Transforming the Health Sector in Kenya by Adopting Integrated Health Management Information System

Caroline Kawila Kyalo[1]*, George.W. Odhiambo-Otieno[2]
[1]Department of Health System, Management, Kenya Methodist University
[2]Department of Information Sciences, Rongo University

**Correspondence email:* bettykawila@gmail.com

Abstract
Achieving better health outcomes is every health organization's dream. Several health management strategies have been developed; a key one being production of quality information for purposes of informed decision making. Most public health facilities in Kenya are to a large extent using manual health information systems, which are cumbersome and fragmented leading to delayed or uninformed decision making. Five key drivers are viewed to influence Integration of Health Management Information System (IHMIS): i) organizational factor, ii) technical factor, iii) behavioral factor, iv) adopted leadership style and v) operationalization of the functions of management. The purpose of the study was to prescribe an ideal design of an IHMIS. A mixed method research design was adopted to determine the significance of the drivers identified in influencing the IHMIS. Both a semi-structured questionnaire and a key informant guide were used to collect data. Data was analyzed and reported using mean scores, correlation and regression analysis. Integration of HMIS was found to positively and significantly correlate with organizational factor, technical factor, behavioral factor, leadership style adopted and operationalization of the functions of management. The study also showed that all variables accounted for total variation in the integration of HMIS. In a multiple regression analysis, the study found the model valid. However only 4 out of 5 of the predictor variables (operationalization of management functions, behavioral factor, technical factor, leadership style adopted were good in explaining total variations in the integrated HMIS in Kenya. This implies that the more these variables are improved the better it gets in achieving integration of HMIS. Integration of HMIS in Kenya is achievable if all the study variables are taken into account. The study suggests that the ideal design of an integrated HMIS would be in the form of an automated web based system in each health organization as opposed to the current manual system. IHMIS will be more successful, if integration within a single health organization is successful. The study recommends a central database for each level of care.

Key words: *Integrated health management information system (IHMIS); Health System Strengthening; Leadership styles; Technical factors; Technology*

IJPP 7(1); 11-23

Introduction

Globally the health sector is committed to building an IHMIS that supports the health sector in working for better health outcomes for the people they serve (WHO, 2007). Strides are being made by the United States healthcare system to reorganize health care providers and delivery systems through IHMIS aiming at better health care services as they address the issues of quality and cost of care (Hwang *et al*., 2013). The intended IHMIS is supposed to increase communication and information sharing across all levels of care including the community level bridging into the main stream care delivery. If achieved, coordination of patient care will be improved, hence improving quality of care given at each level of care. Tomlinson (2013) recognizes that in order to give Canadians the best health and health care in the world by 2025, they require the creation of a functional IHMIS along the full continuum of care —a system based on inter professional collaborative teams that ensure the right provider, at the right time, in the right place, for the right care.

Health system strengthening is as any array of initiatives and strategies that lead to better health through improvements in one or more of the health system's building blocks (WHO, 2007). The WHO framework for health systems strengthening identifies six attributes of a health system: i) a health workforce; ii) health services; iii) health financing; iv) governance and leadership; v) medical products, vaccines, and technologies; and vi) health information (Nutley & Reynolds, 2013). Each building block of the WHO framework is important. However, quality and timely information is the foundation of a strong health system as it informs decision making in each of the other five building blocks of the health system.

A well-functioning health information management system ensures the production, analysis, dissemination and use of reliable and timely information on health determinants, health system performance and health status (WHO, 2007). WHO (2009) emphasize the need to embrace systems thinking because the different sub-systems in the health system are highly connected and a change in one subsystem affects the other. Establishment of an integrated health information management system may help to minimize fragmentation of information across the health system and limited interoperability, which compromise the quality of health care services. Having an IHMIS could be the solution to increased responsiveness in the delivery of quality health care services (Seth, Goyal and Kiran, 2015).

Health information systems in developing countries are fragmented with multiple and very often overlapping demands of disease-focused and specific services programs and usually maintain 'vertical' reporting systems existing side-by-side with the national health information system in response to donor requirements and international initiatives (Nyella, 2009; Kihuba *et al*., 2014; Ndabarora *et al*., 2014). Consequently, the capacity of countries' health information systems is overwhelmed by these multiple parallel demands for information where health workers are overburdened by excessive and often uncoordinated reporting demands (WHO, 2008; Aqil *et al.*, 2009; Wave, 2009).

