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Moderating role of transformational leadership styles of hospital management boards on adoption of mobile health innovations by hospitals in Kenya

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ABSTRACT

Sub-Saharan Africa lags other regions in the adoption of both Patient-Centered (PC) and Facility Centered (FC) mobile health (m-health) applications. Transformational Leadership Style (TLS) of Hospital Management Boards (HMBs) is catalytic for the adoption of disruptive technologies such as m-health by hospitals. There is limited evidence on the effect of TLS of HMBs in the adoption of innovations in Low- and Middle-Income Countries (LMICS). This study investigated the moderating role of TLS of HMBs on the adoption of PC and FC m-health by hospitals in Kenya. It used the Logit Regression Model to test null hypotheses that the four constructs of TLS (Idealized Influence (II), Individualized Consideration (IC), Inspirational Motivation (IM), Intellectual Stimulation (IS)) individually or combined had no significant moderating effect on adoption of PC and FC m-health applications. Primary data was collected from a representative sample size of 211 Top Executives (TEs) of level 4 to 6 hospitals who evaluated the TLS of their HMBs on m-health adoption. At a 5% level of significance, the study found that only the combined application of the four constructs (II, IC, IM, IS) significantly moderated the adoption of PC m-health (p=0.046) but did not moderate FC m-health (p=0.345). Each incremental application of TLS would increase the odds of adopting PC m-health by 1.002 but not for FC. Therefore, this study recommends the capacity strengthening of HMBs in TLS to scale up PC m-health adoption in Kenya and other LMICs. It also recommends a differentiated approach to policies, practices, and theories of adoption of innovations using the PC-FC models.

Introduction

Globally, the use of digital health innovations such as mobile health (m-health) have disrupted and transformed the health care industry (Becker et al. (2014) and Chib (2013)). M-health is the use of mobile phones and other mobile devices in health service delivery. However, Sub-Saharan Africa lags all other regions in adoption of mobile health (m-health) applications (Diwedi et al., (2016); Mechael et al. (2010), World Health Organization (2011)). Kenya lags in m-health adoption by hospitals despite its earlier competitive advantage in adoption of mobile financing and other mobile technologies in other sectors (Kenya Health Sector Market Survey, 2016). There is need to understand factors affecting adoption of m-health by hospitals in Kenya in order to develop effective

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policies and practices that can accelerate Kenya's ambitions for universal health coverage and sustainable development goals. A key characteristic of hospital adoption of innovations in Sub-Saharan Africa, including Kenya, is the role that the leadership of Hospital Management Boards (HMBs) have on adoption of innovations (Abor, 2015). They provide oversight to the Top Executive (TE) and the senior management team of hospitals on strategic management and adoption of innovations. The leadership style of HMB is therefore critical in facilitating adoption of innovations such as m-health. However, there is limited evidence in the literature reviewed on quantitative analyses of the effect of the leadership style of HMB and on implications for policies and practices for scaling up innovations in the health sector.

Transformational Leadership Style (TLS) has been found to be catalytic in adoption of disruptive technologies in other settings (Barth-Farkas & Vera (2014); Prasad & Junni (2016) and was chosen as the leadership style of analysis for this study. Arnold and Loughlin (2013) identified four interrelated processes that Transformational Leaders use to achieve high level of motivation and commitment of followers. These include the use of Idealized Influence (II) (i.e. when leader portrays a sense of strong role model and strong ethical standards that followers aspire to and emulates); the use of Inspirational Motivation (IM) (i.e. when the leader shares a compelling vision, sets high expectations and motivates followers to achieve individual and organizational goals by linking their values and beliefs to the vision and mission of the organization); the use of Individualized Considerations (IC) (i.e. when the leader is conversant of needs and preferences of each follower and integrates them in his decision making) and finally the use of Intellectual Stimulation (IS) (i.e. when the leader creates and fosters an environment of creativity and innovation by promoting individual and team creative problem solving thinking culture). By effectively using these 4 processes, it is hypothesized that transformational leaders of HMBs build resilience of hospitals to face any external or internal disruptions, support implementation of change management and thus moderate adoption of innovations (Valero, 2015). However, the evidence of such claims remain scanty, dispersed and very often not organized through a comprehensive theoretical and empirical framework (Guay, 2013). There is, therefore, the need to demonstrate the moderating role of TLS through its four constructs – individually or combined - on adoption of m-health applications.

