Implementing a new health management information system in Uganda

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This paper reports on research investigating the health management information system (HMIS) implementation process in Uganda, utilizing the diffusion of innovation and dynamic equilibrium organizational change models. Neither perspective guided the HMIS development process. Instead, technological issues, rather than wider organizational issues, dominated the planned change. The need to consider the organizational context when changing information systems arises because the process is more complex than some practitioners have realized, when attempting to understand the causes of information management problems and developing HMIS in low-income countries.

In particular, information system developers had not acknowledged that they were promoting an informational approach to management when they promoted a change from a centralized reporting system to a HMIS supporting use of information at the level of collection. Strategies to facilitate this approach were not advocated.

Organizational theory can contribute to the diffusion of innovation framework. It has yielded an integration of Rogers’s diffusion of innovation framework and Leavitt’s concept of organizational forces in equilibrium. The diffusion framework describes the process, but the organizational model has given the context and reason for aspects of the process. The diffusion model does not predict what needs to change within the organization when a particular innovation is introduced, or how much. The addition of the organizational model has helped.

These frameworks can facilitate the introduction of future information management innovations and allow practitioners to perceive their introduction as a staged process needing to be managed. Implications for practice are identified.

Key words: health information, organisational change, diffusion of innovation, information use

Introduction

Until 1993 Uganda had a centralized health information system (HIS) focusing on morbidity and mortality reporting, with data flowing only from individual health units to the district and national level. Since then, the Ministry of Health (MOH) implemented a health management information system (HMIS) that emphasizes use of information at the point of collection.

Many other low-income countries are moving in the same direction, with more skills demanded of primary health care (PHC) managers, including data and information handling at all levels of the health care system (AKF 1993). The World Health Organization (WHO) identified district-oriented health information systems as a priority (WHO 1988) and noted that 'weakness of information support is acknowledged by most member states as a persistent obstacle to vigorous and objective management', and that ‘efforts to strengthen national information systems have often produced little improvement and have sometimes made the problems worse’ (WHO 1994a).

The Commission on Health Research for Development (1990) identified a need for research on the development of practical health information systems to guide policy and management decisions, and HIS improvements were identified as essential by countries such as Tanzania (Research into Action 1999: 8) and the Caribbean (Research into Action 2000: 5). International partnerships have mobilized funds and technical support as HIS improvements were advocated as part of improving health in low-income countries (World Bank 1999a, 1999b, 2000b, 2001). WHO has taken a lead in helping low-income countries develop HIS by providing technical and financial support to assess, design and develop such systems. No standard development strategy for WHO support is used, but specific principles for guiding HIS development and technical cooperation are encouraged (WHO 2000a). A review of the...
Developing and improving health information systems


Many of these problems indicate a need for information that could inform various aspects of operational managers’ policy implementation, monitoring, evaluation and planning role, rather than contribute to profiling morbidity and mortality status for national use, which was often the aim of central reporting HIS. An underlying concept in many papers is the need for information management strategies to promote an informational approach to health unit and district level health management.

Few publications describe the development of a new HMIS for operational management in a low-income country, although some describe the adoption of information technology at national or health unit level (Newbrander and Thomason 1988; Singh et al. 1992; Jayasuriya 1999). Information system developers in Ghana (Campbell et al. 1996) recognized the scarcity of research describing the process of developing HMIS for operational managers. Van Harteveld (1993) discusses the need for an information management approach when strengthening information systems in Ghana.

Foltz (1993) describes technology transfer in Chad to improve a national reporting system, apparently not developed for operational management of health services, but does not measure success in such use of information. A case study of information system development in Niger (Mock et al. 1993) describes the change from a centralized reporting system to an HMIS, but only MOH central management is facilitated. Duran-Arenas et al. (1998) describe the development of an information system in Mexico which they believe has implications for low-income countries. Robey and Lee (1990), describing the HIS redesign process in the Philippines, identify useful lessons, as does Jayasuriya (1999) in implementing a computerized information system. Heywood and Campbell (1997) identify the need for critical appraisal of determinants of success and failure of HMIS. WHO identifies the need to document common barriers to establishing and sustaining effective routine HMIS and identifies strategies to minimize their effects (WHO 2001b).

This paper reports on a research study to understand the information system implementation process in Uganda as it moved from a centralized reporting HIS to a HMIS that supports district and health unit management, using existing theory and research to deepen our understanding.

