, devolution, and decentralization of HMIS.

part, the deinstitutionalization potential of identity work. The elements of a loosely coupled system are connected but not strongly dependent on each other. One element cannot fully constrain and determine the other as opposed to a tightly coupled system whose elements are strongly mutually dependent (Orton and Weick 1990). We thus demonstrate how the degree of flexibility of the IT design explains, in part, differences in loose and tight coupling between types of identity work and the consequent variance in achieving the desired deinstitutionalization.

The Four Types of Identity Work and Their Potential for Deinstitutionalization

The classification of types of identity work, in relation to their effects on institutions, is limited to whether identity work either maintains or changes identity (Petriglieri 2011) under the pressure of institutional change (Kyratsis et al. 2017). We add nuance to this existing view and identify four types of identity work: *disruptive, legitimizing, reinforcing*, and *transformative*.

In the first era of the case study, both disruptive and legitimizing identity work represented identity-protection responses that users enacted in order to change negative attitudes toward health information, which they perceived as a threat to their identities. Yet, there were differences between the two. Disruptive identity work generated affordances that functioned as means for attitude change because they could change the negative attitudes that threatened users' identities. By realizing these affordances, MROs were more successful in deinstitutionalizing ineffective use of information as demonstrated by doctors' realization of the inadequate use of health information in hospitals. In contrast, legitimizing identity work was limited to justifying the existence of the national HMIS office. The affordances implicated in this type of identity work were means for identity survival by which the national HMIS office could ceremonially perform its identity as the center for information. However, this type of identity work was less likely to change the negative attitudes toward information that threatened its identity. As a result, the affordances it produced contributed to the production of dysfunctional information, which was largely outdated and unusable for timely healthcare planning and hindered the deinstitutionalization of ineffective use of information.

We now move to the second era in which we identified two other types of identity work: reinforcing and transformative. Reinforcing identity work was a form of identity-protection response directed toward protecting and reinforcing one's identity and social status against change. Reinforcing identity work was different from disruptive and legitimizing identity work. These were identity-protection responses motivated by the need to change attitudes that threatened identities. Therefore, they had the potential to be a catalyst for change that might be unrealized as in the case of legitimizing identity work. By contrast, reinforcing identity work was motivated by the need to resist change. As a result, it led to affordances that functioned as means for identity reinforcement, which, in the specific case of HRIOs at the national HMIS office, bolstered their identity as the center for information by strengthening vertical data reporting routines. The realization of these affordances potentially hampered the deinstitutionalization of ineffective use of information at the local level.

Transformative identity work was a form of identity-restructuring response through which HRIOs in the counties took advantage of new opportunities from the environment and technological change to restructure their identity. Through this type of identity work and by interacting with the new decentralized system, users generated affordances that enhanced their role performance and transformed their identity. These affordances were thus means for identity change whereby HRIOs could transform their identities into professionals for health information management. By en-

acting this new identity, HRIOs contributed to the deinstitutionalization of ineffective use of information to strengthen the provision of healthcare in their respective counties.

The Influence of Environmental Conditions on Identity Work

Environmental conditions explained, in part, the differences among the four types of identity work and affordances and their different potential for deinstitutionalization. For example, even though disruptive and legitimizing identity work were both oriented toward demonstrating the value of one's existence to others, their affordances were different due to environmental enablers and constraints. On one hand, the support from leadership (such as doctors) conversant with data was a key enabler to disruptive identity work and the affordances through which users could change negative attitudes toward their identity and thereby deinstitutionalize ineffective use of health information. By contrast, legitimizing identity work and the adverse effects of its affordances on the production of information were deeply rooted in the nature of unstable institutional environments. The discontinuous nature of international funding and limited institutional support by national governments proved to be a source of severe constraints to users' identities. For example, the national HMIS office was created by the initiative of international organizations to function as the center for information of the Ministry of Health. Yet, it was forced into a continuous struggle for survival due to the weak institutional support that followed. Its survival was dependent on the affordances of the dysfunctional HMIS. This explains why its legitimizing identity work had the detrimental effect of maintaining ineffective use of information.