The World Health Organization (WHO, 2011) defines m-health as the use of any wireless technology or portable device by health providers to enable communication between patients and health services, for consultation between health care professionals, for health monitoring and surveillance and for access to information for health care professionals at point of care. WHO thus identified twelve general applications of m-health (see Table 1) that could be further categorized as patient-centered (PC) and facility-centered (FC). PC m-health applications aim to facilitate communications and data between patients and health providers while FC m-health applications mostly facilitate communications and data between health care providers and opportunity to provide services remotely through networked facilities. Studies on m-health have not explored the differences between adoption of PC and FC m-health.

Therefore, this study sought to investigate the moderating role of TLS of HMBs on adoption of PC and FC m-health applications by hospitals in Kenya. It tested the following two null hypotheses:

H_{01} The application of Idealized Influence (II), Inspirational Motivation (IM), Individualized Considerations (IC), and Intellectual Stimulation (IS) by the leadership of HMBs has no significant statistical moderating effect on adoption of PC m-health applications by hospitals in Kenya.

H_{02} The application of Idealized Influence (II), Inspirational Motivation (IM), Individualized Considerations (IC), and Intellectual Stimulation (IS) by the leadership of HMBs has no significant statistical moderating effect on adoption of FC m-health applications by hospitals in Kenya.

Research and Methodology

Empirical Data

There is a significant body of empirical evidence in North America and Asia that shows a significant correlation between TLS and adoption of innovations. A systematic review of transformational leadership empirical studies and its effect on organizational performance found a positive correlation between effective transformation leadership and successful innovation in production systems, new production processes and new products that led to cost reduction, revenue growth and sustainable competitive advantage (Birasnav, 2014). A large-scale survey of 269 sampled firms in Thailand found a significant mediating role of transformational leadership and new product development (Sattayaraksa & Boon-itt, 2016). An analysis of 201 research and development professionals in Singapore found that transformational leadership was positively associated with innovation while transactional leadership had a negative association with innovation. In this study the TLS construct of IM was more significant than other variables (Lee, 2008). Another empirical study in Hong-Kong evaluated the correlation between TLS and creativity by analyzing 182 randomly selected supervisor-subordinate dyads. It also found a positive correlation between TLS and creativity. In the USA, a survey of 163 companies found that both TLS and transactional leadership styles positively influenced organizational innovation but instead the dynamic environment of the organization moderated adoption of innovation, in other words transformational leadership was more efficacious in dynamic environments (Prasad & Junni, 2016). In Africa, Abor (2015) found that the governance and leadership style of hospitals management team in Ghana had a moderating effect by sector and ownership.

Methods

This study applied the survey design to generate numeric or quantified description of trends or association of variables (Creswell & Clark, 2007). It used a Likert scale questionnaire to ensure standardization and comparability of data necessary for generalizability (Parahoo, 2006; Jones & Rattray 2010). The general target population of this study are the 507 (N) Top Executives (TEs) or managers of level 4 to 6 registered hospitals in the Kenya Master Health Facility data base (see table 2). TEs are defined in this study as the most senior officer, manager or executive in charge of strategic leadership and management of the hospital. This study targeted one TE per hospital. The choice of TEs as respondents for this study is justified by the fact that they possess both decision-making power on adoption of health innovations and can provide a reliable evaluation of the TLS of HMBs. This study targeted levels 4, 5 and 6 public, private, FBO and/or NGO hospitals only because these hospitals constitute the primary mechanisms for introduction and roll-out of innovations in the Kenya health system. Levels 3 (health centers), 2 (dispensaries and clinics) and 1 (community levels) are excluded from this analysis as their relevance for m-health and other innovations are often reliant on the adoption of the higher levels of hospitals (levels 4 to 6) that they refer their patients to. This study targeted the 12 m-health classifications by WHO and recategorized them as PC and FC (see Table 1 below).

