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Panel: Labor importation as the steroid for nations' ICT success: A debate

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IT-ENABLED CHANGE INTO THE STRUCTURES OF HEALTH INFORMATION SYSTEMS IN AFRICA: A CASE STUDY IN KENYA

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Abstract

In the recent years most African countries have embarked on a series of reforms involving the decentralisation and also integration of health information systems in order to allow improved efficiency and effectiveness in the health care. However, although the discourse around these issues are reflected in global policy documents of almost twenty years ago, IS are still fragmented and weak at the lower levels of the health service. The paper takes a multivocal and multilevel institutionalist perspective to analyse the role of information technology in shaping these shortfalls between institutional accounts and enactments of reforms. Based on the case study of two divisions of the ministry of health in Kenya, it aims to better understand the change implications of information technology for the structures of a health information system in Africa. This is meant to improve the understanding of the way technology-mediated human interactions produce variance between planned organisational change envisaged in donor-driven reforms of the health care service and unplanned HIS structures emerging from the local institutionally-embedded usage of IT tools.

1   INTRODUCTION

Information technology is one of the key components in the implementation of health service reforms supported by international development partners. These reforms are meant to improve the performance of the health sector mainly through the decentralization and integration of health care. Health Information Systems constitute the main core for the implementation of these reforms. Firstly, decentralised information systems can provide decision makers at the lower levels with timely and accurate information for management and planning. Secondly, integrated health information can support coordinated and effective actions in health care delivery.

Still, there is evidence that public IT investments can lead to unexpected organisational impacts that are distant from the original plans or reform objectives, particularly, in developing countries (e.g., Ciborra 2005). Contradictions have been reported, for example, in the usage of IT in the implementation of New Public Management reforms (Hood 1991). Instead of reducing bureaucracies into flatter and more information efficient structures (Osborne et al. 1992), IT implementations within NPM have actually led to the fragmentation of information systems (Kimaro et al. 2005; Dunleavy et al. 2006) increasing, rather than reducing, complexity.

The divergent findings on the implications of IT in the implementation of public sector reforms (e.g., Ciborra 2005) raise the issue of the gap between the organisational impact of information technology as envisaged in formal restructuration plans and unplanned (or informal) practices or structures emerging from IT usage.

Likewise, although the political discourse on the decentralisation and integration of health information systems has engaged development policies for almost twenty years, health information systems are still fragmented and centralized, at least in Africa (Kimaro and Sahay 2007). Most research in this area has actually found that major differences across health information systems depend on competing rationalities underpinning donor-driven reforms, public administrators' procedures and system users' practices (Chilundo and Aanestad 2004), bearing strong connections with the "resource-deprived" environment (Kimaro and Sahay 2007). Yet, although past research in health information systems in Africa and other developing countries has clarified the mismatch between formal triggers of change (e.g., public sector reform policies) and informal constraints to change (e.g., professional roles, social expectations, IS users' routines) (Kimaro and Sahay 2007), little is known about the role of the IT artefact in relation to this formal-informal divide.

The case study illustrated in this paper is meant to address this gap by answering the question of *how the IT artefact influences the structures of health management information systems in an African country in relation to its institutional and resource-material environment.* The research question rests onto the assumption that the institutional environment both shape and is shaped by users' enactment of IT (Orlikowski and Barley 2001). The mutual relationship between the institutional environment and IT enactment also accounts of the influence of institutionally-embedded resources (Scott et al. 2000), including, not only financial and human resources but also the technical properties of the technology.

Thus, the proposed case study takes a multilevel and multivocal institutionalist perspective to analyse how new and old rules, norms, and cultural meanings influence technology innovation and the usage of IT in information processing within two national health information systems of the Ministry of Health in Kenya.

