AN INVESTIGATION OF EFFICACY OF THE DOCUMENT-BASED HEALTH MANAGEMENT INFORMATION SYSTEM IN KIBAHA AND MOROGORO DISTRICTS, TANZANIA

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Abstract
This study was carried out in two districts namely Kibaha and Morogoro Urban in Tanzania. It sought to examine effectiveness of the document-based health management information system in health facilities. Fourteen (14) health facilities were visited and 41 respondents were involved. In this study, data were collected using questionnaire schedules and interviews. The findings reveal that though most health staff were not involved during the development of the system, they had high regard for it in relation to their information requirements. However, there were a number of factors that deterred its effectiveness. Suggestions are given on how the system could be improved.

Introduction

Routine health data collection in Tanzania evolved over the years. It dates back to the 1960s when there was the then called Kalamazoo system which consisted of few forms used for the collection of morbidity and mortality data. Though the Kalamazoo was deemed simple and thereby user friendly, it was said to be devoid of useful data on day to day management of health facilities and of the respective ministry as a whole (Mdoe, 2004). In the1980s, there was routine data collection from health facilities under the essential drugs programmes, which, unlike the former, was considered to have had some improvements. This contained data on equipment and for case management. Again, over the same period there were a number of vertical programmes established in the country. Data collected under those programmes did not benefit health facilities but rather turned them into mere conduits.

In early 1993, Tanzania set up a semi-computerised National Health Management Information System (NHMIS) in order to improve health performance, provision of health information, quality of data and planning and decision-making in the health sector (URT, 1993). This system may be divided into two categories: document-based health management information system and a computerised one. The system's structure requires all health service providers both government and non-governmental, report and forward data that they collect to District Medical Offices where it is compiled and forwarded to Regional Medical Offices. The Regional Medical Offices in turn, compile, process and forward the data to the Ministry of Health headquarters. Studies such as Mwangu (2003) and URT (2002) show that there has been

poor response in terms of data transmittion to higher authorities virtually at each level of the Health Management Information System although materials for use are free. Additionally, training in the use of those materials was provided to health staff. The problem was considered to be worse on the part of the private health sector. In view of this, there was a need to examine factors that deter effective functioning of the National Health Information Management Systems in health facilities such as dispensaries, health Centres and hospitals. Therefore, this is an exploratory study that intends to suggest how performance of the National Health Management Information System may be improved at the health facility level as they constitute relatively greater part of it.

Significance of the Study

Findings of this study has a practical value. First, an effective Health Management Information System subsytem in health facilities will improve their response rate hence quality information for planning and decision-making at all levels. Again, the researcher believes that uncovering root causes of problems inherent in the present system at the grassroot level would forerun for a better one. Results may also be a basis for reviewing and improving the quality of existing National Health Management Information Systems in the country. Lastly, this study may contribute to knowledge and literature on the topic.

General Objective

The general objective of this research was to examine the efficacy of the National Health Management information system with a view to determining factors that hinder its effective functioning.

Specific Objectives

Specifically, the study sought to:

a) Determine whether information needs of health staff were being met by the existing system;
b) Find out views of health staff regarding the following:
    i) Quality of the document-based system in terms of register books and information, and staff competence in data collection and processing;
    ii) Determine data/information use and impact of health management information system to health staff and to their respective health facilities;
c) Identify factors that constrain effective functioning of the system at the health facility level; and
d) Suggest how the existing system could be improved.

Research Questions

The following research questions were formulated in line to the objectives mentioned above:

a) To what extent does Health Management Information System meet the needs of health staff in health facilities?
b) What are the views of health staff regarding:
   i) Quality of the document based system?
   ii) Impact of the system to health staff and their respective facilities?
c) What are the factors that constrain effective functioning of the system at the health facility level? and
d) What need be done to improve the situation?

Literature Review

The literature is divided into two sections. The first section focuses on research on health management information systems in general and on the African region including Tanzania. This section enabled the researcher to identify a study problem and the extent to which it has been dealt with by other researchers. The second section discusses determinants of an effective management information system and form basis for the theoretical framework employed for this study.

By and large, the available literature shows that one of the major problems pertaining to health information systems in Tanzania has to do with poor response and reporting of health data to respective district and regional health information systems by those responsible for its collection and transmission.

Lucas (1978), Larcker and Lessig (1980), Delone and McLean, (1992), Thong and Yap (1996), Lin and Shao (2000) argue that key determinants of an effective information systems are: (a) systems quality (b) information quality (c) systems use (d) user satisfaction (e) information system's impact and (f) user involvement or participation. Though these constructs have been widely investigated singly in assessing the success of information systems, these constructs have not been applied in relation to Health Management Information system in Tanzania. It is by this reason that this study will use some of these variables in assessing the efficacy of the national health management information system at the health facility level.