In an attempt to create an IHMIS, Kenya adopted a web-based health information management system – DHIS2 – a free open source software. Nonetheless this system has been found to be inefficient in provision of information (Raeisi *et al.*, 2013; Vincent *et*

al., 2014). After installation of DHIS2, the focus has been on submitting complete and timely reports to MoH but with limited analysis of data to inform planning, decision-making, monitoring and evaluation of health service delivery at each level of care, which beats the purpose of devolving power to the information generators (Mutale *et al*., 2013). Overall, the current HMIS in Kenya provides limited information for monitoring health goals and empowering communities and individuals with timely information for decision making (Kimama, 2011; Kihuba *et al*., 2014).

Kenya should consider strengthening its health information management system by developing an IHIMS that collates and uses information from the community level to the highest tier of health service delivery and policy development. This study was therefore timely in prescribing an ideal design of an IHMIS with the aim of improving management of the health system since information is the lubricant that connects all the other building blocks of the health system.

Materials and methods

A mixed method research design was adopted to determine the factors that influence IHMIS in Mombasa (urban), Kiambu (peri-urban) and Kitui (rural) Counties. A list of all registered community units and health facilities within Kitui, Kiambu and Mombasa Counties was obtained from MoH website as at 15th August 2016. Purposive sampling was used to choose the most appropriate respondents constituting a sample size of 104 Government of Kenya (GoK) owned health care organizations selected from a population of 144 GoK HO in Mombasa, Kiambu and Kitui Counties. The study targeted health organization in-charges and persons responsible for health information management at Tier 2 and 3, and community unit chairs and a CHV at tier 1. Tier 2 refers to the primary care services which comprise dispensaries, health centres and maternity homes and Tier 3 refers to the County referral services, which comprise the former sub-district and district hospitals (MOH, 2012). In facilities where health information and records officers were not available, the in-charge guided the researcher in identifying the most appropriate respondent. The sampling formula 30% of the total population was used according (Borg & Gall, 2003). A total of 288 respondents were approached.

Two instruments (a semi-structured questionnaire and a Key informant interview guide) were used to measure constructs and factors affecting the integration of HMIS. The face and content validity of the instrument were established by experts from various universities across Kenya. After revisions were made and approval obtained, data was collected for the pretest (n= 31) and internal consistency reliability was established using Cronbach's alpha, attaining a standardized alpha of 0.703. Integration of HMIS was measured on a 5 point Likert scale. Integration questions were scored at a maximum of 5 points for positive statements strongly agree scored 5 points, agree scored 4, neutral scored 3, disagreed scored 2 and 1 point was awarded for strongly disagreed. Using this a composite indicator was constructed resulting to in dichotomous responses of agreed or disagreed statements. Strongly agreed and agree were merged while strongly disagreed and disagree were merged. The cut-off of whether disagreed or agreed was determined by how far you were from the mid-point which is 3.40. Below 3.40 meant the respondent had disagreed while

above 3.40 meant the respondent had agreed (Bajunaid, 2008)

The return rate of 85% (243/288) was considered adequate for this study. Study participants included Community health volunteers, functional heads, health records management officers, medical superintendents purposively selected health workers. Twenty-three percent (55) respondents were from tier 1 HO, 44.9% (109) from Tier 2 HO, and 32.5% (79) from tier 3 HO.

Results

A total of 243 respondents representing 144 health organizations across the three tiers of the health system in study counties participated in the study

Table 1: Tier/Level of operation * County of operation Cross tabulation

		County of operation			Total
		Kiambu	Mombasa	Kitui	
Tier/Level of operation	Tier 1	20	12	23	55
	Tier 2	43	29	37	109
	Tier 3	13	27	39	79
Total		76	68	99	243

Four constructs were used to measure integration. They included; information accessibility, information availability, data security and data quality.

The results indicated that respondents agreed that their HMIS was manual (mean, 4.18),there has been the need to establish linkages with all data sources in the facility (mean, 4.20), health workers with privileged access to patients records maintained the highest level of confidentiality (mean, 4.07), their HMIS ensured that confidentiality was maintained when sharing information (mean, 4.02), data was collected, analyzed and used in every department in the facility (mean, 3.54), health information users demand quality data (mean, 4.00).