The transition from the first to the second era was marked by significant policy and technological changes: first, the national HMIS office was put in charge of healthcare sector performance monitoring and, as a result, received more institutional and financial support; second, following devolution and the roll-out of the new decentralized HMIS, DHIS2, the counties had more administrative autonomy. These events created the environmental and technological conditions that triggered and enabled reinforcing and transformative identity work. HRIOs at the national level enacted reinforcing identity work to protect their identity from the perceived threat that devolution and the implementation of DHIS2 posed to their identity. At the same time, reinforcing identity work benefitted from the opportunities offered by increased institutional support and international funding and through the flexibility offered by DHIS2. In particular, HRIOs at the national level could inscribe rules of standardized reporting into the flexible design of DHIS2 and, therefore, realize the

affordances implicated in reinforcing identity work. By contrast, HRIOs in the counties viewed devolution and the implementation of DHIS2 as an opportunity to restructure their professional identity. By interacting with DHIS2, they could realize new possibilities for action that, combined with such opportunities as resources, better education, and a supportive leadership, enabled transformative identity work and the formation of a new professional identity.

The Flexibility of IT Design and the Coupling between Types of Identity Work

So far, we have shown how different types of identity work and the respective IT affordances that they generate can potentially enable or constrain deinstitutionalization. Our next contribution is to show how such potential can be realized. In particular, we will discuss *why deinstitutionalization did not occur in the first era* and *why it occurred in the second era*.

In order to understand why deinstitutionalization did not occur in the first era, we use the concept of tight coupling (Orton and Weick 1990) to illustrate the strong dependent relationship between legitimizing identity work of MROs at the national HMIS office and disruptive identity work of MROs at the hospital. Specifically, the affordances implicated in legitimizing identity work contributed to the production of dysfunctional information that had no value in the local provision of healthcare. Not only did these affordances contribute to the negative attitude toward information and were therefore a continuous source of constraints to the identities of MROs, they also inhibited the effects of their disruptive identity work in eroding ineffective use of information. Therefore, the affordances of legitimizing identity work at the national level limited the success of disruptive identity work at the local level. The tight coupling between these two types of identity work was due to the inflexible design of the paper-based and vertical HMIS system, which users could not customize and which limited the affordances they could realize in support of disruptive identity work.

Our final consideration concerns why deinstitutionalization did occur in the second era. The fact that institutional and technological changes enabled transformative identity work contributed to the outcome but was not the only reason for it. We need to explain why reinforcing identity work by HRIOs at the national HMIS office, which was a potential threat to deinstitutionalization, did not hinder this transformative identity work of county HRIOs and its positive effects on deinstitutionalization.

In contrast with disruptive and legitimizing identity work in the first era, reinforcing and transformative identity work in the second era were connected but not strongly mutually dependent. Neither reinforcing nor transformative identity work could fully determine or constrain the other and, for this reason, they were loosely coupled. In particular, we argue that the loose coupling between these two types of identity work was due to the new IT system that users could customize thanks to its flexible nature in order to realize affordances that better supported their goals and identities. For example, initially, the affordances that empowered HRIOs to become professionals of health information management and support a decentralized use of health information were a potential threat to the social status of HRIOs at the national level. HRIOs had first to customize the new system before being able to enact reinforcing identity work and realize the affordances that strengthened their power over centralized reporting. These new affordances did not prevent county HRIOs from realizing the affordances implicated in their transformative identity work, which then benefitted decentralization and the erosion of ineffective use of health information among local administrators. Thus, the affordances that users could realize by interacting with DHIS2 allowed for the coexistence of centralized and decentralized data management practices and mitigated the threat to decentralization posed by reinforcing identity work.

Implications

The main implication of this work concerns the relationship between IT affordances and institutions. Previous research has shown that affordances are linked to institutions (Hultin and Mähring 2014), but there is limited understanding of how affordances might influence institutions. This research fills this gap by showing how IT affordances influence processes of deinstitutionalization through the mechanism of users' identity work. In particular, we identified four types of identity work (disruptive, legitimizing, reinforcing, and transformative) that correspond to different affordances as means for attitude change, identity survival, identity reinforcement, and identity change respectively. These affordances led to different outcomes, in terms of either maintaining or changing institutionalized practices.