There are very few studies on Management Information Systems in East Africa and particularly on Tanzania. The little that is available suggests that more studies are needed on this issue. A study carried out in Uganda investigated and analyzed the management and utilization of Health

Management Information System in Busia District. The study reveals that, among others, the system was characterized by lack of stationery, inadequate and unskilled health personnel, lack of transport and resource centres in health facilities. Again, the health management information system in Uganda was not impressive to health staff, a phenomenon that resulted to minimal utilization of its data for planning and decision-making. This study conducted in Uganda motivated the researcher to conduct a more or less similar study to determine whether problems that were plaguing health system in Uganda, also existed in Tanzanian private health facilities. The study necessitates the need to capture views of health stakeholders on performance of the Health Managemenr Information System.

A report by the Regional Medical Office, Tanga Region (2002) shows that the existing National Health Management Information System leaves a lot to be desired in terms of quality, user satisfaction, and as a tool for planning and decision-making. It pinpoints the problems of the NHMIS in Tanzania as poor reporting, inaccuracy of data, lack timeliness and insufficient analysis.

Lungo (2003) indicates that data and information that has been generated by the NHMIS was not sufficient for planning and decision-making, the reasons being: incompleteness, inaccurate, and untimely reporting. The other causes identified include lack of resources and office space and the existence of parallel reporting legacy information systems. The study sought to investigate why the system is characterised by poor reporting, incomplete data, etc.

Larcker and Lessig (1980) suggest that quality information systems can be measured by the quality of information generated by the system. Similarly, Ahituv (1980) suggests that the quality of information system can be measured by the following attributes: accuracy, timeliness, relevance, aggregation and its formatting. Other researchers including Swanson (1974) have measured systems quality differently. For example, they stress that systems quality can be measured by response time and ease of use among user managers. Hamilton and Chervany (1981) stress data currency, response time, accuracy, completeness, system flexibility and ease of use in measuring the systems quality. Whereas a good number of these variables apply to computerised systems some were selected and applied to document-based system.

The Tanzanian National Health Management Information system is a combination or federation of subsystems developed and implemented as needed but conforming to an overall plan, standards, and procedures. The

assumption is that the success of the NHMIS will be largely determined by the extent to which it meets user needs and interests. The underlying argument is that any information system which takes into account views of the users is likely to have positive impact to users, hence commitment and support to the system. Key indicators of a successful system has been highlighted in Delone and Mclean model (1992), these include systems quality, use, satisfaction, and individual and organisational impact. Some of these indicators have been used to frame concepts for measuring performance of the Health Management Information System subsystem in health facilities.

Methodology

The study was qualitative in nature as it produced answers that were descriptive. The qualitative method was adopted on account that it reflected reality. It enabled the researcher to determine effectiveness of the Health Management Information system in health facilities through analysis of verbal and written answers from the respondents, and observation of the different parts of the system such as people, procedures, technology, and data.

Research Design

According to Babbie (1991), research design deals with identification of what is to be studied, types and sources of information needed as well as units of analysis that would provide the researcher with the best information that would provide answers to his /her research questions. Taking this into account, health staff that run and use the system constituted the units of analysis. The survey method with its inherent techniques such as questionnaires, interviews and observations were employed for investigation.

Interviews

Some data were gathered using an interview guide. Interview sessions were arranged with health staff. These constituted heads, assistant heads and staff who oversee the National Health Management Information System, especially those responsible for filling in, processing and analysing data. Interestingly, due to the nature of their work, most of them preferred to be interviewed rather than being left with a questionnaire. Interview with these people was intended to collect data relating to systems and information quality, use and impact to the respondents' performance. Since the interview was face-to-face encounter with the respondents, the researcher was able to interact with them, probe and clarify issues.

Questionnaires

A semi-structured questionnaire with closed and open-ended questions was designed and administered to respondents face to face. The questionnaires were delivered by hand to some of the respondents even those who stayed

in distant areas due to the availability of a reliable transport. Some questionnaires were collected instantly but some respondents asked to be given more time. Therefore, their responses were picked up at a later time.

