SUDANESE MICROFINANCE SERVICES PROVIDERS DRIVERS FOR INTENTION TO ADOPT MOBILE BANKING

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Abstract

Mobile banking (m-banking) promises to increase the efficiency and outreach of microfinance services in developing countries. Mobile banking could mean deeper outreach to poorer and more rural people, efficiency in operation that allows for lowering the cost of loans, and higher repayment rates. To assess the determinants that influence the adoption of mobile banking by microfinance services providers (MFPs) in Sudan, a modified model based on the technology-organization-environment (TOE) framework was developed. A mixed method approach that combines both quantitative and qualitative approaches is used. Data collected from 30 MFPs are used to test the related hypotheses. The empirical results are based on Partial Least Squares (PLS)

analysis. The findings presented in this paper that reveal ICT infrastructure, top management, market and products, MFP size, effect of regulation on the business model, and partners' collaboration are the major factors affecting adoption of m-banking by MFPs.

Keywords: **Mobile Banking, Microfinance Providers, Sudan**

INTRODUCTION

Sudan has a very high poverty rate (46.5%), where almost one out of two Sudanese are below the poverty line. The government is attaching high priority to micro-financing as one of the tools for addressing poverty alleviation. Many studies showed that the Sudanese microfinance has a positive impact on poverty alleviation, income generating activities, women's empowerment, and improvement in education, access to financial services, and access to health services. Nevertheless of the ambitious development plans, the exerted efforts by Sudanese government through providing favorable climate and the establishment of Islamic financial intuitions and establishing structured microfinance framework extensive work done on policy [1] increase of microfinance portfolios, increase contribution of microfinance sector to GDP, increase number of clients, and increase number of women clients microfinance remains in its early stages. As late statistics shows that the total number of clients in 2014 is 970,000 i.e. 8% coverage of total potential clients (estimated at 7.2 mill), leaving more than 6 million individuals in Sudan have a need of microfinance services [2].

This poor performance of the microfinance sector in Sudan might be due to several reasons, the poor communication, and the weakness of the Sudanese basic infrastructures, limited presence for banks in rural areas' because of the high risk/cost. Sudan microfinance market maintains a high operating expenses ratio at 56 percent [3].There is no sustainable, i.e. profitable, microfinance model for the rural areas, which constitute about 90% of the geographical area of Sudan, mainly due to the lack of road and transportation infrastructure, lack of market access, lack of business skills and recurring conflicts [4]. Limited range of microfinance products has been focusing on micro loans for productive purposes only [5].

Traditional distribution channels solutions may not be the answer to address the problem of microfinance in Sudan. MFPs, therefore, need to innovate and think 'out-of-the-box' for solutions to overcome the problem of microfinance in Sudan. M-banking is seen as a promising channel to facilitate financial access and accelerate financial inclusion to the poor, especially in countries where there is no robust financial and banking infrastructure. Many studies in Sudan suggest m-banking as a solution to microfinance problems [3,6].

In Sudan, there are certain gaps on supply side of microfinance services that is evident from outreach statistics. The gap in the financial services market is creating a unique niche for M-banking, thus enabling a growing number of people to access financial services for the first time. In Sudan, little research was conducted to understand M-banking and the environment needed to develop an effective M-banking for serving Sudan microfinance sector. Thus, this study aims to examine the factors that should be considered to develop a successful M-banking that is suitable for Sudan MFPs.

LITERATURE REVIEW AND HYPOTHESES

Technology Adoption Theories

The diffusion of innovation (DOI) theory [7] and the TOE Framework [8] are commonly used in innovation diffusion and adoption studies in organizations. Other popular theories such as the technology acceptance model (TAM) [9,10], the theory of planned behavior (TPB) [11] and the unified theory of acceptance and use of technology (UTAUT) [12] are not considered in this research because they pertain to an individual's adoption (demand side).

Diffusion of Innovation (DOI)

DOI is a prominent adoption model used in Information Systems (IS) research [13-16]. Das et al. showed that the DOI is one of the most well-known theories related to adoption of new technologies. It proposes five attributes that explain the adoption of innovation in an organization. They are: (1) relative advantage, the extent to which an innovation is better than the previous generation; (2) compatibility, the degree to which an innovation can be assimilated into the existing business processes, practices, and value systems; (3) complexity, how difficult it is to use the innovation; (4) observability, the extent to which the innovation is visible to others; and (5) trialability, the ease of experimenting with the innovation. DOI is predominantly based on the characteristics of the technology and the users' perceptions of the innovation. An organization is a more complex entity than an individual. Meanwhile, Rogers [7] suggests that innovation is a communication process using the various channels within the social system and there are three factors influence the adoption of innovation in organizations.