The theoretical perspective used is "multivocal" as it takes into consideration the complex interlinkages between varied rationalities and sets of meanings (Lounsbury 2007) underpinning the actions of different actors (e.g., international donor partners, national ministries, public employees, etc.) involved in the reforms of the health systems in Africa (Kimaro and Sahay 2007). In particular, the proposed perspective recognizes two main logics: the "New Public Management" (Hood 1991) embedded in imported reform models and the "Old Public Administration" (Lynn 2006) of traditional African bureaucracies. By considering institutions as enablers of "entrepreneurs action" under an

institutional entrepreneurship perspective (Dacin et al. 2002), the clash between different logics may cause the "translation" (Zilber 2006) of new imported practices into localised "hybrids" (Hood 2000) depending on the modalities of adaptation of the new model (e.g., New Public Management).

The frictions between multiple rationalities and processes of hybridizations can be better understood through the "multilevel" perspective which views the context of African Health Information Systems as characterized by three levels of action: the macro or policy level (e.g., formal policies), the meso or organisational level (e.g., management structures) and the user or agentic level (e.g., IS users' routines). The three-level perspective allows to zoom in onto the main sets of meanings underlying international and national development policies at the macro level. It highlights how these are mediated or moderated (Dada 2006) by organization level structures, including for example, the influence of different professional norms (e.g., medical doctors, data managers, etc.), and, eventually, interpreted and enacted by institutionally embedded IT users at the micro-level.

In addition, the enactment of institutions at different levels is associated with the means enabling the mobilization of interpretive resources of the institutional environment (Sewell 1992). These means are represented by the technical features of the technology and also the physical and human resources available. In the first instance, the degree of "interpretive flexibility" or "malleability" of IT designs (Orlikowski 1992) influences may either facilitate or constrain new meanings and practices, thereby, reshaping the institutional order of the public health sector.

Under this perspective, the case study presented in this paper provides a historical longitudinal analysis of change opportunities (or constraints) enabled by the institutional environment and by the resource-material environment (IT technical features, human resources, information tools). This has been achieved by focusing upon changes into the information processing behaviour of IS users following the introduction of a specific technology. In particular, the analysis has evidenced the way they use the technology to process information by taking into account its technological properties and how they make sense of it (Orlikowski 2000; Davidson 2006) by drawing from rules, norms and beliefs of a specific institutional context (Powell et al. 1991; Barley et al. 1997).

The empirical lens adopted draws from the information processing view of organisations, whereby the designs of organisations is associated with their information needs (e.g., Galbraith 1977) and the information flows between the different parts of an organisation (Mintzberg 1979). The main assumption here is that changes in IT-enabled information processing practices reflect changes into the configuration of the organization.

Acknowledging the misalignment between formal policies and designs and unplanned or informal outcomes of their implementation (Piotti et al. 2006), the case study seeks to provide a more systematic understanding of the interplay between top-down pressures (e.g., donor-driven development policies) and bottom-up responses (e.g., data management practices). In particular, by explaining those institutional mechanisms giving rise to multiple rationalities and how these are enacted at different institutional levels, it will clarify the processes influencing the adoption and usage of IT in the restructuring of health information systems.