Through the sensitizing device of identity work, we furthered the understanding of how HMIS users in LMICs can deinstitutionalize ineffective data management practices relevant to the needs of local healthcare managers and providers. In particular, we demonstrated how identity work can be used to better understand the meanings and interests that local

actors attribute to health information, the affordances that emerge from their interaction with the HMIS, and the resulting deinstitutionalization of practices. Even though the specific types of identity work and affordances together with their consequences for deinstitutionalization were discerned from a Kenyan context, the implications of this study for understanding the institutional and development impact of IT can be extended to other LMICs that have similar contextual conditions (e.g., Sarker 2016), in the spirit of "analytical generalization" (Lee and Baskerville 2003).

The Importance of Context for the Societal Consequences of IT

By unveiling identity work as a key mechanism that relates IT affordances to deinstitutionalization, our work links the emergence of different affordances and consequences of IT (Leong et al. 2016) to users' identity work. In particular, we showed how users' identity work can play a crucial role in influencing their commitment to eroding old practices for the institutionalization of a new technology (Dobson and Nicholson 2017). Most importantly, the contextually rich and historically based case study set in Kenya allowed us to theorize about the implications of context (see Johns 2006) for users' identification with a technology, the affordances that are implicated in their identity work, and the resulting implications for the deinstitutionalization of existing practices.

As argued in previous research, features of a social context are not just passive attributes of IT implementation settings, but are active constituents of IT adoptions and implementations (Holeman and Barrett 2017). Recent work has highlighted the critical role of contextual issues that are unique to several LMICs in influencing how ITs are implemented (Venkatesh, Bala, and Sykes 2010; Venkatesh, Bala, and Sykes 2016) and lead to desired societal changes (Venkatesh, Rai et al. 2016). A major contextual condition that affected identity work in our case study, and that is common to other LMICs, is the pressure of inconsistent donor and government support together with conflicting demands and development agendas from national governments and international aid organizations (Biesma et al. 2009; Buse and Walt 1997; Knack and Rahman 2007). Conflicting demands among these actors caused a shift in institutional support to more effective use of the HMIS. Therefore, embeddedness of institutionalized practices in overarching bureaucratic institutions (Nicholson and Sahay 2009) is not a sufficient explanation of why deinstitutionalization of dysfunctional practices might not occur. In the first era, legitimizing identity work constrained disruptive identity work. This example explains why users' response to the threat of discontinuous institutional

support to their identity might be unsuccessful in or even a barrier to disrupting ineffective HMIS practices. Likewise, as shown in the second era, users' identity work in response to new opportunities in the environment might not only facilitate deinstitutionalization (as was the case with transformative identity work), but also reinforce institutionalized practices (as was the case with reinforcing identity work). These findings underscore the importance of contextual research rooted in theory for understanding the development and societal consequences of IT.

IT Materiality and Deinstitutionalization

Overall, this work has broader implications for understanding the institutional impact of technology (Davidson and Chismar 2007; Gosain 2004; Rajao and Hayes 2009) and, most of all, the role of IT materiality in influencing deinstitutionalization processes. Previous research does not offer a focused account of the role of IT materiality in shaping institutions. Studies in this area have mainly examined the institutional impact of IT from the perspective of users' enactments of rules and norms embedded in its design (e.g., Gosain 2004) and the symbolic representations that its materiality evokes (Raviola and Norbäck 2013). Our work adds to this research by providing a clearer account of how IT materiality affects deinstitutionalization through the affordances that users realize from its features while they engage in identity work. Tied to this, we make two key contributions.

First, past research has shown how the inscription of old technologies and the values that users attach to them can reproduce dominant institutions across time (Rajao and Hayes 2009) by framing new IT enactments thereby limiting the realization of opportunities offered by new technologies (Blanc and Huault 2014). By focusing attention on how affordances are implicated in identity work, we demonstrated the role of users' identity work in giving continuity to or breaking with the possibilities for action of old technologies. On one hand, in the light of research that demonstrates how IT systems persist despite their inefficiencies (e.g., Avgerou 2000), the example of legitimizing identity work shows how identity work can generate affordances that sustain a ceremonial and ineffective use of a technology and hamper deinstitutionalization. On the other hand, through the example of disruptive identity work, we demonstrated the role that identity work can play in generating affordances that break with old routines that undermine effective use of a technology.