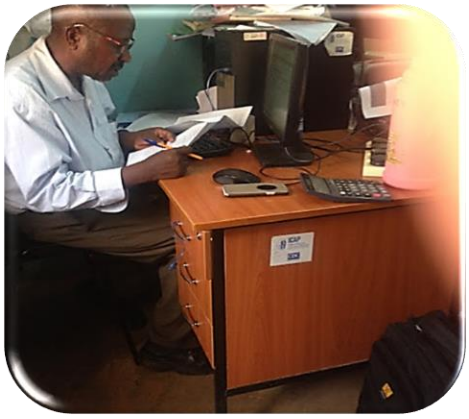
On the other findings indicated that respondents disagreed that: they were able to access information or reports from the sub-county in a timely version (mean, 2.07), Information for returning patients was easily accessible to all service providers simultaneously (mean, 3.08), information on the cost of health care was readily available in our HMIS (mean, 2.91), the hospital management has ensured that all departments are fully automated (mean, 2.27), their HMIS to a large extent is electronic (mean, 2.16), their HMIS was both manual and electronic (mean, 2.62), their HMIS allowed data management to be done in the most effective way (mean, 3.04), their health organization has had an effective mechanism to ensure data capturing and dissemination of information is done (mean, 3.37), Information shared is always timely (mean, 3.13), their HMIS only supports clinical health workers to do their jobs in a timely manner (mean, 2.86), they can retrieve information shared from the sub county hospitals with ease (mean, 3.00), data collected is always complete (mean, 3.27), they audit data to ensure its quality regularly (mean, 2.61) and HMIS ensures that standardization of information is maintained at the various points of service (mean, 3.33).

Table 2 below summarizes the mean scores of the four key indicators of integration.

Table 2: Mean score of the indicators of integration

	Information Accessibility	Information Availability	Data Security	Data Quality
Mean	2.8134	3.3961	4.0514	3.3498
Std. Deviation	.54886	.60324	.71468	.48134
Sum	683.67	825.25	984.50	814.00

Results in Table 2 shows that integration was yet to be achieved in health organizations in Kenya because only one out of the four indicators of integration scored a mean above 3.40. This is evident from figure 1 below:



Data collection strategy and storage

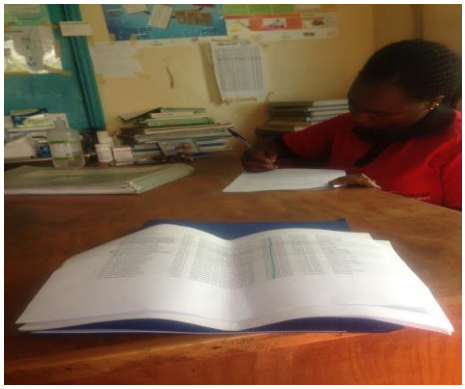


Figure 1: Current status of health management information system in Kenya

Relationship between organizational factor, technical factor, behavioral factor, the role of leadership style and operationalization of the functions of management with the integration of health management information system

Pearson correlations were calculated as shown in Table 3, to determine the relationships between the organizational factor, technical factor, behavioral factor, leadership styles adopted and operationalization of the function of management with integration of HMIS. All the identified variables had a positive and significant relationship with the integration of HMIS. Therefore, the null hypothesis (H0) that stated that there was no significant relationship between organizational factor, technical factor, behavioral factor, leadership styles adopted and operationalization of the function of management and the integration of HMIS were all therefore rejected.

Table 3: The correlation between the specific variables and integration of HMIS

		Organ. Factor	Technical factors	Behavioral Factor	Leadership Style	Functions of Management	Integration of HMIS
Organizational factor	Pearson Correlation	1					
	Sig. (2-tailed)						
Technical factors	Pearson Correlation	.524**	1				
	Sig. (2-tailed)	0					
Behavioral Factor	Pearson Correlation	.209**	.536**	1			
	Sig. (2-tailed)	0.001	0				
Leadership Style	Pearson Correlation	.434**	.538**	.393**	1		
	Sig. (2-tailed)	0	0	0			
Functions of Management	Pearson Correlation	.512**	.705**	.502**	.687**	1	
	Sig. (2-tailed)	0	0	0	0		
Integration of HMIS	Pearson Correlation	.371**	.615**	.534**	.553**	.665**	1
	Sig. (2-tailed)	0	0	0	0	0	

** Correlation is significant at the 0.01 level (2-tailed).

Table 3 study findings show that integration of HMIS was positively correlated with all the variables. This implies that the more a healthcare institution improves on its organization factor, technical factor, behavioral factor, accepts the systems thinking approach in leadership and efficiently operationalizes the functions of management the more its HMIS gets integrated.