2   MULTIVOCAL AND MULTILEVEL INSTITUTIONALIST FRAMEWORK

The proposed theoretical framework is characterised by three levels of analysis: macro or policy level, meso or organisational level, and micro or agentic level (Figure 1). For each of these levels, different institutions have been classified under three major institutional pillars: regulative, normative, cultural-cognitive (Scott 2001). This classification allows to better understand what are the major institutional mechanisms influencing the encoding and enactment of typified behaviours by IT users. In particular, the framework views cultural cognitive institutions as informing all the others (Scott 2004).
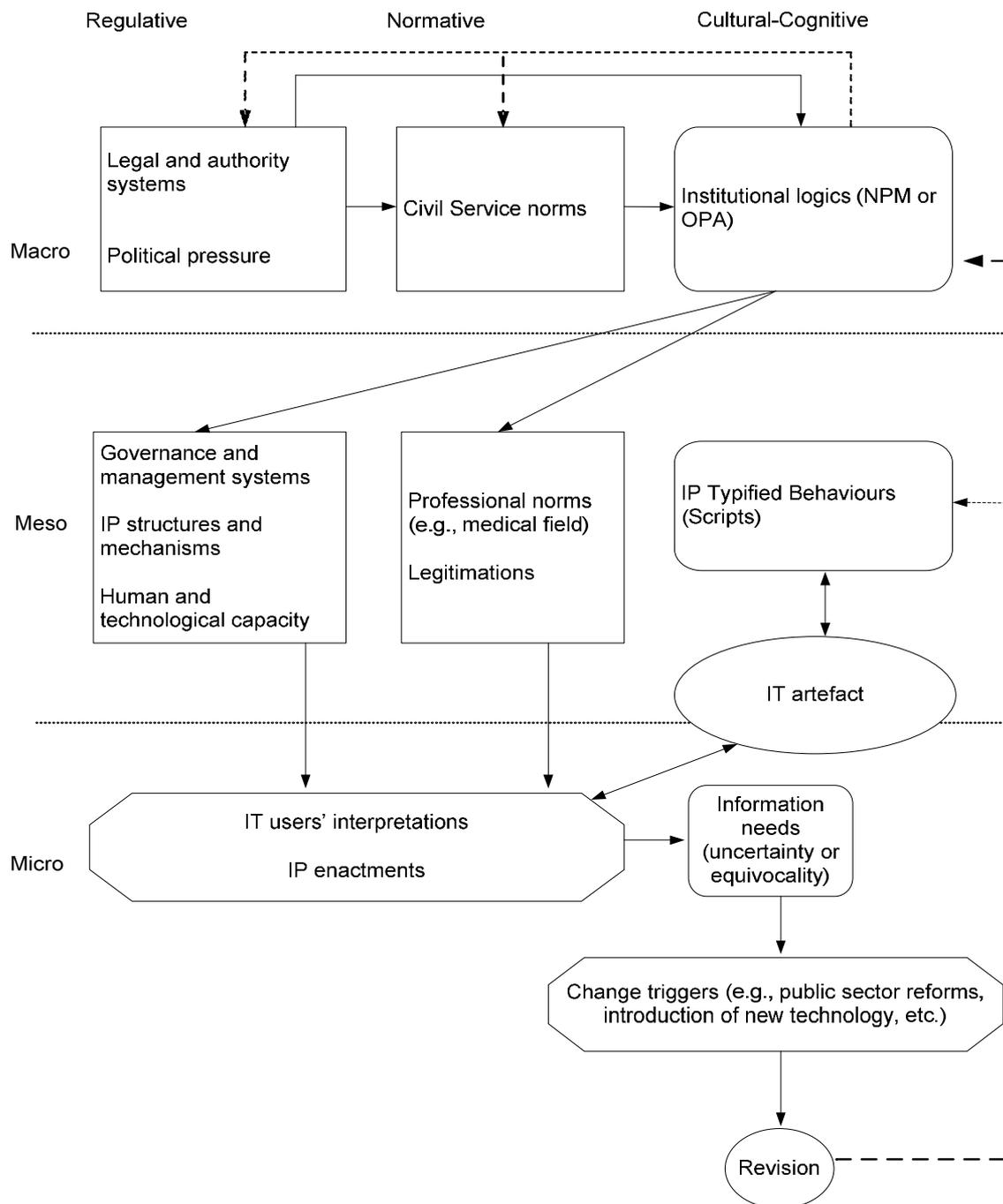
Figure 1. Multilevel institutionalist framework