Second, our work has important implications for understanding how IT systems with a flexible and easy-to-

customize design (Leonardi 2011) affect processes of deinstitutionalization. Past research has shown how users can inscribe existing rules and routines in flexible IT systems in order to reproduce institutionalized practices and structures (Davidson and Chismar 2007) that safeguard their identities (Jensen et al. 2009). A typical argument from this research is that through customizations and local readaptations, users circumvent the functionalities of new IT systems and, as a result, hamper deinstitutionalization. Our work extends this research by showing how the capabilities of flexible IT systems can enable the coexistence of different types of identity work that have contradictory effects for the deinstitutionalization of existing practices. For example, whereas through reinforcing identity work, users at the national level inscribed routines and realized affordances that preserved the status quo, users in the counties exploited the new system functionalities to generate affordances that could transform their identities as well as old data management routines. These findings show how a focus on the affordances implicated in users' identity work can help uncover processes of deinstitutionalization underneath the surface of big institutional and technological shifts such as devolution and the implementation of advanced web-based systems like DHIS2.

Implications for Practice

Various studies have shown how health IT initiatives in LMICs can easily end up as partial or total failures (e.g., Kelly and Noonan 2017; Noir and Walsham 2007). LMICs, with their low-resourced conditions and pressing health challenges, can ill afford such continued failures and, with it, the inability to build their capabilities to improve the use of health information to enhance healthcare. Heeks (2002) has pointed out to the role of design-reality gaps in perpetuating these failures. The focus on designing systems with relevant affordances that support identity work can potentially help in reducing these gaps and improve the chances of systems being effectively used. In this regard, our findings have two important implications for policy makers and practitioners who are responsible for the planning, design, and implementation of HMIS in developing countries.

First, policy makers and HMIS designers are faced with the challenge of meeting diverse user information needs across different levels of the healthcare system (e.g., from hospital managers to policy makers). Our case study highlights the important role of flexible technologies in balancing between the need for data integration while ensuring the coexistence of systems with incompatible goals and constraints (e.g., centralization versus decentralization of the HMIS). In particular, while previous research has stressed the need to balance between centrally controlled and decentralized health information infrastructures (Rodon and Silva 2015), our work underscores the role of identity work and the affordances that it generates in balancing between centralization and decentralization of HMIS. It is thus imperative for governments in LMICs to invest in digital health solutions that are easy to customize in order to accommodate the information requirements and expectations of different categories of users. In particular, key users should be trained and equipped with the necessary skills to be able to customize and make full use of the functionalities of the new system.

Second, our findings highlight how users' views of HMIS in relation to their professional identities might affect meaningful use of health information. Apart from those directly involved in data management, all stakeholders in the healthcare sector need to recognize the vital role of HMIS in delivering good healthcare. The case study showed the struggle of MROs/HRIOs in raising awareness about the importance of health information among doctors and policy makers. Therefore, the planning and design of an HMIS needs to take into account the professional roles and identities of key stakeholders. One way of achieving this is by involving different professional stakeholders, such as doctors and healthcare managers, in discussions about the planning and design of the HMIS. Such an approach responds to the call in the ICT for development literature to build strategies for more human-centric systems as contrasted with the traditionally implemented top-down systems inscribing the interests and agendas of donors and senior ministry administrators (Mukherjee 2015).

Conclusion

The key contribution of this work relates to elaborating the relationship between users' identity work and emerging affordances in producing institutional consequences. As shown in our case study of HMIS in Kenya, such consequences relate primarily to the quality of the information produced and how this may affect the delivery of healthcare services to local populations. Our study about deinstitutionalization in government-based environments is particularly important: it identifies the conditions under which identity work influences the realization of affordances of flexible IT systems (Braa et al. 2007) leading to improved information use. Overall, our work adds to our understanding of the role of ICTs in improving the provision of healthcare services (Miscione 2007; Srivastava and Shainesh 2015) and potentially the larger development processes of the population (Walsham 2010; Zheng 2009), which we see as a moral imperative.

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THE ROLE OF AFFORDANCES IN THE DEINSTITUTIONALIZATION OF A DYSFUNCTIONAL HEALTH MANAGEMENT INFORMATION SYSTEM IN KENYA: AN IDENTITY WORK PERSPECTIVE

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Appendix A

Number of Health Records Information Officers (HRIOs) by District Between 1980 and 2008

Districts	Number of HRIOs
Baringo District	1
Kisumu District	1
Kitale District	1
Meru District	1
Mombasa District	2
Nairobi District	(4)*
Nakuru District	1
District in Eastern Province	1
Turkana District	1
Unknown district	3

*These officers moved from another district included in the list.