It should be noted that DOI has significantly contributed to adoption and diffusion research by providing important tools that help in predicting the likelihood rate of adoption. Nevertheless, it is argued that the theory does not provide evidence on how attitude evolves into acceptance and rejection decisions and how innovation characteristics fit into this process [17,18]. Also, studies about complex organizational technology have criticized the insufficiency of the attributes of the DOI theory in illuminating the adoption behaviour of complex organizational technologies [19].

Technology Organization Environment Framework

Technology-organization-environment (TOE) framework as Tornatzky et al. [8] proposed the TOE framework to explain the process of innovation in the context of an enterprise. It considers three features of an enterprise that influence the adoption of innovation: the contexts of technology, organization, and environment. The technology context refers to the internal and external technology relevant to the organization and the technologies that are available for possible adoption. The organization context refers to the descriptive characteristics of the firm (i.e., organizational structure, firm size, managerial structure, the degree of centralization), resources (human and slack resources), and the process of communication (formal and informal) among employees. The environment context comprises market elements, competitors, and the regulatory environment [20-25].

TOE framework is chosen as the theoretical basis for the development of our research model from aforementioned theories. This choice is based on several considerations. Firstly, the TOE framework has been widely recognized by previous studies as a well-established framework through which to study e-commerce adoption. Secondly, the TOE framework considers various contexts, not only focusing on technological contexts (such as DOI), but also considering organizational and environmental contexts. Moreover, it is recognized that a model that covers many dimensions can provide better explanatory power than a model that only covers one dimension [26]. Thirdly, the TOE framework is recognized as a model that employs an interactive perspective that assumes that the changes in an organization are determined not only by individuals in organization but also by the characteristics of the organization in which they operate [27]. The interactive perspective allows the researchers to treat all of the factors and their interaction in one dynamic framework [26] and it is believed that this can explain Information and Communications Technology (ICT) innovation adoption comprehensively [28].

Microfinance and Mobile Banking

It is widely accepted that microfinance has long been utilized as a direct strategy for poverty reduction in less developed countries. In a more extensive sense, microfinance can be defined as the delivery of financial services to poor households, so that they can manage their financial resources more effectively and cope with poverty [29]. In the interim, microfinance industry has been spread broadly across the globe because of the increasing demand and interest towards poverty alleviation [30]. As individuals are taking initiative to alleviating poverty, it has given a rise to microfinance activities in different countries [31].

Within Sudan context, Maruod et al. [32] study the role of Rural Development Project (NKRDP) as a MFI in women development in North Kordofan. The results showed that the project helped in providing education services, health services, water services, fuel services, and handcrafts, respectively. Moreover, in a study performed by Siddig [33]

results show that microfinance institutions enable poor low-income households to develop their microenterprises, which enhance their income earning capacity, and improve their living standard. As per Amira [34] study in Sudan, main findings showed that participation of women in micro-credit program helps in promoting women's empowerment, in particular the economic and sociocultural dimensions of empowerment. In this respect, Sayed et al. [35] study in Sudan, results show that there is a positive effect of microfinance on poverty reduction by 16%. Results also show that poverty depth was reduced from 95% to 12% after microfinance credits and also severity of poverty reduced from 91% to 2%. Also, Impact Evaluation Assessment MFIs Sector in Sudan 2007–2012 (2013) study demonstrates that microfinance customers respondents reported an improvement in nutrition for their families (46.7% of clients), followed by better access to education (36.3%), better access to health services (33.8%), and purchase of property (30%). When compared to non-clients, less impact is reported by non-clients in all areas. Ahmed et al. [36] conclude that Sudan emerges as the most prominent market for Islamic microfinance in terms of number of Islamic banking providers. Elsayed study results show that only 33.3% of the clients were able to repay their debts fully while the others defaulted. The study results also found that applying a high loan-profit-rate of 12% could be one of the problems of small repayment rate. Elshiekh [37] conducted a study with the twin objectives of investigating and assessing microfinance accessibility in the River Nile State, Sudan. Results show that most of clients who had access to microfinance are not poor.