The *macro or policy level* focuses on the influence of different actors (e.g., Governments, donor agencies) in the diffusion of new public sector models and technologies (Ciborra et al. 2005). At this level the main institutional mechanisms are "legal and authority systems" including the international pressure carried through donor funding (regulative pillar), "Civil service norms" (normative pillar) (Scott 2001), and the two main sets of meanings ("cultural-cognitive pillar") characterising the multivocality of the public sector in Africa: the New Public Management embodied in the reforms (Hood 1991), and the Old Public Administration (Lynn 2006) of local public service models (Table 1). Institutional logics at the macro level influence the institutional elements at the *meso or organisational level* encompassing governance and management systems, information processing mechanisms, human and technological capacity (regulative pillar), norms and legitimacies dictated by the professional field of the organisation (e.g., health) (normative pillar), patterns of typified information

processing behaviours (or "scripts") encoded in different institutional logics (NPM or OPA) (Barley, 1986) and influenced by the material properties of the IT tool (e.g., software source) and institutionally-embedded enactment of the IT tool ("IT-in-practice", Orlikowski 2000) at the *micro-level*.

NPM Logics	OPA Logics
Managerialism Increased responsibility and decision-making power at managerial level (disaggregation, agencification) Devolution (decentralisation of power to the periphery) De-politicisation of implementing structures and functions	**Bureaucracy and politicisation** Decision-making is concentrated at top of hierarchy Input controls, rules and procedures
Accountability Result and performance-oriented management system	**Political affiliation** Political rewarding system
Market Competition Externalisation of the public service to market	**Monopoly** Internalisation of service delivery (insourcing) Weak market economy
Customer-orientedness Responsive, diversified and "exclusive" service Customer identity of beneficiaries	**Politicisation of service** Central (external) political control Public service complies with international/national policy priorities Bureaucratic/administrative public service delivery

Table 1. Institutional logics of the New Public Management and Old Public Administration

At this level, IS users mobilise IT resources by drawing from this set of institutionalised patterns of information behaviour encoding institutions informed by either NPM or OPA institutions. Depending on how these are sensed (Weber and Glynn 2006), IT users build their perceptions and assumptions on information needs (e.g., uncertainty and equivocality reduction, Daft et al. 1981) and their choice of the best actions, processes and structures to meet them (Malhotra 2000). Hence, by grounding the information processing view of organisations within an institutionalist perspective, it is assumed that the information behaviour of individuals depends on how they legitimate their information needs over time under specific point-in-time institutional and technological pressures. This, in turn, influences their choice of which patterns of information behaviour or *scripts* to enact. Typified behaviours or scripts are viewed as encoded in policy or macro-institutional mechanisms, organisational structures, and technical features of the IT tools available. The revision of typified behaviours may destabilise the institutional order (Chreim, Williams et al. 2007) giving rise to hybrids that inform new organisational structures.

3 THE CASE STUDY OF TWO HEALTH INFORMATION SYSTEMS IN KENYA

3.1 Methodology

The case study consists of two units of analysis: the central Division of Health Management Information Systems (D1), and the Division of Vaccines and Immunisation (D2). The divisions represent two of the units of analysis of the case study of three health management information systems in Kenya including the HIV/AIDS information system of the National AIDS Programme. Data were collected during a field visit at the Ministry of Health in Kenya. The case study comprehends a sample of thirty-eight semi-structured interviews (one hour average each), 13 from the Division of Health Management Information Systems (D1); 11 from the Division of Vaccines and

Immunisation (D2), and the rest from the National AIDS Programme, which is not illustrated in this paper.

Staff members with the earliest date of deployment were selected in order to capture the longest longitudinal accounts possible. Moreover, the sample included not only health records officers, the direct users of the information system, but also medical management and technicians, i.e., the indirect users of the information system. The inclusion of different organisational roles into the sample of informants was part of a "comprehensive sampling" strategy (Miles & Huberman, 1994, p. 38) in order to have a more systemic view of the evolution of the information system and technological changes.

The questionnaire was structured according to the theoretical framework in Figure 1. Questions were asked regarding their main functions in the division, changes in their working practices, professional values, technological changes and institutional reforms. Interview data on public sector reforms were also triangulated with main policy documents of the Government of Kenya and Ministry of Health covering a period from 1990s up to date. Relevant international agencies' policy and project documents were also retrieved online.