Table 1: M-health applications categories and re-categorization as **per WHO**

		Response	
m-health re-classification by end-users Taxonomy	**m-health applications per WHO categorization**	**1=Yes**	**0=No**
Patient Centered (PC)	Health call centers/telephone help line		
	Emergency toll-free telephone services		
	Treatment compliance		
	Appointment reminders		
	Community mobilization		
	Awareness raising over health issues		
	Mobile surveys (surveys by mobile phone)		
	Surveillance		
	Patient monitoring		
Facility Centered (FC)	Mobile telemedicine		
	Information and decision support systems		
	Patient records		

Source: Authors

The ethical approval for the study was obtained through United States International University - Africa and the research approval was given by the National Council on Science, Technology and Innovations (NACOSTI). Further authorizations and recommendations to conduct the study were provided by the Ministry of Health (MoH) at national level and from county health departments.

Table 2 below shows the population size of the level 4-6 hospitals with each hospital representing one top executive.

Table 2: National Distribution of Hospitals by Categories of Ownership and Classification of Levels

Types of Hospitals	**Public**	**Private For Profit**	**FBOs/NGOs**	**Total**
Tertiary Hospitals (level 6)	4			4 (1%)
Secondary Hospitals (level 5)	14	3	1	18 (4%)
Primary hospitals (District or sub-district level 4)	278	139	68	485 (95%)
Total	296 (58%)	142 (28%)	69 (14%)	507

Source: Adapted from the Kenya MoH Master list of hospitals (2017)

Selected facilities were spread across all 47 counties and registered in the MoH database. This study used the census method for the 22 level 5 and 6 hospitals. It used the Slovin formula to select a stratified simple random sampling method for the 485 level 4 hospitals to select a sample of size 219 facilities proportionately distributed across the 47 counties and ownership to derive a total of 126 public health facilities from 278 registered hospitals; 63 private for-profit hospitals from 139 registered facilities, and 30 from FBOs/NGOs (see table 3)

Slovin Formula $n = N/(1+Ne^2)$ was used to derive the sample size at the margin error of e=0.05 or a confidence level of 95%. Where n is the sample size and N, the total population. Since N=485, then $n = 485/(1+485*0.05^2)$ = 219 facilities.

Table 3 below shows the representative distribution of respondents by type of ownership of hospitals.

Table 3: Distribution of level 4 hospitals by types of providers/ownership (n=485)

Types of Hospitals	Population	Sample Size
Public	278	126
Private For-Profit	139	63
FBOs/NGOs	68	30
Total	485	219

Source: Authors

The questionnaire was pilot tested and validated in 2 counties (Kiambu and Nairobi) with 20 TEs of public, private and FBO/NGOs hospitals. This study used the Cronbach's alpha scores to assess the constructs reliability of the instruments in the pilot phase. The outcome of the reliability test was within the recommended range by Field and Miles (2010) of alpha between 0.65 and 0.8 as summarized below.

Table 3a: Case processing summary and reliability statistics

		N	%
Cases	**Valid**	20	100.0
	Excluded[a]	0	.0
	Total	20	100.0

a. Listwise deletion based on all variables in the procedure.