It should be recalled that offering financial services to needy individuals under the traditional microfinance setting is now and again expensive, inefficient, unrewarding and unappealing for MFPs; the main problem with needy individuals' access to formal finance is that they are too costly to serve [38]. In the digital age, no business can flourish without better use of ICT. It ought to be noticed that M-banking can convey financial services close to the needy individuals lives [39]; it can reduce the problem of lack of proximity and high operation cost to reach distant clients with bricks and mortars branches [40]. In this respect, Kumar et al. [41] explored three potential benefits of M-banking for MFPs: (i) reaching new customers; (ii) improving the economics for the MFIs; and (iii) serving existing customers better. A CGAP research about microfinance and mobile [42] concluded that MFIs and their customers can benefit from M-banking. Mobile banking could lower the transaction costs of repaying loans, meaning that poor people are more easily able to make payments. Lower transaction costs arise from mobile banking, as clients won't have to travel to branches to make payments, which saves them time and income. Mobile banking could also reduce the need for bank branch staff, thus increasing bank efficiency, if payments are made and tracked electronically through mobile banking, this could increase staff efficiency. To evaluate the usages and adoption of mobile financial services by clients, Moshy et al. [43] led a survey on clients, mobile operators, ICT professionals, agents in Uganda and Tanzania. They contended that mobile financial services reach to rural areas and greater number of clients who were previously excluded from financial services.

Understanding the significance of M-banking technology for Sudanese microfinance sector, in October 2010, the Central Bank of Sudan (CBOS) contracted two experts from HORUS Development Finance to investigate a pro-poor branchless banking initiative in Sudan. In addition, Yassir [44] study demonstrates that in Sudan the traditional and informal cell phone transfer is dominating the market by 62% varying from region to another, however it appears that where the banking services are not accessible probably this per cent increased as appears in west 80% and east 81%. Alizé et al. [45] study uncovers that cell telephone coverage in Sudan is amazingly high, with 80% of retailers owning one phone, and 18% owning two. Above all, the outcomes highlight the direct positive impact of mobiles on business effectiveness in Sudan. As per ZAIN PWC [46] in Sudan M-banking for the unbanked can possibly incorporate an immense part of the populace in banking services.

Factors that Influence MFPs in Adopting Of M-banking

Daghfous et al. [20] in their study on exploring success and critical factors in adoption of E-banking by Lebanese banks, use the TOE framework, found that; organizational variables (bank size, functional divisions, technical staff, technical infrastructure, perceived risks, decision makers` international experience and mastery of innovation) are variables which exert significant impact on the adoption of E-banking. Moreover, to study adoption of Enterprise Systems ES by SMEs in (UK), Ramdani et al. [23] combined TPB, TRA, TAM, DOI, UTAUT, and TOE frameworks. Results indicate that firms with a greater perceived relative advantage, a greater ability to experiment with ES before adoption, a greater top management support, a greater organizational readiness, and a larger size are predicted to become adopters of ES. In addition, Al Nahian et al. [22] identified that organizational capabilities, perceived benefits, perceived credibility, perceived regulatory support, ICT industries readiness, lack of financial institutions readiness, and institutional influence were the most variables affecting e-banking adoption by SMEs in Bangladesh. Additionally, the findings by Zhu et al. [21], on study based on TOE factors, showed that technology competence, firm size, financial commitment, competitive pressure, and regulatory support are important antecedents of e-business use and value at the firm level. Moreover, Benjamin [47] study findings in Nigeria, reveal that government policy and effort of donor agencies; stiffer competition among banks; telecommunications focus on customer's retention and revenue growth; reach of telecom networks; high penetration of mobile phones; and need for increased efficiency and lower cost are facilitators to entrepreneurial m-banking. Meanwhile, conservative and vague regulation; security issues; underdeveloped infrastructures; lack of interoperability; business model issues; and lack of basic need for banking/financial services were identified to be the obstacles to entrepreneurial m-banking. Furthermore, the factors affecting the adoption of E-banking by microfinance institutions MFIs in Kenya were examined by Muriuki's [48]. The results showed that strong support and commitment from top management and business resource (Infrastructure and skills) for e-banking were the major factors influencing the adoption of e-banking. Moreover, to explore the main factors affecting adoption of E-banking in Ethiopia, Bultum [24] employed TOE framework. The study reveals that E-banking