Data analysis was also framed within the theoretical framework of Figure 1. Interviews were first transcribed and coded in NVIVO 8. Starting from a pre-defined set of codes for each level (macro, meso, and micro) and pillar (regulative, normative, and cognitive), new codes were created along the process of data analysis (Miles & Huberman, 1994 p. 58). Time-series codes were also created starting from 1980 with a five-year interval. After coding each set of interviews for one division, codes were reviewed and similar codes were grouped under common categories ("pattern coding", Miles & Huberman, 1994, p. 69). As a consequence, all data from the previous division had to be reviewed and analysed again to take into account the new concepts.

3.2 Overview of context

The two divisions have developed separate information systems, each characterized by different technological, organisational and policy histories that have affected their evolution. In the last two decades, the health care system in Kenya has gone through a series of public sector reforms mainly under the pressure of multilateral financial institutions such as the WB and the IMF (e.g., "Structural Adjustment Programmes"; "Poverty Reduction Strategy Paper"). In reaction to these reforms, the Ministry of Health issued the National Health Policy Framework (GOK 1994) followed by two major five-year implementation plans in 1999 and 2005 (MoH 1999; MoH 2005). The health sector reform had among its objectives the decentralisation of sector management to the lower levels of the health systems (e.g., districts) and the integration of the health service packages for a more cost-effective and accessible health care.

Thus, the implementation of the reform required the creation and strengthening of health management information systems at the provinces, districts, and health facilities. It is also supposed to involve the merging of health information systems scattered across the various vertical health programmes (e.g., HIV/AIDS) into the central health management information systems of the Ministry of Health.

It followed that in the 80s the Ministry started decentralising the local planning of the health care provision to the districts (GOK 1994) including the creation of health management information systems in district offices. However, apart from this, not much has been achieved in the implementation of the reforms. On the contrary, programmes have developed separate information systems exacerbating the lack of integration and coordination across programmes. This did also negatively affect the decentralisation of health information systems by overloading reporting systems of districts and health facilities.

Since 2005, however, the introduction of result-based management and monitoring and evaluation systems has given a new boost to the decentralisation and integration of health information systems (NSSSP II 2005-2010, MoH 2005). These reforms represent the apex of the restructuring of the public

sector under the logic of the NPM, marking the formal shift from a bureaucratic output-based to a managerial outcome-based approach. As a result, more emphasis has been put onto an integrated well functioning Health Management Information System at all levels. This is supposed to work as a key component of the monitoring and evaluation system of the health service.

3.3 Case study analysis

3.3.1 Division of Health Management Information Systems (D1)

The HMIS Division (D1) is responsible for the collection and analysis of routine health data (e.g., outpatient morbidity, inpatient morbidity and mortality, service utilization, hospital administrative statistics, etc.). Data are managed through Clarion a dos-based data base management system developed in the early 90s through donor assistance. However, given the low usability of the system and the lack of specialised assistance for maintenance, in 2004 most data were migrated to Excel for data analysis. Due to the low data storage capacity of Excel, the only data still stored in Clarion are the in-patients which need to be exported to Excel sheets for the analysis.

Thus, after more than fifteen years Clarion is still in place, despite the fact that health information officers in the division feel quite uncomfortable to work with an obsolete dos-based system that they consider unfriendly and cumbersome. Moreover, the technical features of Clarion (incompatible with Windows- and web-based platforms) have limited its diffusion in the health service and, consequently, its legitimization. This system could not be easily and cost-effectively adopted by the lower levels of the health system posing limitations to the decentralization of the division's information processing structures. As a consequence, apart from a few districts sending their reports in Excel sheets, most data entry is still done at the central level enacting the OPA cultural-cognitive institution of "centralised information processing".