Testing the influence of the identified variables on IHMIS using the Step wise Multiple Regression

A stepwise multiple regression analysis was further performed on the five drivers of integration of HMIS to examine their combined effects on the integration of HMIS.

Table 4 shows that only four out five of the drivers were significant.

The regression models in Table 4 containing the four variables was found to be valid ($F(4,238) = 66.359$, $P< .000^{e}$) meaning 4 out 5 the variables in this study were good predicators of the variations in the integration of HMIS.

Table 4: Integration and all variables Step wise Multiple Regression: Model Validity

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.239	1	21.239	191.107	.000[b]
	Residual	26.784	241	.111		
	Total	48.022	242			
2	Regression	23.813	2	11.906	118.031	.000[c]
	Residual	24.210	240	.101		
	Total	48.022	242			
3	Regression	24.815	3	8.272	85.182	.000[d]
	Residual	23.208	239	.097		
	Total	48.022	242			
4	Regression	25.320	4	6.330	66.359	.000[e]
	Residual	22.703	238	.095		
	Total	48.022	242			

a. Dependent Variable: Integration of HMIS

b. Predictors: (Constant), Functions of Management

c. Predictors: (Constant), Functions of Management , Behavioral Factor

d. Predictors: (Constant), Functions of Management , Behavioral Factor, Technical factors

e. Predictors: (Constant), Functions of Management , Behavioral Factor, Technical factors , Leadership Style

This implies that the first model was the best in significantly improving our ability to predict the outcome variable (because the *F*-ratio was highest at 191.107). However, the 3 other the new models (with the extra predictors) were also good and significant.

Table 5: The Stepwise Multiple Regression: Model Summary

Model		Unstandardized Coefficients		Standardized Coefficients		t	Sig.
		B	Std. Error	Beta	R^2		
1	(Constant)	.981	.177			5.555	.000
	Functions of Management	.753	.054	.665	.442	13.824	.000
2	(Constant)	.748	.174			4.291	.000
	Functions of Management	.601	.060	.531		10.018	.000
	Behavioral Factor	.224	.044	.268	.496	5.051	.000
3	(Constant)	.803	.172			4.672	.000
	Functions of Management	.461	.073	.407		6.277	.000
	Behavioral Factor	.180	.046	.215		3.957	.000
	Technical factors	.185	.057	.213	.517	3.212	.001
4	(Constant)	.649	.183			3.542	.000
	Functions of Management	.364	.084	.321		4.327	.000
	Behavioral Factor	.175	.045	.209		3.877	.000
	Technical factors	.173	.057	.200		3.033	.003
	Leadership Style	.151	.065	.142	.527	2.301	.022

a. Dependent Variable: Integration of HMIS

The multiple regression results in Table 5 indicated that the constant and four out of five of the drivers of integration of HMIS explains 52.7% of the total variations in the integration of HMIS ($R^2 = .527$). This implies that when all variables are combined the organizational factor becomes insignificant. This is because the four factors make up the organization.

The stepwise multiple regression model in Table 5 established that all the models were significant hence based on the findings of the multiple regression, the study rejected the null hypothesis H02, H03, H04 and H05 in favor of alternative hypothesis. The study therefore concludes that the higher the level of participation in the function of management, positive behavioral factor of health workers, improved technical factor and adoption of systems thinking approach in leadership, the easier it is for integration of HMIS to be successful. On the other hand this study failed to reject H01 and concluded that in a combined effect, there is no significant influence of organizational factor on the integration of HMIS.

Discussion

The most important factors in predicting integration of HMIS were functions of management, behavioral factor, technical factors and the leadership style adopted. This means that for the HMIS to be successfully integrated, the organization must operationalize the functions of management in a way that every person in each health care organization participates in the planning which leads to improved coordination and better reporting techniques. This means that HOs need to examine and realign the design

of their HMIS to align with the organization functions as well as encourage team work and participation. These findings concur with various observations and conclusions made by several researchers in systems design (American Hospital Association, 2014; Sherburne, 2010) where hospitals have a set timeframe to meet meaningful use requirements of HMIS certified criteria.