Appendix B

Number of HRIOs by County in 2015 ▬▬▬

Counties	Number of HRIOs
County in former Coast Province	1
County in former Rift Valley Province	1
County in former Eastern Province	1

Appendix C

Guide to Data Interpretation ▬▬▬

Table C1. Definitions of Identity Work		
Means of Identity Work	**Definition**	**Source**
Direct identification	Direct identification of individuals and their attributes (e.g., honest, dishonest)	Lok 2010
Indirect identification through group categorization and affiliation	Identifying individuals with a social group or category (e.g., being the member of a profession or professional association)	Alvesson and Willmott 2002
Indirect identification through prescribing and describing practices, rules, and responsibilities	Individuals' self-association with practices and responsibilities imply the adoption of a particular identity	Alvesson and Willmott 2002; Lok 2010
Indirect identification through the definition of others	Individuals define themselves through the definition of others (e.g., if they define others as dishonest, they imply that themselves and the social group that they represent are honest)	Alvesson and Willmott 2002; Lok 2010
Indirect identification through the definition of the general context	Context implies any identifying attributes of an individual or social group that are valued (e.g., drive for teaching excellence in higher education implies that academics are "good researchers" as well as "good teachers")	Alvesson and Willmott 2002; Lok 2010
Tension between professional (or organizational) identity ("who we are") and social identity ("who they think we are")	Tension between professional (or organizational) identity and social identity triggers identity work through which individuals seek to realign their own sense of self with how others perceive them	Boudreau et al. 2014; Watson 2008
Indirect identification through the definition of the work environment and artifacts	The work environment and its artifacts can have meanings that people attach to their identities (e.g., a librarian might feel strongly attached to the physical library environment and its books)	Boudreau et al. 2014
Role claiming and use	Individuals challenge a threat to their identity by affirming and enacting their role in society	Creed et al. 2010
Identity-protection response	Individuals seek to change negative attitudes that they perceive as a threat to their identity	Petriglieri 2011
Identity-restructuring response	Individuals restructure their identity in response to change	Petriglieri 2011
Enhanced role performance	Individuals enhance their role performance by playing a new function in society and, thereby, form a new professional (or organizational) identity	Leung et al. 2014

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Table C2. First Era: The Disruptive Identity Work of Medical Records Officers at the Hospitals		
Means and Types of Identity Work	**Data**	**Interpretation and Coding**
Indirect identification, through group categorization and affiliation (Alvesson and Willmott 2002)	"I don't find any way in which we can separate the medical records personnel and the health information personnel … the medical records maintained and analyzed by the medical records personnel are the source of health information … the two are complementary" (MRO's letter, Ministry of Health 1984).	Identifies medical records personnel with health information personnel. Shows that "medical records personnel" and "health information personnel" were equivalent for practical purposes, indicating that a new identity of health records and information officers was taking shape. *Coding*: medical records officers as health records and information officers.
Indirect identification, through prescribing or describing practices, rules, and responsibilities (Alvesson and Willmott 2002; Lok 2010)	"When we started operating in the hospitals we had nothing to do with information, we were only processing patients' documentation. But then, with time, information has become part of the health records and information personnel [to such an extent that] one cannot do without the other" (Interview with HRIO).	Highlights the fact that MROs were an important "source of health information" through the patients' records they were managing. Health information and their cadre were mutually dependent, one could not exist without the other. *Coding:* HRIOs' identification with information.
Direct identification (Lok 2010)	"The health records and information management profession … is the custodian of health information" (Interview with HRIO).	Directly identifies MROs as "custodians of health information." We consider such self-identification the expression of their identity. We also think that this definition of identity captures the intimate connection between MROs' identity and information. *Coding*: MROs as "custodians of health information."
Indirect identification, through the definition of others (Alvesson and Willmott 2002; Lok 2010)\n\nTension between professional identity ("who we are") and social identity ("who they think we are") (Boudreau et al. 2014; Watson 2008)	"Out of the [Medical Training Center in 1992], as we went to hospitals, information was never taken seriously … people [at the hospital] knew a doctor, a nurse, the laboratory technician, a cleaner … for them [health information] was paperwork …. We [as Medical Records Officers] understood the power of information [and] how it [could be used] to make decisions" (Interview with HRIO).	Identifies people at the hospital as lacking understanding about the usefulness of health information (health information was "paperwork"), thereby positioning MROs as *information experts* (i.e., those who understand the "power of information"). *Coding*: MROs as information experts. It also indicates that the negative perception of MROs as performing "paperwork" at the hospitals, namely, their social identity, posed a threat to their professional identity as the experts who understood "the power of information." *Coding*: tension between MROs' social and professional identity.
Indirect identification, through the definition of the work environment (Boudreau et al. 2014)	"We asked for a computer in a hospital, but they did not understand … why [we needed] a computer …. [One computer] was in the doctor office … doing nothing … We were desperate to be given data … but people did not take us seriously" (Interview with HRIO).	Highlights that MROs were not able to perform as *information experts* because of lack of computers and resources to process data in their work environment. *Coding*: MROs not able to perform as information experts.