Sampling, Sample Size and Data Analysis

Fourteen (14) health facilities were selected through simple random sampling from the list obtained at Kibaha and Morogoro Urban Medical Offices, but respondents were purposively chosen as these were supposed to be heads of health facilities and those that were overseeing the document-based National Health Management Information Subsystem. In total, 41 respondents were interviewed for this study. These respondents had been selected to participate in this study because they were knowledgeable, experienced, and well exposed to document-based Health Management Information System currently in use. Therefore, they were in a position to provide the researcher with genuine information that was needed to complete this study. Field data, that is responses from the respondents in this study were organised, frequencies computed, and analysed both qualitatively and quantitatively.

Findings and Discussion

The purpose of this study, as stated earlier, was to investigate the effectiveness of the document-based Health Management information system in Tanzania. The study intended to identify factors that affected its efficieny. The first reseach question was "to what extent the document-based health Management Information system meets the information needs of the internal users?" Answers to this question were crucial for a concern had been raised that users of this system particularly at lower level were not involved in its development and therefore their needs and interests were not taken into account when designing the system, Mwangu (2003).

Table 1: Responses of heath staff on the extent to which the document-based Health Management Information System (HMIS) meets their Information needs

Name of the District n=41	Type Health Facility	To a very great extent	To a great Extent	Medium	To a small Extent	To a very small Extent
Kibaha	Dispensaries	3	9	3	0	0
	Health Centres	0	0	3	0	0
	Hospitals	0	3	1	0	0
Morogoro Urban District	Dispensaries	0	2	5	0	0
	Health Centres	0	4	2	0	0
	Hospitals	0	1	5	0	0
Total		3 (7.31%)	19 (46.34%)	19 (46.34%)	0 (0%)	0 (0%)

Source: Field studies

Table 1 reveals that 53.65% of the respondents maintained that their information requirements were being met to a great extent. Another 46.34% of respondents held that their requirements were moderately met. There was no respondent who reported that the system was meeting his/her information needs to a small extent. These findings therefore, clear the doubt created by the previous study (Mwangu, 2003) that although lower level users of the health management information system might not have participated on its development and implementation they still considered it useful and meets their requirements.

The Quality of the system influences user satisfaction. It was due to this reason that this study sought to gather views of health staff that work with health facilities regarding quality of the system that they were using. Their views were collected in relation to spaces and extent to which manual forms were update. Space of data collection and processing tools /HMIS forms has direct influence on data quality. When manual forms contain

insufficient spaces some relevant data may be omitted or squezzed in such a way that another person will not be able to read and record data correctly.

Table 2: Responses of Health facility staff on spaces of HMIS register books/forms

Name of District n=41	Type of Health Facility	Very Sufficient	Sufficient	Some how sufficient	Not Sufficient
Kibaha District	Dispensaries	0	4	2	9
	Health Centres	0	0	0	3
	Hospitals	0	1	0	3
Morogoro Urban	Dispensaries	0	4	0	3
	Health Centres	0	0	0	6
	Hospitals	0	1	2	3
Total		0 (0%)	10 (24.39%)	2 (9.76%)	27 (65.85%)

Source: Field Studies

Surprisingly, data on table 2 reveal that no respondent considered spaces for filling in data in manual forms to be very sufficient. Only 24.39% of respondents maintained that spaces were sufficient. 65.85% of respondents considered spaces to be insufficient and 9.76% somehow sufficient. The results suggest that no review of the system had been done since its inception. Health staff have been tackling this problem either by adding new lines to create more space, squizzing their handwritings or by not recording some data, a phenomen that results to data incompleteness.

The currency of the document-based system was investigated with a view to determining whether system reviews had been conducted after implementation. Reviews are important for the correction of errors, addition of important items or deletion of information or data that does not appears to be necessary. Respondents were also urged to list data that they perceived to be important or not important but had not/ had been included in the forms.

Table 3: Health facility staff assessment on extent to which HMIS registers/forms were up-to date

Name of District n=41	Type of Health Facility	Up-to-date	Not up-to-date
Kibaha	Dispensaries	1	14
	Health Centres	0	3
	Hospitals	0	4
Morogoro Urban	Dispensaries	0	7
	Health Centres	0	6
	Hospitals	0	6
Total		**1 (2.43%)**	**40 (97.56%)**

Source: Field Studies

Information contained in table 3 shows that 97.56% of respondents indicated that registers and forms that constitute the document-based health management information system were not up-todate. Only 2.43% maintained that they were up-todate. These findings further confirms that the system needed be reviewed. A good number of respondents who holds that the system was not up-todate (97.5%) cited a number of items that were contained in the forms which were no longer in use and some that needed to be included but they were yet to be incorporated. An example of data items that may be eliminated include chloroquine tablets, chloroquine syrup and chloroquine injections. A typical example of data items cited that should have been incorporated include health insurance data and Mosquito nets' discounts.