This is mainly due to the lack of legitimacy of the division within the health system ("macro-normative"). In fact, the contradictory views over the nature of the mission and tasks of the division in the health system caused no little confusion in the governance arrangements of the division (meso-regulative) with serious implication for its financial support (macro-regulative): "we were under preventive and promotive, then I realised another time we were told no […] we should report to […] planning cause you provide information for planning […] that is why even when we asked for support we could not be supported". It is only after the introduction of performance contracts with the public sector reforms in 2005 and the official recognition of HMIS as the Ministry's Monitoring and Evaluation system that the division's staff could rely on a stronger institutional back-up, a new governance structure with a clear mission legitimized by the top-ranks of the Ministry.

Since then, the management and staff's decisions and actions have also been characterized by the logics of managerialism and accountability triggering the strengthening of its information processing capacity. Only recently have the provinces and districts been equipped with new IT tools, which could bring to a partial decentralization of its information processing structures. However, this has not happened with government funding, as one could have expected, but still with donor resources.

Hence, the formal acknowledgement of the role of HMIS by the government reforms has not been followed by a substantial legitimation of the division ("Rhetoric of change"). Its mission is still output-oriented and passive with respect to the new overall vision and mission of the Ministry of Health aiming towards a more efficient and inclusive health service The lack of support and legitimacy at the macro level and the absence of a strong and focused mission at the meso level hindered the entrepreneurship of health records and information officers and the medical leadership in their attempts to strengthen the information system.

Management and health information staff are still struggling to gain major legitimacy and attract more government support notwithstanding the more enabling policy environment. Under these circumstances, they have been unable to put into place technological improvements and coherent information processing mechanisms and procedures (e.g., different data entry processes per system)

that could have streamlined the division IS through a stronger integration across central and peripheral levels of the health information system. Hence, the information processing structures of the division are still centralised and cumbersome.

3.3.2 Division of Vaccines and Immunisation (D2)

Like in the division of HMIS (D1), in the Division of Vaccines and Immunisation (D2), computerisation happened in the early 90s with the adoption of CEIS (Computerised Epidemiological Information System), a dos-based system developed and implemented through donor assistance. Like Clarion, CEIS was very cumbersome to use especially because of the lack of programmers that could fix its bugs and upgrade it to accommodate new information requirements. However, towards the end of 2003 the division experienced a more radical technological shift with the upgrading of the old system into Epi-Info, a more user-friendly, self-sufficient Windows computerised system, compatible with a web-based working environment. This innovation enabled a major integration between the central information system and data management offices at the periphery.

This technological shift is the result of an institutional process that started in the 80s when the division was created under the international mandate of the World Health Organisations Expandable Programme on Immunisation (WHO 1989). Thus, based on the major legitimacy of its mission in the global health strategies (macro-normative), the division was supported by conspicuous donor funding.

Informed by the OPA logic of "politicisation of service", the exogenous pressures of donor funding triggered a series of actions and events at the micro level, that, by contrast, were mainly informed by the NPM logics of "accountability" and "customer-orientedness".

One action in particular was the initiation of a performance-based grant programme of immunisation at the beginning of the year 2000. This constituted an incentive for the division to improve its routine monitoring systems to provide data evidence that could award them with further funding. Thus, under the NPM logic of "managerialism", the management of the division engaged in a series of activities to streamline the information system. It started by asking support from international partners to design EPI-Info, a new Windows-based network system. By the end of 2003 EPI-Info was rolled out to the provincial offices which started performing data entry. In this way, the workload of processing information was more evenly distributed between the centre and the provincial offices ("partial decentralisation of information processing"). Later on, policy guidelines on data management were also introduced at all levels bringing more consistency in routine reporting.

Although the latest improvements have happened under the pressure and with the help of international partners, the need to attract donor funding does not seem to have been the major reason behind it. In the last decade, most donor funding has been diverted from immunisation to other international health priorities (e.g., HIV/AIDS). Hence, while in 1999 donor contribution to the routine immunisation system was 83% against the 17% from Government budget, in 2001 Government financing equalled 53% of total expenditures after the Government increased considerably its contributions to vaccines procurement (WHO 2001).