Table C2. First Era: The Disruptive Identity Work of Medical Records Officers at the Hospitals (Continued)		
Means and Types of Identity Work	**Data**	**Interpretation and Coding**
Identity-protection response through which individuals attempt to change the attitudes of those people who are a potential source of threat to their identity (Petriglieri 2011)	"If you cannot convince the medical doctor in charge of the [hospital] [of the value of information], you may not get resources. So [we tried to change] their attitude [toward information in order for them to say]: 'Oh, it is necessary! Let us also allocate some money [for a computer].' With the easy retrieval of information and easy compilation of data, they appreciated that this computer was necessary" (Interview with HRIO).	Implies that affordances of "retrieving and compiling data" were the means by which MROs attempted an "identity protection-response" meant to change doctors' attitudes toward information. *Coding*: affordances as *means for attitude change*.
	"Doctors in charge of the hospitals never used to care about information. We used to tell them that without health service data, it was hard for them to understand what patients in that area were suffering from …. We would show them how the data could be used to see the finances and man-hours used to treat the first 10 causes of morbidity … Those doctors who were able to use those data could manage the service very effectively" (Interview with HRIO).	Implies that MROs' identity-protection response generated affordances that could change attitudes that threatened their identity and could therefore disrupt institutionalized practices such as ineffective use of information among doctors. *Coding*: identity-protection response as *disruptive identity work*.

Table C3. First Era: The Legitimizing Identity Work of the National HMIS Office		
Means and Types of Identity Work	**Data**	**Interpretation and Coding**
Indirect identification, through prescribing or describing practices, rules, and responsibilities (Alvesson and Willmott 2002; Lok 2010)	"Recently Health Information System ([i.e., the national HMIS office]) … have been assigned the task of being responsible for all Health Information within the Ministry of Health. This system will have the following functions: to undertake the collection, analysis, publication, and dissemination of information necessary for planning, administration, and research work" (HIS 1981).	Identifies the national HMIS office as the unit "responsible for all health information within the Ministry of Health" and with the functions of collecting, analyzing, and disseminating data for the Ministry of Health. *Coding*: national HMIS office as unit responsible for health information.
Direct identification (Lok 2010)	"[The national HMIS office], being the center for information in the Ministry, should be allowed to control all the data files from other departments and programs" (HIS 1992b).	Identifies the national HMIS office as the center for information in the Ministry of Health. *Coding*: national HMIS office as the center for information.
Indirect identification, through the definition of others (Lok 2010; Alvesson and Willmott 2002)	"The Ministry of Health had not made the information system as a core business. They did not see the need [to] come for the information and hence they were not putting enough resources into the information system" (Interview with ex Head of Department).	Highlights the Ministry of Health's lack of interest in information and indirectly identifies the national HMIS office ("the information system") as the unit in charge of information within the Ministry of Health. *Coding*: national HMIS office as the unit in charge of information.
Direct identification (Lok 2010) Tension between organizational identity ("who we are") and social identity ("who they think we are") (Boudreau et al. 2014; Watson 2008)	"Planning was collecting the same data, the health sector [department] was doing the same. So, you see, the [national HMIS office] had become redundant [because it was not supported. By contrast, we wanted] to make sure that we had an information center of excellence [catering for] reliability of data, timeliness, report writing, and information sharing" (Interview with former Head of Department).	Identifies national HMIS office as the "information center of excellence." *Coding*: national HMIS office as the "information center of excellence." It also highlights that other departments perceived the national HMIS office as unnecessary for the production of information. The social identity of the national HMIS office (i.e., how other departments in the Ministry perceived them) represented a threat to their desired organizational identity as the center for information. *Coding*: tension between national HMIS office's social and organizational identity.
Identity-protection response (Petriglieri 2011) through role claiming and use (Creed et al. 2010).	"The role of the [national HMIS office] in the Ministry is to [serve] other departments with the most needed information for planning purposes. It also functions as the data bank for all types of data in the Ministry (HIS 1992a)." "The [national HMIS office] lost control of all its resources …. The resultant inefficiency hurt the Ministry as a whole [since] the department has been unable of providing data for planning. It is strongly felt that for [the national HMIS office] to function at its maximum efficiency it needs to be recognized as a division ([an independent unit]) in the Ministry" (HIS 1992a).	Show how the national HMIS office engaged in an identity-protection response by claiming their role as the data bank for all types of data in order to request more resources and to be turned into a more independent organizational unit of the Ministry. *Coding*: identity-protection response by claiming role as the data bank of the Ministry.