systems, such as ATM, mobile banking, internet banking and others were not well adopted due to low level of ICT infrastructure, lack of legal frameworks, security risk and lack of trust on the use of technological adoption, and limited technical and managerial skills available in Ethiopian banks for the adoption of E-banking. Khatri et al. [49] explored the perception of two service providers regarding m-banking adoption for rural areas of Australia. Study results uncover that absence of collaboration between the banks and telecommunications providers could be a reason as to why implementation of mobile based services has been slow in Australia. Further, Yousif et al. [50] reviewing MFIs experiences with mobile financial services MFS, touched on these factors, the right market environment, organizational re-structure, IT/MIS integration, and the regulatory environment. Ongwenyi [51] studied the influence of mobile phone banking technology on traditional banking transactions in Kenya from the perspective of banking institutions. The study discovered that the introduction of new products and services such as cash transfers, payment of bills, deposits and account statement inquiries, are the key drivers for mobile banking undertaken. A study conducted by Chong et al. [52] in Vietnam found out that a government support in connection with consumer intention to use online banking is highly essential. Heyer et al. [53] present a set of five factors that could determine mobile money potential for scale: extent of latent demand for transactions, range of quality of existing alternatives, regulatory environment, retail landscape and cellular market landscape. AlGhamdi et al. [54], study argues that the significant factors that affect e-commerce adoption in Saudi Arabia are governmental support and customers and retailers involvement level. In India, Ketkar et al. [55] identified key mobile banking implementation barriers: Conservative regulation; Business model issues among Banks, Telcos and Retailers; Reach and coverage reliability of Telecom networks, Interoperability among Banks and Telco networks; Critical mass of users for growth; Consumer concern over security of transactions and loss of handset; Lack of basic need for banking/payment services; Cost of usage to consumer; Lack of consumer trust in services of Telcos and their retailers; Low responsiveness of Telcos for resolution of issues. Authors, furthermore note that in some countries, governments have taken actions towards the implementation of mobile banking in the form of policy regulation.

Within Sudanese context Khattab et al. [56] study reveals that the essential factors to the development of branchless banking in Sudan using mobile technology are the identification of the industry key players, the enabling regulatory environment, the infrastructure readiness and Sudanese cultural values. Meanwhile, Alam [57] found that the challenges most dominant in the application of online banking in Sudan were building the appropriate infrastructure, the Sudanese customers' perception of online banking, and the lack of skilled bank employees. Alam [57] further added that a significant investment in the ICT infrastructure by the government is recommended. In this respect, Nada [58] investigates the challenges facing the use of ICT for disseminating agricultural information to farmers in Gezira State, Sudan. The findings indicated that use of different ICT requires different levels of education. Furthermore, the cost of the ICT varies from one tool to another and some of them are expensive to purchase. Besides, cultural factors such as laws, beliefs, political and institutions are of

significant to implement ICT applications. Meanwhile, Mohamed et al. [59] study shows that m-banking is used by 12.6% of the study's' respondents. Factors that affect adoption of e-banking include, inaccessible internet, lack of means reporting technical problems, unclear legislations protecting e-transactions, weak banks' role in raising clients awareness, unclear e-banking guidelines and instructions, frequent power cut offs, and high e-banking services' fees. The government has a major role to play in promoting the basic infrastructure required to increase the diffusion of e-banking. This includes provision of stable supply of electricity and latest information and communications technologies, moreover; there is a need to enact legislation to protect e-transactions.

Moreover, Sara [25] study findings highlighted the importance of many specific elements in e-government adoption in Sudan. These include: forming ICT strategy with clear vision and plans; applying advanced ICT infrastructure; managing the organizational change and resistance to change; and providing adequate training. Additionally, Tingari [60] study deals with the evolution of banking technology (BT), electronic banking (e-banking) and M-banking in Sudan. Tingari [60] findings showed that although M-banking is believed to be essential, still the services provided are at an infant stage. It is also found that concerned parties are not fully cooperating. This raises risks and constitutes challenges that hinder full utilization of M-banking in Sudan. Based on these results, the main recommendation of the researchers was that regulatory policies should be stated clearly to ensure full collaboration between all concerned parties. This is to support bank managers and decision makers in formulating their strategic plans to deliver competitive services.

Finally, Horus [61] study reveals that, establishing good collaboration between MNOs and partner microfinance providers is a real challenge as they traditionally do not understand each other. The business model of such a partnership between MNOs and microfinance providers is complex, and must be based on a fair repartition of investments, costs and revenues. In addition, the need for ICT infrastructure, regulatory framework, innovative products such as saving, remittance, and capacity building of MFPs are highly critical.