This means that besides the attractiveness of donor funding, the structural improvements in the health information system that followed the development and implementation of EPI-Info rested onto the new legitimation that immunisation and disease surveillance data acquired within the country. Aware of this, management sought as much support as they could to improve their monitoring and evaluation systems in order to provide evidence of the division's achievements and needs to secure funding from the Government budget.

Hence, the Government ownership (and legitimacy) of national immunisation initiatives facilitated the "translation" (Zilber 2006) of the value of health information for planning instilled by international partners. In this way, the management of the division was facilitated with respect to other departments such as HMIS (D1) in the implementation of the Second National Health Sector Strategic Plan (2005-2010).

Hence, the logics of accountability and customer-orientedness have been the major triggers towards the adoption of a new computerised system for the restructuration of the health information system following the legitimacy of the division in the national health service. These logics survived the considerable withdrawal of donor contribution. In contrast, they were reinforced by the need to compete for the meagre government resources. The appropriation of these endogenous logics into the national immunisation services allowed a more consistent action of management towards an efficient and effective M&E system within the framework of the new reforms.

4   DISCUSSION OF FINDINGS

Findings show that the adoption of Information Technology has led to distinct institutional shifts and organisational outcomes. In the Division of Health Management Information System (D1) cultural-cognitive institutions informing central information processing still persist in contrast with the Division on Vaccines and Immunisation (D2) where the process of decentralisation of their information systems has been more effective. The different impact of the technology onto the structures of the health information systems of the two divisions is due to both institutional and the embedded material resource environment, namely, the technical properties of the technology and available human capabilities.

Although decentralisation policies started far back in the late 80s, the decentralisation of health care delivery has never been fully achieved. The case study shows how different approaches towards technological change and the usage of IT in the two divisions have actually produced opposite outcomes in the decentralisation of the structures of two health management information systems informed by the same policy environment.

In particular, in the first division the weakness of endogenous macro-policy institutions fails to translate the new logics of the NPM informing the reforms into the local setting. The mediator function of the meso-level institutions in maximising the benefits of IT-enabled change is thus hindered. The initiative of management and records personnel did not find the necessary support at the policy level lacking access to the resources necessary for the enactment of the new logics. Although the normative pressures at the meso level from the health records profession to improve the efficiency of the HIS might have identified the need for new IT systems and information processing practices, the lack of a viable institutional, and consequently, material resource environment has prevented these demands from being turned into a necessity and a clear response action.

In contrast, an increased commitment by the central Government in the provision of immunisation services brought about the necessary legitimacy of the Division of Vaccines and Immunisation (D2) in the national health system. The new legitimacy instilled a stronger motivation by management towards the enactment of imported logics informing donor-driven monitoring and evaluation systems into the local context. This motivated management towards the employment of information technology for the partial decentralisation of the information system. Management has been an important catalyst of change towards this direction by focusing on the provinces as the strategic layer of coordination of the health information system and by standardizing data collection practices. Hence, although donors were instrumental by providing the financial and technical resources necessary for the set up of the new computerised system (Epi-Info), the main trigger of the IT-enabled decentralisation of the information system came from endogenous pressure to acquire national legitimacy that would secure Government funding.

Although the alignment between political administrative, management and user levels (Kimaro & Sahay 2007) is important for attaining results, this alignment is easier to achieve when there is a strong support and legitimation from the political administrative level. Institutional forces at the macro-policy level are the main triggers of IT-enabled organizational change. This change is as much consistent and effective as the main cultural-cognitive institutions informing it are supported by endogenous institutions at the macro level.