Cronbach's Alpha	**N of Items**
.748	76

Source: Authors

Based on feedback from the panel of experts, research assistant and feedback from respondents, a further refinement of key terminologies was conducted. An additional team of 15 experienced research assistants based in the selected counties was hired to ensure accuracy of respondents and higher response rate due to their local knowledge of the county systems. The use of emails or e-surveys was not considered as a reliable option for this study due to the low rate of response observed in other studies that targeted executives of hospitals by emails and potential challenges of excluding rural hospitals that may have limited ICT infrastructures. Data collection occurred between April and July 2018. The data analysis was conducted using SPSS 21 and comprised of descriptive and inferential statistics using statistical techniques, non-parametric methods. Data was first collected on the 3 FC and 9 PC m-health individual applications thereafter the results were transformed to generate the PC and FC variables while maintaining the adoption measurement scale. The response scale for PC and FC was based on the arithmetic mean of the responses for each variable under each category. The responses recorded are discrete (mutually exclusive and exhaustive) and therefore, adopts univariate logit model to analyze adoption or non-adoption decisions by hospitals through the perspectives of the TEs. The study used the Logit Regression Model (LRM) to explain the theoretical and mathematical reasoning of the two outcomes Y=0 or Y=1. The LRM as used in this study satisfies the characteristics of the study where the dependent variable is binary while the explanatory variables were nominal, ordinal and interval/ratio. In addition, the LRM model was found appropriate, as its analysis was not constrained by normality requirement as well as restrictions of missing values in data. In this model, the explanatory variables of the 4 Is were incrementally added to determine their individual and collective effect on adoption of m-health applications. To test the hypotheses, the study first conducted the Omnibus Tests of model coefficients to check if the new model with moderating variables of TLS is an improvement of the constant model without integration of TLS constructs at 5% of significance level. It also tested the goodness of fit of the two models (PC and FC) using the Cox & Snell square and the Nagelkerke R Square. It used the Hosmer-Lemeshow test to analyze

whether the predicted probabilities are the same as the observed probabilities. It also used the Chi-Square test to understand the association of TLS on adoption of m-health. The Nagelkerde R square was used to explain variance in the logic models.

The general LRM of this hypothesis is therefore described as follows:

$$\text{In}\left[\frac{p_k}{1-p_k}\right] = \psi_0 + \psi_1 X_1 + \psi_2 X_2 + \psi_3 X_3 + \psi_4 X_4 + \psi_5 X_5$$

Where for i=1,2,3…..5) $+\Psi_i$ are coefficients of the TLS determinants Xi measured as categorical variables X1-X3 and moderating variables X1-X5 defined as follows:-

X1= Idealized influence

X2= Inspirational motivation

X3= Individualized consideration

X4= Intellectual stimulation

X5= Idealized influence* Inspirational motivation* Individualized consideration * intellectual stimulation

Pk=is the likelihood of adopting the kth (for k=1,2) m-health category 1= PC and 2= FC.

Results and Discussions

The total number of questionnaires that met the requirements for the study was 211 out of 241 (87.5% response rate) questionnaires distributed across 24 counties. The response rate complies with recommendations by Fincham (2008) that a response rate of 80% and above is needed for generalizability of results of surveys. Four questionnaires were discarded because they were filled by non-top executive staff and 3 questionnaires were discarded because the hospitals self-categorized as level 3 hospitals, despite being registered as level 4 in the MoH database. The overall distribution of respondents by hospitals ownership was 48% for public, 36% for private and 16% for FBOs/NGOs. The distribution by levels of hospitals was 80% level 4 hospitals, 16% level 5 hospitals and 4% level 6 hospitals. The geographical distribution of hospitals was 36% urban, 38% semi-urban and 26% rural. Table 4 below shows the distribution of adoption of PC and FC m-health applications by level of hospital, category of ownership and geographical locations.