A book by (Raymond, Pike, Kenyo, & Pels, n.d.), documents that a good design of an information system improves the management of that institution. A good system is characterized by satisfying the business need, ease in use, its graphic design should reflect the brand of the organization and its analytical design should be able to represent the quality information. The system should also have a logic flow, be uniform and integrated and well structured. This study however found that, although, most health organizations, have employed the manual registers affecting their usability, the registers however have adopted the brand of the Ministry of Health in Kenya through the graphics of the registers. The system however does not provide a logical flow neither is it uniform or integrated.

High client's expectation today, new technology and legal regulations keep changing, it is more critical than ever to build a comprehensive teamwork in an organization. This can be achieved where communication and information sharing are done efficiently and in good time. Without timely information sharing or communication, an organization has difficulty in functioning effectively. Having an integrated HMIS would streamline information sharing to enabling a single reporting system. Coordination and reporting are key aspects in management of the health system and this can be well achieved by having a HMIS that is integrated to support the function of management. (Baarah, Kuziemsky, Chamney, Bindra, & Peyton, 2014), however reported that most of the HISs focus on collecting data and storing it as per department instead of focusing on the total service delivery, the study finding portray the same case still exists in Kenya in the year 2017.

Health workers are the implementers of any innovation an organization decides to introduce, therefore the acceptance of the system is a crucial success factor. This implies that health care managers must adopt systems that meet the need of the users. Integration aims at improving the health care service delivery through improving patients experience, enhancing access and service coordination, strengthening the links between different levels of care, reducing duplication among others. This study finding conquer with Baarah *et. al* .2014 who shows an improved relationship between behavioral factors and with HMIS systems are easier to integrate.

The findings on the influence of Human infrastructure, Systems Interoperability and IT infrastructure on both the relationships in Table 4 and in Table 5 regression analysis show that the technical factors were significant. The study findings revealed that most of the data collection and reporting tools were paper based, this therefore hindered interoperability, this findings agree with (Aladdin *et al.*, 2014) who reported that due to the co-existence of both the manual and automated processes unintended consequences arise including communication breakdown, creation of more work and even adverse events such as medical errors. This therefore makes it difficult to achieving interoperability with existing information systems. Two critical paths identified by (Zhao & Xia, 2014) that are important in enabling interoperability include

standardizing data infrastructure and the community readiness to adopt change. Therefore, health care organizations in Kenya need to build collaborations in exchanging information, coordination of their business function and process. If this is acceptable among the healthcare providers, then achieving interoperability and value networks becomes easy.

The study findings show that leadership style adopted in an organization plays a critical role in the integration of HMIS as shown in Table 4 and Table 5. The Kenya health system has greatly adopted management by objective leadership style, hence, leaders are only concerned primarily with organizational or group performance. Therefore, any innovations are limited to group performance. The problem with this kind of leadership is to get people to accept their role in the entire economy or in a sector in totality. Systems approach to management defines leadership as a process of dynamic interaction among people with varying roles who align themselves to solve specific social problems or to generate general evolutionary social change. This process is understood as working together for better results and not controllable by the leader (Abu-Nahleh, 2013). Integration of HMIS will succeed or accessibility, availability, security and quality. fail based on the leadership style adopted. Because information systems take the design of the organization it is crucial to ensure that leader appreciate the fact that an organization is interdepended, interrelated with other organization hence align itself with others to solve the health problems together. This would lead to better health outcome. All the leadership styles have an effect on integration however systems approach is more stronger in promoting integration of HMIS this study findings agree with those of (Humaidi & Balakrishnan, 2015).

Conclusion

The study concluded that operationalization of the management functions (planning, organizing, staffing, leading, controlling and coordination), leadership style adopted, technical factor (staff skills, availability of computers, internet connectivity, power, and system design) and behavioral factor of care providers and seekers are critical factors in the success of Health Management Information System Integration. The current study has verified that in a regression analysis four variables did have an in influence the integration of HMIS. It is therefore prudent to conclude that, the current study has proved that, the research model adopted was valid, and also contributes in HMIS studies.