Competence of health staff in data collection and processing is important if data completeness and accuracy is to be maintained. At the health facility level data were being collected from patients and other entities. That data is entered into forms or ledgers and then manipulated, a phenomenon that results to periodical reports. Regarding their qualifications it was found that most of them qualified their positions but results have not been shown as it was not an intent of this study. Initially the researcher thought he was asking

for sensitive information to which respondents could not provide data. Interestingly, respondents were glad to give their impressions on ability to collect and process data manually. The findings were as follows:

Table 4: Responses of health staff on their competence in data collection and processing

Name of District n=41	Type of Health Facility	Very Competent	Competent	Medium	Less competent	Completely incompetent
Kibaha District	Dispensaries	0	3	5	7	0
	Health Centres	0	3	0	0	0
	Hospitals	0	2	2	0	0
Morogoro Urban	Dispensaries	0	1	3	3	0
	Health Centres	0	0	5	1	0
	Hospitals	0	3	1	2	0
Total		**0 (0%)**	**12 (29.27%)**	**16 (39.02%)**	**13 (31.71%)**	**0 (0%)**

Source: Field Studies

Information summarized in table 4 above suggests that there was still a lot to be done on training as about 70% of respondents were moderately competent and less competent. No one dared say he/she was very competent. Another 29.27% maintained that they were competent and that was a group of those who had participated in seminars or attended short trainings. It was also gadhered that those who considered themselves incompetent or moderately competent either got instructions from their colleagues or took personal initiatives to study manual guides.

Data accuracy was another variable measured to determine success of the document-based National Health management Information system. It meant the extent to which data being filled in and manipulated were free from errors. Data accuracy at the health facility level is particulary important as it forms the base for data accuracy in the middle and strategic National Health Management Information Subsystems.

Table 5: Health facility staff assessment on Accuracy of HMIS data

Name of District n=41	Type of Health Facility	Very Accurate	Accurate	Somehow Accurate	Not Accurate	Completely Not Accurate
Kibaha District	Dispensaries	3	9	3	0	0
	Health Centres	0	3	0	0	0
	Hospitals	0	4	0	0	0
Morogoro Urban	Dispensaries	0	5	2	0	0
	Health Centres	0	5	1	0	0
	Hospitals	1	5	0	0	0
Total		4(9.75%)	32 (78.05%)	6 (14.63%)	0 (0%)	0 (0%)

Source: Field Studies

Information summarized in table 5 above reveals that 78.05% of respondents were of the opinion that data was accurate and 9.75% maintained data was very accurate making a total of about 88%. This result shows tremendous improvement which may be partly because of seminars and training conducted after system implementation and long experience of the health staff. The findings differ sharply from those obtained by Mwangu (2003) and Lungo (2003). Only 14.5% considered data to be somehow accurate but no one thought that data was inaccurate. These findings do not augur well with respondents' opinions on their competences as demonstrated in table 4 Those who thought data were moderately accurate pointed out that some of health facilities had inadquate staff. There is general tendency to use previously recorded data with little modification to conceal forgery and submit them to higher authorities. Some use the previous year's recorded data to approximate data for the current year. Again, it was disclosed that there were peak periods to which data on patients were not recorded at all owing to workload.

Completeness of Data is another important variable that leads to accuracy, reliability and relevance of data or information generated by the system. This was measured against the extent to which all data items had their attributes filled in and extent to which data on all entities were completed by data entry clerks..

Table 6: Health facility staff assessment on completeness of data/information

Name of District n=41	Type of Health Facility	Very Complete	Complete	Moderately complete	less complete	Not complete at all
Kibaha District	Dispensaries	2	6	5	2	0
	Health Centres	0	2	1	0	0
	Hospitals	0	2	1	1	0
Morogoro Urban	Dispensaries	0	3	3	1	0
	Health Centres	0	3	3	0	0
	Hospitals	1	2	1	2	0
Total		3 (7.32%)	18 (43.90%)	14(34.15%)	6 (14.64 %)	0 (0%)

Source: Field Studies

The findings summarised in table 6 above seem to confirm earlier findings in studies such as Mwangu(2003) and Lungo (2003) that data contained in health management information system was not complete. Respondents that maintained that data was moderately complete and less complete were nearly half constituting about 49%. Most of them provided further clues that they attributed to lack of training, lack of staff and tendency of patients to skip some of the registration processes. There was also times when it was not possible for health staff to collect community data especially during peak periods.