RESEARCH FRAMEWORK AND METHODOLOGY

The literature review revealed that the Technology-organization-Environment (TOE) can guide the study to investigate factors influencing intention to use M-banking by microfinance customers and implementation by microfinance services providers in Sudan. The proposed framework is depicted in Figure 1 below.

Figure 1: Study Proposed Framework.
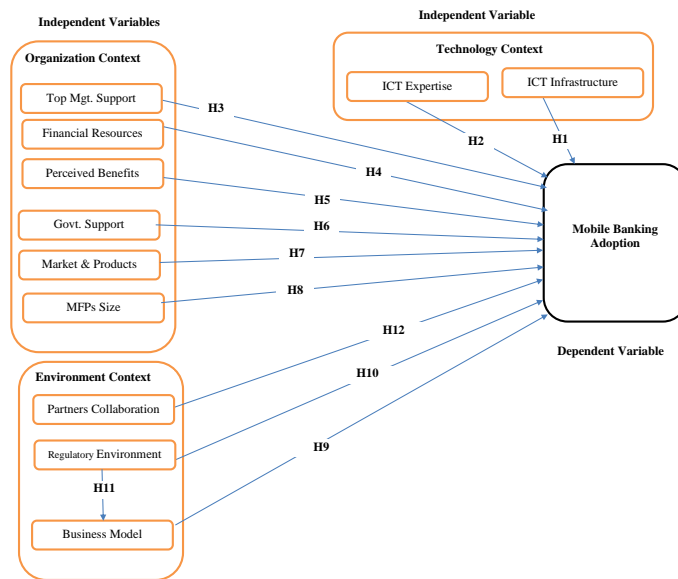
Methodology and Estimation Procedures

This study used survey research design and used primary data that is generated through a structured questionnaires and interviews. The questionnaire population of this study consists of about 30 MFPs in Sudan (Table 1). The interviewees include microfinance sector senior staff and experts (microfinance and ICT).

Hypotheses of the TOE context

The technology context

H1: ICT infrastructure has a significant effect on MFPs to adopt mobile banking.
H2: ICT Expertise has a significant effect on MFPs to adopt mobile banking

The organization context

H3: Top management support has a significant effect on MFPs to adopt mobile banking.
H4: Financial resources commitment has a significant effect on MFPs to adopt mobile banking.
H5: Perceived benefits of mobile banking, has a significant effect on MFPs to adopt mobile banking.
H6: Government support has a significant effect on MFPs to adopt mobile banking.
H7: Market conditions and Products provided have a significant effect on MFPs to adopt mobile banking.
H8: MFP Size has a significant effect on MFPs to adopt mobile banking.

The environment context

H9: Business model has a significant effect on MFPs to adopt mobile banking.
H10: Enabling Regulatory Environment has a significant effect on MFPs to adopt mobile banking.
H11: Enabling Regulatory Environment has a significant effect on business model
H12: Partners' collaboration has a significant effect on MFP to adopt m-banking.

MFPS DATA ANALYSIS

Measurement Model

Table 1: MFPs Convergent Data.

	Factor loading	Average Variance Extracted (AVE)	Composite Reliability CR
ADP	0.613	0.524	0.658
BRC	0.913	0.835	0.938
BSM	0.855	0.735	0.943
FNS	0.666	0.506	0.603
GVS	0.748	0.592	0.809
ITE	0.762	0.602	0.819
ITI	0.915	0.838	0.939
MRS	0.820	0.682	0.937
PRB	0.808	0.662	0.946
RGE	0.808	0.671	0.890
SIZE	1	1.000	1.000
TMS	0.881	0.783	0.915

Table 2 below displays discriminant validity of the measurement model for MFPs, since the square roots of AVE values of all constructs are higher than the corresponding correlations among the latent constructs and higher than 0.707, the study concluded that it is meeting the evaluation criterion of Fornell et al. [62] and Hair et al. [63] Hence, the construct validity of the measurement model for MFPs is good.

Table 2: MFPs Discriminant Validity.