Finally, further important considerations can also been drawn from the material resource environment, specifically, in relation to the technical features of the IT systems. Epi-Info (D2) and Clarion (D1) were both exogenous technologies of western origin introduced to improve efficiency (timeliness) and accuracy (completeness) of information (Health reports). However, this happened in two different and distant periods of time with different technological advancements. In the early 90s, the technical properties of information technologies did not enable easy networking and communication channels for the integration of information processing. Moreover, being Dos-based, its lower level of usability and user-friendliness implied high deployment costs to the data management offices at the periphery. Lastly, off-the-shelf data management packages were not as diffused as today (e.g., Excel) and the development and enhancement of integrated application suits for data storage and analysis, especially, with poor in-house capacity, was quite demanding. Given the technological advancements of the time, Clarion was among the best technologies to achieve "timeliness and completeness of reporting" by enabling fast data entry and increased data storage capacity at the central IS office.

Hence, although the institutional pressures and sources for change are more or less the same for both systems (donors want more efficient M&E system "accountability") and such institutional pressures or mechanisms encode the same meanings ("cultural-cognitive institutions") of change, the enactment of these meanings is influenced by material technological environments (entailing different technological properties) spanning across two different technological eras. Eventually, this gives rise to two different structural and institutional outcomes (centralisation vs. partial decentralisation) and of course performance outcomes.

Likewise, what is it that turns the users' perceptions of Clarion as an efficient system of the 90s to an outdated and cumbersome system of the year 2000? Most likely, the trigger of a change of cognitive framing (Orlikowski et al. 1994; Davidson 2006) of Clarion has been the exposure towards more advanced technologies. This must have increased the awareness that there are more efficient ways of processing data through IT tools. Hence, it can be inferred that the major factor influencing the changes in the framing of Clarion has been the evolution of the technological environment and the availability of more advanced data analysis features. This has contributed to a more limited usage of Clarion and, on the other hand, a more frequent usage of Excel, which contributes to the enactment of different IT-enabled IP behaviours ("IT-in-use structures", Orlikowski 2000) and also distribution of tasks.

5   CONCLUSIONS

The case study has shown that the impact of information technology onto the structures of a health information system in Africa is mainly influenced by the support of endogenous macro-level policy institutions and resources. These stimulate the enactment of exogenous cultural-cognitive institutions informing donor-driven reforms by management and key professions at the meso-organisational level towards the usage of technology for sustainable change. Moreover, the material resource-environment represented by the institutionally-embedded technical properties of IT and relevant human expertise is instrumental for the translation of exogenous logics informing change. Hence, the IT artefact can be used to reduce the gap between formal planned structures and informal routine or practices (Kimaro & Sahay 2007) of IT users, if new rationalities embedded in imported reform models are translated to the local context through stronger Government commitment at the macro/policy level. This can facilitate the task of management and key professional staff in their effort to leverage information technology for the realignment between policy discourses at the macro level and their enactment at the micro-level.

The material resource environment plays a considerable role in shaping the institutional forces underpinning IT innovation and usage. Donors' resources are still instrumental in the transfer of new technologies and accountability systems to the health systems of countries like Kenya. In fact, decision makers within Governments are not familiar with the usage of information technology as powerful tools for planning and monitoring the health system. Moreover, specialised solutions such as

computerised epidemiological systems are more available from the global market than the local market.

Management and professionals at the meso level of the public administration can reduce the gap between global and local "technological frames" (Orlikowski and Guah 1994, Davidson 2006). Being more exposed to international experts, and new innovations, and building onto past experience of IT investments, they can master IT-enabled transformations for a sustainable and effective restructuration of the health information system.

Moreover, the technological environment, in terms of different technological properties, also contributes to the definition of institutional pressures and management and IT users enactments. Hence, expectations of structural changes and performance depend onto the opportunities offered by technological advancements. In the same way, the enactment of same logics (e.g., efficient data processing) can lead to different structural outcomes depending on the material properties of the technology and the influence of the material technological environment (e.g., dos-based systems are kept for centralised systems, while Windows- and Web-based technologies are introduced to decentralise systems). These considerations offer a contribution towards a better conceptualisation of the IT-artefact in the human enactment of information technology.

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