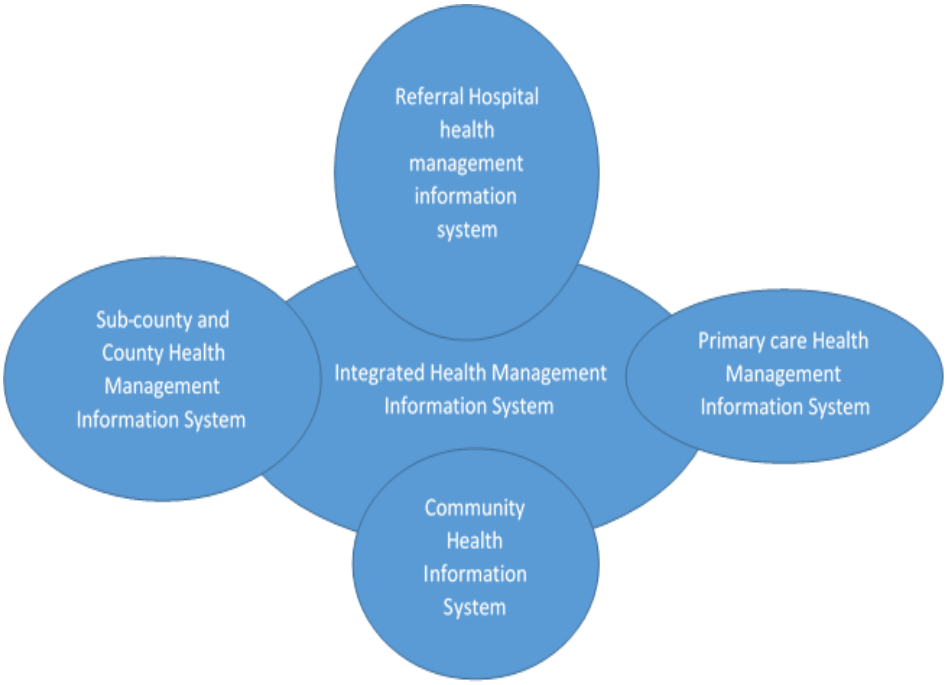


Figure 2: Integrated HMIS Design.

Figure 2 gives a picture of an ideal design of an IHMIS that should provide healthcare managers with essential information from the different subsystems, pooled into a central database and compiled in a simple format for improved management of the health system. Health organizations managers should give a lot of support in ensuring coordinated and efficient data collection strategy is achieved, invest in technical factors, maintain a proper balance between functions of management, behavioral factors, technical factors, leadership style and pay close attention to the design of HMIS by ensuring it is well aligned with the organization structure matching it with every levels of care objectives.

Recommendation

1. The functions of management should be operationalized and streamlined by managers in a way that each health worker in the different tiers of care are involved in the integration of HMIS by ensuring each plays a specified role. This would avoid roles overlaps and duplication and create a sense of belonging and ownership of the system.
2. The health workers behavioral factors should be influenced by introducing to them the new innovations i.e. use of technology. Currently the health workers are in a comfort zone with what they are used to, not knowing things can be much better if new innovations can be embraced.
3. More investment is required in the technical factors especially in IT infrastructure for the health sector to be able to enjoy advancement in technology.
4. For integration to be achieved the health sector in Kenya has to adopt the systems thinking leadership approach.
5. Management support in terms of actualizing the web based system design and doing away with manual

HMIS is a crucial factor in the effort towards achieving integrated HMIS in the health organization.

References

Abu-Nahleh, I. I. (2013). The Role of Leadership Theories in Information Technology Acceptance: Case Study at Al-Hikma Pharmaceutical Company. *Journal of Computer Science and Information Technology*.1 (2),33-40

Aladdin, B., Craig, E. K., Austin, C., Jaspreet, B., Liam, P., Hashemite, Jordan. (2014, April 1-3). A Design Strategy for Health Information Systems to Address Care Process Management. Published in the 5th International Conference on Information and communication systems (ICICS) Irbid, Jordan

American Hospital Association. (2014). *AHA News: Tavenner: No delay in 2014 meaningful use timelines, but hardship flexibility.* Retrieved September 21, 2015, from http://news.aha.org/article/tavenner-no-delay-in-2014-meaningful-use-timelines-but-hardship-flexibility