	BRC	BSM	FNS	GVS	ITE	ITI	MRS	PRB	RGE	SIZE	TMS
BRC	**0.914**										
BSM	0.392	**0.857**									
FNS	-0.034	-0.052	**0.711**								
GVS	0.272	0.395	0.355	**0.769**							
ITE	0.204	0.576	0.320	0.528	**0.776**						
ITI	0.210	0.226	0.102	0.076	0.383	**0.915**					
MRS	0.430	0.517	0.387	0.553	0.630	0.443	**0.826**				
PRB	0.279	0.129	0.647	0.483	0.405	0.142	0.659	**0.814**			
RGE	0.184	0.468	0.216	0.524	0.484	-0.027	0.436	0.297	**0.819**		
SIZE	0.265	0.373	0.073	0.122	0.225	0.283	0.358	0.146	0.004	**1.000**	
TMS	0.333	0.443	0.291	0.356	0.482	0.478	0.813	0.643	0.238	0.353	**0.885**

Structural Model

The hypotheses assessed by looking at the magnitude of the standardized parameter estimates of the variables (i.e., the beta or coefficient values), together with the corresponding t-values that indicated the level of significance (Table 3). Also, the overall model using squared multiple correlations (R^2) values for the dependent variables assessed. Hair et al. [64] point out that an R^2 value of 0.20 is deemed as high in fields such as customer behavior.

Table 3: Hypothesis Analysis.

Hypothesis		Path Coefficient	T Statistics	P Values	Conclusion
H1	ITI -> ADP	0.083	1.752	0.080	Accepted
H2	ITE -> ADP	-0.027	0.133	0.894	Rejected
H3	TMS -> ADP	0.485	2.599	0.010	Accepted
H4	FNS -> ADP	0.094	1.558	0.120	Rejected
H5	PRB -> ADP	0.104	0.170	0.865	Rejected
H6	GVS -> ADP	0.022	0.903	0.367	Rejected
H7	MRS -> ADP	0.238	2.067	0.039	Accepted
H8	SIZE -> ADP	-0.700	2.169	0.031	Accepted
H9	BSM -> ADP	0.101	0.419	0.675	Rejected
H10	RGE -> ADP	-0.132	1.383	0.167	Rejected
H11	RGE -> BSM	0.485	7.163	0.000	Accepted
H12	BRC -> ADP	0.124	1.819	0.069	Accepted
	ADP	0.729			
R square	BSM	0.219			

The PLS multiple regression calculation results for MFP model is shown in table above and Figure 1, indicates that ICT infrastructure (H1), Top management support (H3), market and products (H7), MFP Size (H8), Enabling Regulatory Environment effect on business model (H11) and Stakeholder's collaboration (H12) have significant effect on M-banking adoption by MFPs, Hence H1, H3, H7, H8, H11, and H12 are accepted. The results also indicate that MFP size has the higher and negative effect on the dependent variable, with *β (*-0.700), followed by Top management support with *β* (0.485) and Enabling Regulatory Environment effect on business model, with *β (*0.485).

However, the values of β for ICT Expertise (H2), Financial resources commitment (H4), Perceived benefits (H5), Government support (H6), Business model (H9), and Enabling Regulatory Environment (H10), factors are -0.027, 0.094, 0.104, 0.022, 0.101, and -0.132, respectively, which are all insignificant. Hence H2, H4, H5, H6, H9, and H10 are rejected.

In summary 6 hypotheses were accepted from 12. Meanwhile, the coefficient of determination, Adjusted R squared, is 0.729 for the dependent variable adoption. The coefficient of determination (R2) of mobile banking as endogenous latent variable is of 0. 729. Under the Rule of Thumb, indicating that strong models. Thus, can be explained the same time that the factors Technology, Organization, and Environment, is a variant of the substantive nature of mobile banking 72.9%.

In addition, the coefficient of determination, adjusted R squared, is 0.219 for the dependent variable business model that means regulations environment explains a substantial 21.9% of the business model variance for the attitude to adopt M-banking variable by MFPs.

INTERVIEW RESULTS

To get in-depth information, and the story behind participants' experiences, and to validate data collected through questionnaires, face-to-face and E-mail interviews were conducted. The interviews covered Central bank of Sudan senior staff in Khartoum and Kassala states, senior ICT and microfinance staff in banks, MFIs, and NGOs. ICT and microfinance experts. The main objectives of the interviews were to investigate the major problems facing microfinance sector in Sudan and the role of mobile banking to resolve these problems.

The Interviews Covered

M-banking and microfinance

Most of the respondents claimed that M-banking have advantages to microfinance customers and microfinance providers. The major advantages are providing a broad range of financial transactions (cash and non-cash) outside of bank branches, increase outreach, cost and time saving, improvement of the payment system efficiency, and

facilitating financial inclusion of the poor. On the same vein, M-banking is not free from risks, security risks, and reputation risks are the major items reported by most respondents.