Methodology

Uganda was chosen because it was developing the HMIS when research funding was available. The qualitative approach follows Morse (1994), with the research strategy based not on conscious, prior consideration of philosophical questions, but on study purpose, research question, skills and resources available: if the question concerns the nature of the phenomenon, then the answer is best obtained by using ethnography.

We used participant observation, interviews, official document examination, written field-notes and diaries. Two country visits were made by JG, using the peripheral observer role (Alder and Alder 1994: 380) during a 1-day workshop and later during a 9-week period of HMIS training. Twenty-nine in-depth interviews, 47 semi-structured interviews and 19 group discussions with health unit, district level and national health officials, academics, district management trainers and other health service providers complemented this work. Theme development was aided by NUD*IST software.

Using Phillips and Pugh’s (1994) classification of relationships between theory and empirical evidence, we use theory only to elucidate and develop further understanding when analyzing empirical data. Although initial data collection and analysis were not guided by existing theory, we were theoretically aware (Glaser and Strauss 1967) beforehand.

The theoretical constructs of most value have been Rogers’s (1995) diffusion of innovation framework and Leavitt’s (1965) idea of an organization as forces in dynamic equilibrium, elaborated by Leavitt et al. (1973), where organizations have a semi-permanent framework, an arrangement of the processes, material resources and people in some sequence and hierarchy: change in one part leads to changes elsewhere.

The diffusion of innovation framework is an approach to identify problems and specify a solution, or identify in advance issues that inhibit or facilitate adoption of a technological change. The decision regarding an innovation is seen
as a developing process, and a staged model, the Innovation-Decision Process, is proposed. Implementation does not automatically follow the decision to adopt an innovation – Rogers (1995) describes this as the Innovation-Process model of innovations within organizations.

Background

Uganda’s health sector reform was part of overall public sector reform (Villadsen 1996), involving a form of decentralization (Mills et al. 1990) called devolution (Jeppsson and Okuonz 2000). The district administration was strengthened with some formal transfer of power to lower levels as well, but, with insufficient financial means, the districts relied on central government. The MOH expected the districts to develop their own plans to reflect national policies and guidelines, but with district priorities and requirements (MOH 1993). Uganda had 45 districts in 1997, with no intermediate level. Each district has counties, sub-counties, parishes and villages.

Other major health policy changes taking place included restoration of services to acceptable levels to match the changing social, economic and political environment (MOH 1993b), and reorientation of health services to primary health care (PHC).

There was a legacy of irregular and inadequate wages for health workers and undue influence by international donors – on health services and policy (Okuonzi and Macrae 1995) – and by the nationally based vertical programmes. In 1987 a new HIS was introduced by the Health Planning Unit of the MOH; this was replaced by the HMIS in 1996/7.

The HIS was geared toward central planning to produce information on health unit activity to support international donors’ reports to their headquarters. The information was supplemented by ad hoc community-based surveys carried out by non-government organizations. Unlike the HIS, the HMIS information was to be for decision-making and improving operational health services performance. All health units (including non-government units) were to collect, process and report routine data relevant both to national policy and health programme objectives and to the needs of health unit health professionals. The design identified critical management questions that the information should answer and, to identify appropriate data collection, processing and analysis, utilized the systems framework of inputs, procedures, outputs and outcomes for immediate management, rather than awaiting higher-level feedback. The system was to be integrated by having one data source and set of forms in the health facility, so that all existing health programme and general administrative information would be brought together, instead of having parallel and duplicate information.

Specified data and information flows included: the internal flow of information amongst the health unit team; written monthly reporting from the health unit to the District Health Team (DHT); oral reporting of specific information to DHT members on supervisory visits; and written feedback from the DHT for comparison with other health facilities.

Data processing and analysis were intended to be primarily conducted by health unit staff, processed into summary values to show changes over time, and provide performance indicators at health facility, district and national level. Aggregation of data only to the level where information could be produced for decision-making was intended to make the data meaningful. Graphs of routine information were to be produced by health units for their own purposes.

The intended use of information in health units was not always clear from the documentation, but implied: indicators of low performance leading to examination of individual records to provide insights into how to improve; collection of specific information to trigger certain actions at health unit and district level, such as specific disease notification leading to investigation; service targets to be made using population information, knowledge of attendance and available resources; and information to be used to answer specific management questions and plan future health unit services.

Information use at district level was intended to include: formulation, monitoring and evaluation of annual workplans; monitoring and improvement of health unit service delivery in coordination with support supervision visits; and reporting of selected information to the District Health Committee for planning, monitoring and evaluating progress towards district and national objectives. Reports generated for various national MOH and donor departments were to be used for national planning and policy formulation.