Table 4: Distribution of adoption status by level of hospital, ownership and geographical locations

		Patient Centred		**Facility Centered**	
Hospital attributes		Non Adopters	Adopters	Non Adopters	Adopters
Hospital Classification	Level IV	54 (42%)	75 (58%)	88 (54%)	75 (46%)
	Level V	7 (28%)	18 (72%)	12 (41%)	17 (59%)
	Level VI	2 (67%)	1(33%)	3 (50%)	3 (50%)
Hospital ownership	Public	35 (44%)	45 (56%)	57 (59%)	39 (41%)
	Private	22 (41%)	32 (59%)	31 (44%)	39 (56%)
	FBO/NGO	6 (26%)	17 (74%)	15 (46%)	17 (54%)
Hospital Location	Urban	25 (44%)	32 (56%)	38 (54%)	33 (46%)
	Peri-urban	25 (43%)	34 (57%)	40 (53%)	36 (47%)
	Rural	13 (32%)	28 (68%)	25 (49%)	26 (51%)

Source: Authors

There are more adopters of PC than FC m-health applications at level 4-6 hospitals. Private and Public hospitals have similar proportion of both PC and FC m-health applications adoption while FBO/NGOs have the highest proportion of PC m-health applications. Overall there is higher proportion of adopters of PC m-health than FC m-health applications. There is a higher percentage of adoption of PC and FC m-health in rural areas than in urban and peri-urban areas.

Table 5 below presents the Omnibus tests for Model Coefficients for each PC and FC m-health applications.

Table 5: Omnibus tests of model coefficients transformational leadership style

		Omnibus Tests of Model Coefficients		
m-health applications category		Chi-square	df	Sig. (p-Value)
PC	No Moderator	0.416	3	.937
	Presence of Moderator	12.757	8	.120
FC	No Moderator	.882	3	.830
	Presence of Moderator	5.212	8	.735

*=Significant at 5% level of significance
Source: Authors

At 5% level of significance, results overall, both models with or without TLS of HMBs variable are not statistically better than the constant only models as indicated by PC values of [(Chi-Square=0.416, df=3 and p=.937 (>0.05) with no moderator and Chi-Square=12.757, df=8 and p=.120 (>0.05) with moderator] and FC values of [(Chi-Square=.882, df=3 and p=.830 (>0.05) with no moderator and Chi-Square=.830, df=8 and p=..735 (>0.05) with moderator].

Table 6 presents the output for model summary which provides information about the goodness of fit of the two models.

Table 6: Model TLS Summary for Goodness of Fit Test Transformational Leadership Style

		Goodness of fit summary		
m-health category		-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square,
PC	No Moderator	170.893	.003	.004
	Presence of Moderator	158.552	.094	.128
FC	No Moderator	209.413	.006	.008
	Presence of Moderator	205.084	.034	.045

Source: Authors

From the resulting Nagelkerke R Square PC model without and with the moderator is 0.004 and 0.128 respectively, while similar values for FC model are 0.008 and 0.045 respectively. The results show that inclusion of the moderator variable improves the explanatory power of the variances in two models. The higher values of Nagelkerke R Squared in the presence of moderators of 0.128 and 0.45 implies that 12.8% for PC and 4.5% for FC of the respective changes in adoption of the two interventions are explained by the moderating variables identified. Given the results under the corresponding Omnibus test values, while the Nagelkerke R results seem to show low explanatory power of variability, these are still acceptable given the -2 Log likelihood (goodness of fit test) values for the predictors for each model. Additionally, the Hosmer-Lemeshow test shown in Table 7 below explores whether the predicted probabilities are the same as the observed probabilities.

Table 7: Hosmer-Lemeshow test

		Hosmer-Lemeshow test		
m-health applications category		Chi-square	df	Sig. (p-value)
PC	No Moderator	5.025	3	.170
	Presence of Moderator	7.414	6	.284
FC	No Moderator	.457	2	.796
	Presence of Moderator	7.248	7	.404

*=Significant at 5% level of significance
Source: Authors

In view of results from the Ominbus test, Nagelkerke R Square and Hosmer-Lemeshow Test, the study tested the significance of the two hypotheses using the Logit Regression Model. Table 8 below show the results of LRM for PC adoption model analyzed against TLS of HMBs variables. Constructs with p values (Sig) less than 0.005 are statistically significant moderators of adoption of m-

health applications by hospitals in Kenya. The Wald chi-square statistic tests the unique contribution of each moderating variable in the context of other predictor variables, to test the conventional 0.05 standard for statistical significance.