Table C3. First Era: The Legitimizing Identity Work of the National HMIS Office (Continued)		
Means and Types of Identity Work	**Data**	**Interpretation and Coding**
Identity-protection response through which individuals attempt to change the attitudes of those people who are a potential source of threat to their identity (Petriglieri 2011)	"We have worked for many years to enable the 'gurus' in this Ministry to understand what we are [by showing] them [the information services] we can provide, how we can use the data we have collected … to [prove disease incidence and prevalence]" (Interview with HRIO). "I remember once, a HMIS officer with a team [told planners of the Ministry of Health]: 'I can place the information [you need to justify] the budget.' So they came back and collected the data to justify their request" (Interview with HRIO).	Imply that MROs at the national HMIS office sought to change the negative attitudes that threatened their identity by persevering in the collection and reporting of data to prove their value as the "information service provider" ("what we are"). *Coding*: identity-protection response.
	"When it was learned that a district is endeavoring to compile reports for each of the four quarters of 1991, they were informed that reports are to be prepared for only the most recent quarter for which data is available—not for multiple back quarters" (DHMIS Task Force 1992).	Implies that MROs at the national HMIS office were not fully aware of the value of the information they produced. The affordances they realized as part of their identity-protection response, such as "collecting and compiling data reports," were directed toward demonstrating the value of their existence as the center for information to others. These affordances were thus less likely to lead to changes in attitudes toward information and data management routines. *Coding*: affordances as *means for identity survival.* It also implies that the national HMIS office's identity-protection response was just an attempt to justify its existence by ceremonially performing its threatened identity. *Coding:* identity-protection response as *legitimizing identity work*.

Table C4. Second Era: The Reinforcing Identity Work of the National HMIS Office		
Means and Types of Identity Work	**Data**	**Interpretation and Coding**
Indirect identification through definition of general context (Alvesson and Willmott 2002; Lok 2010)	"Some [counties] are still not working …. [Compared to] when we used to have great power and force [on] them to report, that autonomy in terms of reporting [to] the national level sometimes is positive and sometimes is negative" (Interview with HRIO).	Implies that the change in context after devolution raised concerns that the national HMIS office could lose power and control over the information collected compared to when it acted as a controlling agent over data reporting. *Coding*: national HMIS office as a controlling agent over data reporting.
Indirect identification through prescribing or describing practices, rules, and responsibilities (Alvesson and Willmott 2002; Lok 2010) Identity-protection response (Petriglieri 2011) against threat of status loss (Kyratsis 2017) through role claiming and use (Creed et al. 2010)	"We did not want fragmentation … Counties are managing health information, but the main central repository still remains at the central level … they have to send all the data to the national level" (Interview with HRIO).	Identifies the national HMIS office as the central repository of all health data, a role that it claims in response to the threat of IS fragmentation and potential loss of control over health information. *Coding*: national HMIS office as the central repository of all health data; identity-protection response through claiming the role of central repository.
Indirect identification through artifacts (Boudreau et al. 2014) Identity-protection response (Petriglieri 2011)	"We decided that we, at the national level, will revise the data collection [forms]" (Interview with HRIO). "DHIS has centralized and standardized the [reporting forms]. The people at the [national HMIS office] can control the [reporting forms]. So the only [reporting forms] that we use are approved by the Ministry [through the national HMIS office]" (Interview with HRIO).	Highlight the importance of overseeing the revision of data collection forms to control the information that was reported and consolidate the national HMIS office's status as the central repository of all health data. *Coding*: national HMIS office as the central repository of all health data; identity-protection response as *reinforcing identity work.*
	"All information is reported through a single channel. [This gives] more power to health information officers … for controlling the information other than when we [used to have] many … parallel reporting systems" (Interview with HRIO).	Implies that the affordance of "reporting data through a single channel" linked to a central data repository increased the power of HRIOs as "controllers" of health information. *Coding*: affordances as *means for identity reinforcement*.
	"[There is the tendency toward] central local control [characterizing] a struggle [for power]. People are not very used to decentralization. They are too used to reporting data …. People still set accountings without using the health information [and prepare] budgets without referring to DHIS" (Interview with medical officer).	Implies that the affordances that HRIOs at the national HMIS office realized within the context of reinforcing identity work functioned as means for identity reinforcement and reproduced routines of vertical data reporting. *Coding: reinforcing identity work* can strengthen routines of vertical reporting.