Some features within the HMIS were not always made explicit: certain management tools; the teaching and supervision role of the Extended DHT (EDHT); and the ‘informational approach’ to decision-making, encompassing the ‘rational health unit decision-maker’.

The HMIS was initially designed and developed with expatriate consultant help and input from the MOH and other health care providers and donors. It was piloted in two districts and extended gradually to all districts. Two developers and 12 trainers trained the EDHT, who then trained in-charges and senior health staff at health units.

Results: adoption of a HMIS innovation

The HMIS is viewed here as innovation diffusion, focusing on the Implementation stage, when district personnel were trained. Figure 1 illustrates our use of the Innovation-Process model with concepts from the Innovation-Decision model. Leavitt’s dynamic equilibrium framework was essential to complete that understanding, as indicated by the diamond shapes.

Redefining the innovation

Redefining the innovation to meet organizational needs and structure took place as the HMIS definition and its purpose varied. The developer and trainers did not adequately
explain the Principles Knowledge embedded in the HMIS, namely the anticipated new approach to management and decision-making based on information. Examination of the specified management questions was not in the classroom-based curriculum for supervisors or in-charges. Trainers redefined the HMIS by focusing their training not on health unit information use but on data collection and processing for in-charges and by leaving use of information and much processing for district-level staff.

New definitions were probably dependent upon individual ability and role. Health workers saw the HMIS as: new and integrated, with fewer forms; new centres for holding information; logistic and supplies data, morbidity data and data produced through interaction with patients. The HMIS affected data flows; monthly reports were going to district offices, and duplicate reports were probably not sent to national level. Health units did not process information as expected; many health workers could not graph data and district staff did this. Using information to inform decisions proved too difficult for in-charges and often district or national level staff set targets instead.

Innovation adoption at health units was only partial. The HMIS was serving district needs more than health unit needs, so redefining had taken place. One District Medical Officer said he used the HMIS information “for the annual Workplan we are doing now, for setting priorities, by knowing the most recurring diseases, for resource calculations, to know the numbers of patients. But I think the HMIS is of more benefit to the district than to the health unit, especially with decentralization.” District staff processed the data and new forms to varying degrees, though some found the work too difficult.

Reasons for redefining

Previous practice contributed to redefining and included: existing information management problems; the HIS information management strategies; old ways of working; concomitant changes; recent policy not enacted; management problems at district and health unit level; excessive influence of international donors; and organizational and cultural practices. Other reasons, also identified by Rogers (1995), included: adopters lacking full knowledge of the innovation; the desire to simplify a complex and difficult to understand innovation; and the innovation being an abstract concept and tool. Other reasons, not identified by Rogers, were: ‘inventors’, change agents and aides lacked full knowledge of the innovation; lack of management tools to utilize the innovation; and insufficient decision-making power.

The innovation’s perceived attributes and incompatibility with management roles, ability, policy and organizational situation were probably contributing to redefining. There was a lack of tools to monitor and evaluate the innovation’s implementation and use, and a lack of understanding of changes needed with the HMIS. The management tools, power and attributes of the innovation were not aligned with the HMIS in accordance with the dynamic equilibrium concept.

Restructuring

Organizational restructuring occurred since the innovation was introduced but not aligned, including: the role of the Medical Records Officer (MRO) at district and health unit level; the power structure within health units and district offices; administrative procedures; additional contractual
relationships; and empowerment of some people to whom the HMIS training brought extra finance.

**Constraints on implementation**

The hierarchy of power in health units and at district level constrained HMIS implementation, as decentralization was not fully enacted or understood. The previous hierarchy of power placed the MRO in a lowly position, but the district MRO was now expected to be an HMIS supervisor, even of clinically trained staff, and fellow DHT members were expected to produce reports the MRO could file, collate and even interpret, which meant he had the right to demand reports from these staff. While changes were expected in health units, developers and trainers were unaware of these constraints. Although face-to-face training of in-charges by supervisors was probably an appropriate communications strategy, insufficient time was allocated. Hence the social and communication structures impeded diffusion.