Table 8: PC m-health applications adoption and moderating role of transformational leadership style of hospitals' management boards in Kenya.

Variables in the Equation								
Variables	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**	**95% C.I.for EXP(B)**	
							Lower	**Upper**
Idealized Influence	-.416	.279	2.220	1	.136	.659	.381	1.140
Inspirational motivation	.107	.213	.254	1	.014	1.113	.734	1.688
Individualized consideration	-.093	.314	.087	1	.768	.911	.492	1.687
Intellectual stimulation	.410	.261	2.468	1	.116	1.507	.903	2.512
Individualized consideration by Idealized influence by inspirational motivation by intellectual stimulation	.002	.002	.582	1	.046	1.002	.997	1.006
Constant	-.618	1.547	.160	1	.689	.539		

Source: Authors

The estimated predictive PC model is as shown in the equation below.

$$\text{In}\left[\frac{p_1}{1-p_1}\right] = -0.618 + 0.416 * \text{Idealized influence} + 0.107\text{*Inspirational motivation -0.093*Individualized consideration} + 0.410\text{*Intellectual stimulation} + 0.002 * (\text{Idealized influence* Inspirational motivation * Individualized consideration * intellectual stimulation})$$

It shows that the combined 4 Is constructs of TLS (p=0.046) significantly moderated adoption of PC m-health. From the EXP (B) corresponding results, a positive change in TEs perspectives of application of TLS by HMBs would increase the odds of adopting PC m-health applications by 1.002 or 0.02%.

Table 9 below shows the results of LRM for FC m-health applications adoption variables.

Table 9: FC m-health applications adoption and moderating role of transformational leadership style of hospitals' management boards in Kenya

Variables in the Equation								
Variables	**B**	**S.E.**	**Wald**	**df**	**Sig.**	**Exp(B)**	**95% C.I.for EXP(B)**	
							Lower	**Upper**
Idealized Influence	-.429	.215	3.992	1	.046	.651	.428	.992
Inspirational motivation	.194	.148	1.705	1	.192	1.214	.908	1.623
Individualized consideration	-.186	.406	.209	1	.647	.830	.374	1.842
Intellectual stimulation	.121	.276	.192	1	.661	1.129	.657	1.939
Individualized consideration by Idealized influence by inspirational motivation by intellectual stimulation	.086	.091	.890	1	.345	1.089	.912	1.302
Constant	-.323	1.062	.092	1	.761	.724		

Source: Authors

The equation of FC m-health moderating effect of TLS is as follows:

$$\text{In}\left[\frac{p_2}{1-p_2}\right] = -0.323 - 0.429 * \text{Idealized influence} + 0.194\text{*Inspirational motivation -0.186*Individualized consideration}$$

$+ 0.121$*Intellectual stimulationt $+ 0.086 *$ (Idealized influence* Inspirational motivation * Individualized consideration * intellectual stimulation)

It shows that the combined effect of the 4 Is does not significantly moderate adoption of FC ($p= 0.345 > 0.05$). However, it shows that only the individualized influence predictor variable was statistically significant ($p=0.046$).

In summary, the TLS of HMB significantly moderate adoption of PC m-health applications ($p=0.046$) and would increase the odds of adopting PC m-health applications by 1.002 or 0.02%. However, TLS of HMB does not significantly moderate adoption of FC m-health applications.