Table C5. Second Era: The Transformative Identity Work of HRIOs at the Counties		
Means and Types of Identity Work	**Data**	**Interpretation and Coding**
Enhanced role performance (Leung 2014) and identity-restructuring response (Petriglieri 2011)	"We are empowered, we are able to do things that we were not able to do before. [Now with DHIS2] I am able to do analysis … and discover the pattern in the data. I have the time to look at the data whereas [with the manual system] most of the time was dedicated to data entry. Now [health records information officers help managers] understand the indicators and … come up with interventions. We can give more interpretation and more analysis than the managers" (Interview with HRIO).	Implies that the affordances that HRIOs could realize thanks to DHIS2 empowered HRIOs by giving them more time to analyze data and enabling them to advise their county heads on health services manage-ment. These new possibilities for action resulted in enhanced role performance and, therefore, the formation of a new identity. *Coding*: affordances enable enhanced role performance and identity restruc-turing (*transformative identity work*).
Direct identification (Lok 2010) Identity-restructuring responses (Petriglieri 2011)	"DHIS has had very much [impact] on [HRIOs] profession. [In] other days we used to be manual. Now, you can guide the health sector, you can guide everybody, you can know what is happening, you can easily identify the gap [by comparing] national indicators. DHIS has made work much easier [from the point of view of] a profes-sional for health information manage-ment" (Interview with HRIO).	Identifies HRIOs as "professionals for health information management." *Coding*: HRIOs as professionals for health information management. It also implies that the affordances that HRIOs realized through DHIS2 enabled them to restructure their identity as professionals for health information management. *Coding*: affordances as *means for identity change*.
Indirect identification through prescribing or describing practices, rules, and responsibilities (Alvesson and Willmott 2002; Lok 2010)	"[In some counties [HRIOs are] assis-tants to the Medical Office Head … HRIOs are the ones that know informa-tion [and] are responsible for health information. In monthly and quarterly [review meetings], they look at the data and they … analyze [and] compare … indicators [and prepare] some [work plans] based on information" (Interview with HRIO).	Indirectly identifies HRIOs as *health information experts* (i.e., those who are responsible for and "know information" to advise health managers). *Coding*: HRIOs as health information experts.
Indirect identification through prescribing or describing practices, rules, and responsibilities (Alvesson and Willmott 2002; Lok 2010)	"Counties [have started] talking health because they have a vibrant and active information manager. [Those counties] where our information officers … have a say in the county parliament [and] in budgeting are doing very well in terms of reporting. They know where they have problems [and] where they tap their money" (Interview with HRIO).	Indirectly identifies HRIOs as "informa-tion managers." *Coding*: HRIOs as information managers. It also suggests that the transformative identity work of HRIOs contributed to the deinstitutionalization of ineffective use of information among county administrators, who, thanks to the support of HRIOs acting as infor-mation managers, could "talk health." This means that information managers were able to use health information in managing health service resources. *Coding*: *transformative identity work* enables deinstitutionalization of ineffective use of information.

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