Several constraints related to the HMIS's perceived attributes. The intended training approach was not always undertaken and there was a lack of understanding of changes needed to accompany the innovation. Several unfounded assumptions were made about health unit staff and procedures when identifying relevant information management strategies. For example, HMIS data collection, processing and information use assumes a certain level of general education and specialist training amongst health workers, but this was not available, especially in smaller health units. Too few support supervision visits for HMIS training were made for health unit personnel to grasp new skills, such as data processing, compiling graphs and statistics. The trainers falsely assumed that in-charges could easily be taught data processing methods, but after 3 years many in-charges in pilot areas had problems. Data collection was not always linked to diagnostic ability as many health units did not have the equipment and/or expertise to diagnose the diseases monitored. Many nursing aids trained on-the-job had insufficient grasp of English language concepts in the materials. Workers' skills were not aligned with the HMIS.

Organizational changes intended to be in place before HMIS implementation, including decentralization and the extension of managerial responsibilities for health unit clinicians, were incomplete. Thus there was some incompatibility of information management strategies with management roles, ability, policy and organizational situation.

After 3 years of engaging with the HMIS, people were seeking innovation knowledge of various kinds. The developer lacked faith in the usefulness of the HMIS, and there were too few tools to monitor and evaluate the innovation's implementation and use. These constraints may be due to the HMIS definition or to the management of information system development. Classifying these as incompatibility of perceived attributes deepens understanding, as Rogers (1995) suggests, but it could be interpreted as the innovation upsetting the dynamic equilibrium of the organization.

A key perception of the implementers was that international donors had excessive influence over health unit data collection and, because they were interested in particular country-wide programmes, national level MOH, rather than district or health unit staff, often determined data collection.

The complexity of introducing the HMIS has been clarified after developing a combined and expanded model from Rogers's two models. Our findings on HMIS implementation do not fit neatly into the classical Innovation-Decision Process model, particularly because the implementation phase is too limiting.

The Innovation-Process model's redefining and restructuring concepts offered clarification, as did many Innovation-Decision model concepts, including: prior conditions affecting implementation, perceived attributes, and lack of knowledge constraining implementation. Unlike Rogers's (1995) Innovation-Decision model, it appears these concepts, which would usually be important before the adoption decision, were important in the implementation stage. Re-invention of the innovation during implementation is possible (Rogers 1995).

These two models do not entirely explain the evidence. Rogers's (1995) concept of structural change within an organization is too limited to understand how different aspects of the organization change with innovation introduction. An adapted version of Leavitt's dynamic equilibrium model was developed viewing the HMIS as the technology.

Figure 2 illustrates the dynamic equilibrium model, with suggestions of where non-alignment occurred in health units. The earlier description indicated management roles or in-charge ability were not always appropriate to the information management strategies, and vice versa. Management roles and the HMIS were not 'aligned': the HMIS assumes in-charges will be managers, with monitoring, evaluating, controlling and planning responsibilities, but these responsibilities have not been completely devolved. In-charges do not have complete control over drug supply, which the rational decision-maker idea assumes. The patchy implementation of the cost-sharing policy and incomplete financial decentralization illustrate lack of alignment between structure and information management strategies; cost analysis procedures were sometimes redundant. If in-charges wanted to act as rational managers and take an informational approach to decision-making, lack of power prevented this.

The intended strategy of small health units is to provide comprehensive PHC services with principles of equity and community participation. In-charges have to monitor, control and evaluate health centre services and resources, manage staff and provide accommodation. For there to be alignment of these two aspects, information to support the policy and roles is needed, but this was often not the case. Non-alignment of technology with organizational strategy arose, as the data to monitor the strategies were lacking. Few data were collected which could indicate which specific groups within the health unit catchment area were in greater need or accessing more services than other groups. Data collection or management questions on the following were
Implementing a health management information system

Figure 2. Application of dynamic equilibrium model of organizational change in health units: the HMIS is not aligned to Intended Strategy, Structure, Individuals and Roles, or Management process

not incorporated into the HMIS: socioeconomic factors, access to clean water and sanitation, and attitudes, practice and knowledge of health-related behaviour – all components of Comprehensive PHC (CPHC) vision.

Assuming management tools, procedures and style are an additional organizational force (Scott Morton 1991), this case study indicates non-alignment of health unit information management strategies and this force. One key informant said it was difficult to use information on the percentage of children with protein-energy malnutrition “as there are no standardized case definitions”, an essential management tool. Information management strategies were not linked to health unit decision rules, and there was no alignment of strategy and HMIS. ‘Individuals and Roles’ appear to be non-aligned with the HMIS, although some job changes were taking place to facilitate alignment. Some administrative procedures and information management strategies were not aligned.