In addition, respondents mentioned the following enablers and drivers for growth of M-banking/payment services in Sudan, good mobile network coverage, compatible products, lower cost to consumers for M-banking/payment transaction, collaboration of major stakeholders, facility of getting quick information updates on transactions processed, need for MFPs to improve reach and cost of service, consumer trust on M-banking providers (MNOs and MFPs).

On the other hand, the weaknesses of the network performance, conflict between stakeholders, lack of clear regulatory framework for M-banking, weak awareness of the mobile banking, and lack of reliable management information system (MIS), were seen to be the major hinders of M-banking implementation in Sudan.

Regulatory Issues and Government Support

Respondents claimed that government support is one of the important factors that influence adoption of mobile banking in Sudan. Mobile banking is rarely addressed directly by the relevant regulatory frameworks. One of the major sources of funding to MFIs is savings. Micro-savings are internationally recognized as being a vital form of cash flow for clients or as a source of on-lending funds to MFIs. However, this aspect is not considered in Sudanese MFIs because the regulatory framework in Sudan restricts the majority of MFIs from deposit taking.

In addition to the issuance of related policies, government support to the expansion of telecommunications infrastructure in rural areas, encouraging the trends of government electronic payment through M-banking, and government coordination role between different stakeholders (MFPs, mobile operators etc.) were consider important for mobile banking adoption by MFPs.

MFPs Issues

Respondents' comments that before considering mobile banking, the institutions should make sure it had the operational capacity to manage it without increasing its level of risk beyond acceptable levels. In this regard, microfinance providers require massive capacity building. Meanwhile, microfinance products and services from formal providers of services are not customized to suit the needs of targeted local communities, giving an advantage to informal providers. Moreover, weak utilization of technology in the microfinance sector is another obstacle. There is no shortage of funds allocated for microfinance in Sudan, but the prevailing institutional inadequacies would not allow such substantial outlays to have much impact on poverty reduction. Most of the respondents have doubts about the capability of MFPs top management commitment to

adopt M-banking. In addition, they said that there is a knowledge gap due to backwardness in microfinance and technology implementation in the country.

ICT Readiness

It should be noted that implementing mobile banking would require reliable ICT infrastructure mainly in rural and semi-urban areas. In this respect, most of the MFPs rely on traditional core banking systems, which is not suitable for the inclusion of the poor and micro-financing activities, It should be recalled that there is no significant mobile banking initiative can be launched in Sudan without ensuring that MFPs are equipped with a stable and scalable MIS such as loan tracking system LIS, managed by competent ICT staff. MFIs belong to NGOs, and other MFPs (except banks) need to have excellent management systems. Some microfinance institutions have acquired recently loan tracking systems which do not support electronic and mobile financial transactions. Technical capabilities: Easy network access, secure channels between all players is a must.

In conclusion, with about 10 million customers, 6 million of them own smart phone, mobile banking can be implemented in Sudan within the next two years if the issues mentioned above are overcome.

DISCUSSION OF THE FINDINGS

ICT Infrastructure

ICT infrastructure (H1) is accepted, this result indicates that ICT infrastructure is one of the determinant factors that influence MFPs in Sudan in adopting m-banking technology. This result is consistent with previous studies, such as Alam [57], Daghfous et al. [20], Muriuki's [48], Khattab et al. [56], Sara [25] and Ayana [24]. However, it contradicts to findings reported by Ifinedo [65], Pan et al. [66] and Zhu et al. [67].

The study results suggest that the poor quality of telecommunications network service is a major obstacle for microfinance sector to effectively deliver some services such as mobile banking. Therefore, the government has a major role to play in promoting the basic infrastructure required to increase the diffusion of m-banking. This includes provision of stable supply of electricity and latest information and communication technologies. The Sudan government can also help the banking institution by ensuring a better m-banking infrastructure (i.e. wireless network) and help to encourage users to use m-banking.

ICT Expertise

ICT expertise (H2) is rejected and in line with Alawneh et al. [68] findings. However, it contradicts with prior studies by Alam [57], Daghfous [20], Muriuki's [48], findings, which showed that significant relationship between ICT expertise and M-banking, adoption.

This indicates that MFPs in Sudan do not recognize the ICT expertise as a factor that influences them in adoption of m-banking. This may be due to the fact that most of the despondence are banks with long experience in ICT and have experience staff, so they think that ICT expertise is not a major factor in M-banking adoption.