Table 10 below provides a summary of hypotheses tested:

Table 10: Model result of hypotheses on moderating role of TLS by hospitals' management boards in Kenya

Hypotheses	Results
H_{01} The application of Idealized Influence (II), Inspirational Motivation (IM), Individualized Considerations (IC), and Intellectual Stimulation (IS) by the leadership of HMBs has no significant statistical moderating effect on adoption of PC m-health applications by hospitals in Kenya.	**Rejected.**
H_{02} The application of Idealized Influence (II), Inspirational Motivation (IM), Individualized Considerations (IC), and Intellectual Stimulation (IS) by the leadership of HMBs has no significant statistical moderating effect on adoption of FC m-health applications by hospitals in Kenya.	**Failed to reject**

Source: Authors

Implications of the study

This study confirms the results of empirical studies by Sattayaraska (2016); Birasnav (2014); Prasad and Junni (2016); and Cheung and Wong (2011) that TLS has a moderating effect on adoption of disruptive technologies such as m-health. However, this study shows that the moderating effect of TLS of HMB is different for adoption of PC and FC m-health applications by hospitals in Kenya. The difference in the effect could be attributed to two facts:

1) The nature and focus of the technology: It could be argued that FC m-health applications (mobile telemedicine, information and decision support systems, patient records) are by nature operational, more complex and more internally focus than PC m-health applications. The patient focus of the PC m-health may require greater alignment with both external stakeholders (e.g. policy makers, insurance companies, patients and patient advocacy groups) and with internal stakeholders (e.g. management of change across multiple levels of staff) – hence the need of TLS of HMBs to support CEO in navigating a more complex process of adoption of PC innovations than FC.
2) The intrinsic focus or bias of TLS: It could be argued that HMBs who use TLS by the nature of the 4Is that are human centered would be more inclined to innovations that affect patients directly (PC) than innovations that affect processes (FC). In this case, the application and moderating effects of TLS by HMBs would be more bias towards PC than FC m-health applications.

Conclusions

This study demonstrated that the moderating role of TLS on adoption of innovation is different based on the focus or orientation of the innovation. TLS significantly moderated adoption of patient focused m-health innovations but did not moderate adoption of facility or process-oriented innovations. The moderating effect of TLS of HMBs with the 4Is combined were statistically significant ($p=0.046$) moderators of PC m-health applications but not for FC m-health applications. Except for IM ($p=0.014$) for PC and II ($p= 0.046$) for FC, the study found limited evidence of the significant moderating effect of each individual construct outside of the combined effect.

The findings of this study present important considerations and recommendations for practitioners, policy makers and academicians. For managers and owners of hospitals, this study recommends capacity strengthening of their HMBs in TLS to accelerate adoption of PC m-health applications by hospitals in Kenya and in other LMICs. Transformational leaders of HMBs will successfully support TEs in their management of change and adoption of disruptive innovations such as m-health. For developers of and marketers of PC m-health applications or other related digital health technologies, this study recommends integrating the analysis of the leadership style of HMBs as an additional indicator for product introduction. However, for FC m-health innovations, the focus on the TLS of HMBs will be less optimal. For policy makers, this study emphasizes the need for greater focus on the selection criteria for the leadership of HMBs that go beyond medical technical knowledge or tenure. TLS should be strongly encouraged amongst criteria for

the leadership of HMBs in health care settings that are pursuing transformational changes through adoption of PC innovations. For academicians, this study highlights the need to ensure integration of the moderating effect of TLS in theories of adoption of innovations and for using a differentiated matrix for analyses of effect of TLS based on the targets of innovations – patient focus, or facility/process focus.

While this study presents important findings on the moderating effect of TLS on adoption of m-health, it is important to point key limitations of the study. This study did not approach a longitudinal view of adoption of innovations in view of the nascent nature of m-health adoption in Kenya. It also did not separate the different processes and stages of decision making on adoption (e.g. considering adoption or adopted then rejected) but instead chose a binary approach (adopted or not adopted) that fits the Logit Regression Model. The use of non-binary models, though complex, could produce different results. Finally, this study did not include the sensitivity analysis based on the tenure of HMBs and TEs leadership. Future studies should consider a longitudinal analysis of the moderating effect of TLS and should test the differentiated effect of PC and FC in other sectors and regions.

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