Aqil, A., Lippeveld, T., & Hozumi, D. (2009). PRISM framework: a paradigm shift for designing, strengthening and evaluating routine health information systems. *Health Policy and Planning*, *24*(3), 217–228. https://doi.org/10.1093/heapol/czp010

Baarah, A., Kuziemsky, C. E., Chamney, A., Bindra, J., & Peyton, L. (2014). *A design strategy for health information systems to address care process management*. Paper presented in the 5th International Conference on Information and Communication Systems (ICICS) (pp. 1–6). retrieved from https://doi.org/10.1109/IACS.2014.6841957

Bajunaid, M. M. (2008). *The effectiveness of co-operative education programmes for developing students' awareness of the importance of generic competencies*. (Doctoral Dissertation)University of Glasgow.UK.

Borg, W. R., & Gall, M. D. (2003). *Educational Research: An Introduction*.(7th ed.) Boston: Allyn & Bacon.

Humaidi, N., & Balakrishnan, V. (2015). Leadership Styles and Information Security Compliance Behavior: The Mediator Effect of Information Security Awareness. *International Journal of Information and Education Technology*, *5*(4), 311–318. https://doi.org/10.7763/IJIET.2015.V5.522

Hwang, W., Chang, J., LaClair, M., & Paz, H. (2013). *Effects of Integrated Delivery System on Cost and Quality*. Retrieved October 3, 2016, from https://www.pcpcc.org/sites/default/files/resources/Effects%20of%20Integrated%20Delivery%20System%20on%20Cost%20and%20Quality.pdf

Kihuba, E., Gathara, D., Mwinga, S., Mulaku, M., Kosgei, R., Mogoa, W., … English, M. (2014). Assessing the ability of health information systems in hospitals to support evidence-

informed decisions in Kenya. *Global Health Action*, *7*(0), 1-9 https://doi.org/10.3402/gha.v7.24859

Kimama, F. M. (2011). *Challenges facing the implementation of hospital management information systems in hospitals in Nairobi*.(Masters thesis)University of Nairobi, Kenya.

Mutale, W., Chintu, N., Amoroso, C., Awoonor-Williams, K., Phillips, J., Baynes, C., Sherr, K. (2013). Improving health information systems for decision making across five sub-Saharan African countries: implementation strategies from the African Health Initiative. *BMC Health Services Research, 13*(2), 1.

Ndabarora, E., Chipps, J. A., & Uys, L. (2014). Systematic review of health data quality management and best practices at community and district levels in LMIC. *Information Development*, *30*(2), 103–120. https://doi.org/10.1177/0266666913477430

Nyella, E. (2009). *Challenges in health information systems integration: Zanzibar experience.* paper presented in the International Conference on Information and Communication Technologies and Development (ICTD) Retrieved from https://doi.org/10.1109/ICTD.2009.5426679

Raymond, D. F., Pike, J. C., Kenyo, L. N., & Pels, S. E. (n.d.). *Business Information Systems: Design an App for That 1.0*. Retrieved from https://catalog.flatworldknowledge.com/bookhub/2579?e=frost-ch01_s02Seth, M., Goyal, D. P., & Kiran, R. (2015). Development of a Model for Successful Implementation of Supply Chain Management Information System in Indian Automotive Industry. *Vision: The Journal of Business Perspective*, *19*(3), 248–262. https://doi.org/10.1177/0972262915599465

Sherburne. (2010). *Standards and Guidelines for Electronic Medical Records Systems in Kenya*. Retrieved from https://www.ghdonline.org/uploads/Standards_and_Guidelines_for_Electronic_Medical_Record_Systems.pdf

Wave, V. C. (2009). *Health Information Systems in Developing Countries.* Retrieved from https://www.ghdonline.org/uploads/HIS_Analysis_Developing_Countries_may09.pdf

World Health Organization, W. (2007). *Framework and standards for country health information systems.* Geneva: World Health Organization.

World Health Organization, W. (2008). *Health Information Systems.* Retrieved August 2, 2016, from http://www.who.int/healthinfo/statistics/toolkit_hss/EN_PDF_Toolkit_HSS_InformationSystems.pdf

Zhao, K., & Xia, M. (2014). Forming Interoperability through Interorganizational Systems Standards. *Journal of Management Information Systems*, *30*(4), 269–298. https://doi.org/10.2753/MIS0742-1222300410