The diffusion framework describes the process, but the (Figure 1) in order to complete understanding of the process. Non-alignment of organizational structure with the HMIS was apparent to the developer, who felt lack of district level financial control inhibited information use. In a devolved situation, international donors should negotiate with district and national level personnel, yet when donors held a district meeting, they merely gave information. It was also felt the organizational structure prevented implementation in other ways. One District Health Volunteer believed the HMIS was useful information. Some changes in the MRO role were also taking place; the technology was pushing realignment of individuals and roles.

Non-alignment of organizational structure with the HMIS was apparent to the developer, who felt lack of district level financial control inhibited information use. In a devolved situation, international donors should negotiate with district and national level personnel, yet when donors held a district meeting, they merely gave information. It was also felt the organizational structure prevented implementation in other ways. One District Health Volunteer believed the HMIS needed a good communication and referral system in order to work, but this was lacking, especially during the rainy season. With decentralization there had been some redistribution and reinforcement of power at DHT level and District Medical Officers became more powerful, but the teamworking idea imposed by national and international agencies could conflict with this.

The exploration of the change from the HIS to the HMIS, within Leavitt’s theoretical framework, reveals other changes needed to ensure equilibrium and proper information system functioning. It proved useful to change Task to Strategy and add Management procedures, tools and style as an additional force within the organization, though this organizational change model has been useful only as an adjunct to the Innovation-Process model. Dynamic equilibrium diamonds are placed within the Redefining and Restructuring Stage (Figure 1) in order to complete understanding of the process. The diffusion framework describes the process, but the
organizational model has given the context and reason for aspects of that process. The diffusion model does not predict what needs to change within the organization when a particular innovation is introduced, or how much, but the addition of the organizational model has helped.

Discussion

The need to consider the organizational context when changing information systems suggests the process is more complex than some practitioners have realized when attempting to understand the causes of information management problems and developing HMIS in low-income countries. Avgerou (1993) also criticizes national development planning information-system developers for not seeing organizational change as part of the systems development process in low-income countries.

The extent of change needed to accompany the HMIS had not been recognized and health workers were focusing upon the small, rather than significant information system changes in the absence of definitive information. Rogers (1995) did not discuss this, but others distinguish radical change from incremental change (Kaluzny et al. 1977; Greer 1981; Onstrup and Pinto 1991; Orlikowski 1993).

The issue of an innovation bringing concomitant changes or a cluster of innovations is mentioned by Bonair et al. (1989) who reviewed the transfer of medical technologies to low-income countries: 'Transfer of foreign medical technology to developing countries means not only transfer of drugs and equipment, but also transfer of a foreign cultural perception of disease, the so-called western medical paradigm.' Foltz (1993) recognizes the problem of defining the innovation, a new MIS in Chad, when she says this is a complex combination of organization and computer technology. The developers and trainers did not fully recognize that the HMIS was intended to promote an informational approach to management. In Niger (Mock et al. 1993), information system developers realized they were introducing not only statistical techniques, but also a new management approach with wider organizational consequences.

The diffusion of innovation framework, in its application to organizations, is predicated on the following idea: 'An organization is a stable system of individuals who work together to achieve common goals . .' Rogers (1995: 403). This idea was not borne out here. There was a conflict of interest amongst individuals within the organization, as national donors requested extra data collection and processing to support their headquarters’ interest, rather than MOH information management strategies. Using the diffusion of innovation framework to deepen understanding of the adoption of new information management strategies in a management-training package, Gladwin et al. (2002) identified that individuals supporting the adoption were pursuing personal career goals in addition to organizational ones. Mock et al. (1993) found personal agendas affected implementation when new information system strategies to reform the HMIS were introduced in Niger.

Greer (1977: 506) criticizes the diffusion of innovation framework because it does not take into account political theory. Themes of a political nature here were not explained within the framework, but they have been displayed graphically as additional issues in Figure 1. That civil servants pursue personal rather than organizational goals, constraining rational decision-making, is not a new concept (Montgomery 1987: 914; Gyimah-Boadi and Rothchild 1990: 52). Waddington (1992) claims that recognizing differences between

Figure 3. District level application of dynamic equilibrium model of organizational change: the HMIS is not aligned to intended Strategy, Structure, Individuals and Roles, or Management processes.
The Innovation-Process model does not include the idea that after the adoption decision, rejection or discontinuation could take place during implementation, although this is recognized in the Innovation-Decision Process. This research has shown the relevance of the Innovation-Process model and that social structure affects not only the decision to adopt (as the Innovation-Decision process suggests) but also the implementation process and consequences.