Responses of health staff on their ability to accurately interpret health issues in their environment accurately

Health issues that were being referred to included existing health situations in areas that surround health facilities, health problems and actions to be taken to solve them as per health management information system. This variable was measured on individual basis. Thus respondents were asked to indicate the extent to which the manual system had had impact on them as regards to their abilities to interpret health issues accurately. The responses were as follows:

Table 7: Responses of health staff on their ability to interpret health issues accurately

Name of District n=41	Type of Health Facility	Very high	High	Moderate	Low	Very Low
Kibaha District	Dispensaries	5	8	2	0	0
	Health Centres	0	3	0	0	0
	Hospitals	0	4	0	0	0
Morogoro Urban	Dispensaries	3	2	2	0	0
	Health Centres	0	3	3	0	0
	Hospitals	0	6	0	0	0
Total		8 (19.51%)	26 (63.41%)	7 (17.07%)	0 (0%)	0 (0%)

Source: Field Studies

Information summarized in table 7 above seems to indicate that health management information system have had high impact to individual health staff because 82.92% indicated that it had highly enhanced their ability to interpret health issues accurately around their workplaces and surrounding environments. 17.07% of respondents maintained that it had moderate impact to them and no one said that it had no impact to him/her.

Unlike the previous variable that sought to measure impact of the document based health management information subsystem to individual health staff, the other variable leveled against measuring impact of the system to health facilities was capacity to plan, monitor and evaluate health facility performance. Respondents were asked to contend the extent to which they perceived the manual system had increased health facility' capacity to plan, monitor and evaluate their performances. The following were the findings:

Table 8: Increased capacity to plan, monitor and evaluate health facility performance

Name of District n=41	Type of Health Facility	Very high	High	Moderate	Low	Very Low
Kibaha District	Dispensaries	0	7	8	0	0
	Health Centres	3	0	0	0	0
	Hospitals	0	2	2	0	0
Morogoro Urban	Dispensaries	0	2	2	3	0
	Health Centres	0	3	3	0	0
	Hospitals	0	0	3	3	0
Total		3 (7.32%)	14 (34.15%)	18 (43.90%)	6 (14.63%)	0 (0%)

Source: Field Studies

Table 8 above reveals that the same respondents that claimed health management information system had high impact on them, turned down the impact of the system to their health facilities. About 58% of respondents indicated that the document-based National Health Management information system either had moderate or low impact on planning, monitoring and evaluation of health facilities. The major reason cited was management's failure to utilize data that were being collected. The situation was said to be worse in private health facilities where owners of health facilities were in charge of virtually everything. No wonder then that response of the private health sector on submitting reports to District Medical Offices had been low.

Conclusion and Recommendations

The Document-based health management information system has shown improvements in terms of data quality but there are a number of factors that need to be addressed by the Ministry of Health and other health stakeholders. Based on the findings presented above, the following are recommended: First, maintenance and review of information systems is a necessary requirement after implementation. This requirement is regarded

by many to be applicable to computerised systems only. The present study on document based system reveals a number of discrepancies whose solutions require review of the system. It is therefore recommended that spaces in manual forms be increased and data items updated.

Second, information systems have five components staff/users being one of them. The quality of the system is usually measured through assessment of all of them including competence of staff to collect, process and deliver services. It is strongly recommended that all staff who provide health services in the health service sector be trained on how to fill in data in book registers and process them. Training only a few of them can be very cumbersome especially in incidents of death, travel or leave. Waiting for staff to come back and process data after they had gone on leave has frequently caused delay in sending reports to higher authorities. Again, training of health staff on how to collect and process data for document based health management information system should be incorporated in the curriculum of all Medical colleges. This is because a number of health staff shift to other health facilities after training. The situation is worse in private health facilities as staff transfer easily to where they can be paid relatively higher salaries.

Third, data inaccuracy and incompleteness seem to be caused by lack of staff in health facilities. This problem may be solved only if government and private health facilities will employ a good number of health staff. Here, the question of cost is unavoidable in order to attain high data quality.

Fourthly, document based health management information subsystems should have an impact on health facilities. In this regard, owners of private health facilities should be trained on the importance of information as a resource and how they can utilize it for planning and decision-making. Training that was being conducted centred on how to fill in data and prepare reports but could not arose interest of the health staff interest to use data for management purposes.

The study provides the insights on the extent to which user information needs were being met and discloses setbacks of the document-based health management information system. All respondents expressed that their needs were being met at various degrees a phenomenon that rates it effective. Notwithstandingly, health stakeholders should take appropriate action to incorporate the recommendations outlined above in order to improve the existing system.

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