Information system developers and implementers had not acknowledged they were promoting an informational approach to management with the change from a centralized reporting system to an MIS supporting use of information at the level of collection. In Ghana, Campbell et al. (1996: 15), reporting on HMIS development, acknowledge their desire to increase the number of ‘informed decisions’. They assumed that having more objective, locally collected information would lead to more effective and consistent health management, but they did not acknowledge a different management approach was needed. Although they acknowledge appropriate data analysis tools and some management tools were necessary, there appears to be a lack of management questions or decisions associated with the data, and no training in management tools. They do not provide the conceptual framework to link information, management tools and management. Lipeveld et al. (2000) call for research which identifies ‘how one could design and conduct training that effectively improves the actual use of information for health services planning and management’.

Conclusion

This case study followed the HMIS planning process and explored the evidence by utilizing the diffusion of innovation and dynamic equilibrium organizational change model, which guided previous research and practice. Neither perspective guided HMIS development and implementation in Uganda. Instead, technological issues rather than wider organizational issues dominated the planned change to the HMIS.

The diffusion of innovation and dynamic equilibrium organizational change models are applicable to the introduction of new information management strategies and management approaches in low-income countries. Some refinements to the models described by Rogers and Leavitt have been made, as detailed by Gladwin (1999) and Gladwin and Wilson (2000). These frameworks can facilitate the practice of introducing such innovations and enable practitioners to see the introduction of innovations as a staged process to be managed. Issues that may facilitate or inhibit adoption may be identified in advance.

Some implications for practice from this study reinforce existing guidelines while others are new. Rogers’ (1995) diffusion framework is relevant to the introduction of new information management strategies and management approaches, and his 87 generalizations with implications for practice are also relevant. Table 1 identiﬁes some of the practical implications of this work; more detail is given in Gladwin (1999). These ideas can also be used as part of needs assessment and evaluation as well as introducing information management innovations. This case study has documented common barriers to establishing and sustaining effective routine HMIS and strategies to minimize their effects, a recent WHO aim (WHO 2001b).

Endnotes

1 This paper is a companion paper to the present one as it follows the introduction of another information management innovation; the two yield complementary implications for practice.

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### Table 1. Key implications for introducing information management innovations

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Strategies</th>
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<tr>
<td>Improve innovation definition</td>
<td>Develop implied Meaning or Principle Knowledge before introduction and introduce it before, or at the same time as, Awareness and How-to Knowledge. Clarify whether a radical change or natural extension is implied.</td>
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<tr>
<td>Understand potential adopter's situation</td>
<td>Be aware of organizational context and influencing factors.</td>
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<tr>
<td>Understand IM innovations involve organizational change</td>
<td>Address compatibility of innovation with existing practice. Ensure alignment of new IS technology by viewing introduction of IM innovation as issue of organizational change and facilitate alignment of forces within organization at all stages of process. Focus on information use as well as data collection and processing.</td>
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<tr>
<td>Adopt conceptual frameworks</td>
<td>Make explicit IM strategies to support informational management approach and put support strategies in place.</td>
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<tr>
<td>Utilize existing expertise and research in IS</td>
<td>Diffusion of innovation framework and organizational change ideas will allow practitioners to see innovation introduction as staged process to be managed. Efforts to improve HMIS should prioritize conceptual frameworks that describe health workers' understanding of factors affecting health status and are utilized in planning and monitoring.</td>
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<tr>
<td>Broad needs assessment, monitoring and evaluation</td>
<td>Clarify links between information, management tools and management.</td>
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<tr>
<td>Training</td>
<td>Develop national Health Information Management Strategy.</td>
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<tr>
<td>Adopt staged process of innovation diffusion</td>
<td>Needs assessment, evaluation and monitoring should focus upon data collection, processing and information use, skill levels and roles performed, organizational structure, organizational strategies, management tools and management processes in operation, and health workers' view of changes. All IM changes need to be monitored and evaluated; failure to adopt a particular IM strategy may signal inappropriateness. Allow sufficient time for this long process, particularly at planning stage, as HMIS implementation will proceed slowly, but chance of success will be higher.</td>
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<tr>
<td>Understand cultural issues</td>
<td>Develop appropriate IM strategies and general features.</td>
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| IM = information management; IS = information system; HMIS = Health Management Information System; DHT = District Health Team.
a case in the field of health care in Ghana. *International Forum on Information and Documentation* **18**: 32–6.


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