Top Management Support

Top management support is accepted and it correlates with prior studies, such as P.finedo [65] Muriuki's [48], Ramdani et al. [16], Sara [25], and Zhu et al. [67]. Top management support was found to be one of the main enablers of the success of m-banking adoption in MF sector. This needs a lot of work by the m-banking major stakeholders to ensure that MFP top management are aware of the benefits and requirements of m-banking and are ready to support the implementation.

Financial Resources

Financial resources variable (H4) is rejected and it correlates with prior studies, such as Alawneh et al. [68] and Ifinedo [65] who comment that financial resources factor did not confirm the availability as an important factor needed to enhance IEBT acceptance among the sampled SMEs. Alas, it contradicts with prior studies, such as Toufaily and Daghfous [20], Zhu et al. [21], Alam [57], and Nada [58] which observed that financial resources is a significant factor that affecting technology adoption. This indicates that MFPs in Sudan do not recognize the financial resources availability as a factor that influences them in adoption of m-banking. As mentioned earlier, most MFPs are government owned organizations depend largely on finance from government, supporting alliance to the sector such as Islamic Development Bank (IDB) and United Nations Development Programme (UNDP).

Perceived Benefits

Perceived Benefits (H5) is rejected and it contradicts with prior studies by Ramdani et al. [16], and Riyadh et al. [22], findings that support the importance of perceived benefits in technology adoption. This means that the perceived benefit is not one of determinant factors of mobile banking adoption by MFPs in Sudan. In this note, without a valid working example in the country it is difficult to realize the expected benefits; this view is supported by McKay [41]. According to McKay [41], to answer the question: how can MFIs take advantage of mobile banking? To answer this question, a team of CGAP studied 15 leading microfinance organizations (NGOs and commercial banks) to understand their perspective and plans for M-banking. There is much more diversity amongst this group both in the ways they planned to use M-banking and in the benefits they hope to receive. A wide gulf separates those institutions that are in countries with existing M-banking services and those that are not. Those fortunate MFIs in countries like Kenya and the Philippines have several different ways they can take advantage of the M-banking services at their doorstep. Unfortunately, the vast majority of MFIs are in countries without M-banking services [41]. Mahalaxmi [69] notes that banks can realize

the full benefits of the roll out of alternate channels only if there is a perceptible increase in the usage by customers.

Government Support

Government's support (H6) is rejected and it agrees with prior studies by Parhizgar et al. [70], and Ifinedo [65]. However, it contradicts with Sudanese studies (e.g. Mohamed et al. [59]; Nada [58]; AlGhamdi et al. [54]; and Chong et al. [52]. This means that the government's support is not one of determinant factors of mobile banking adoption by MFPs in Sudan. This may be due to the fact that most of the respondents MFPs are government owned or semi government organizations and they get support from government by default. This is clear from interviews meeting were the respondents claimed that government support is one of the important factor that influences adoption of mobile banking in Sudan. Government support normally provided through enabling polices, technical assistance, and in kind.

Market conditions and Products

Market scope is the horizontal extent of a company's operations and indicates the nature of the firm's product-market domain. Market and products is accepted and it correlates with prior studies, such as Yousif et al. [50], Benjamin [47], Ongwenyi [51], Heyer et al. [53] and Ketkar et al. [55]. Demand by the unbanked for mobile banking also depends on the type of functionalities that are available and the ability of the financial products to meet the needs of the unbanked [71]. MFIs that have been successful in using m-banking for their operations are located in mature m-banking markets where customers are already aware that the mobile phone can be used for payments [42]. Before launching any services, Sudanese MFPs should carry out all the necessary research, including a cost/benefit analysis, client-focused market research, and assessment of internal structure, processes and ICT capacities, business model and market environment [50].

MFP Size

MFP size is accepted and it correlates with prior studies, such as Kraemer et al. [72], Zhu et al. [21], Ramdani et al. [16], and Daghfous [20]. One probable reason for the significant positive relationship between MFP size and ICT adoption is the greater size of the organizations as they generally have more slack in their resources and therefore assign more organizational resources (e.g., financial, technical, and human resources) for the adoption of any new ICT innovation. Within Sudanese context MFPs size (number of employees) should accepted with caution since most of MFPs are government organization and many staff is not qualified, so they may hinder the adoption.

Business Model

Business model (H9) is rejected and it contradicts with prior studies, such as Ketkar et al. [55] and HOURS [61] studies' findings, which support the significant relationship between the business model and mobile banking adoption. This indicates that MFPs in Sudan do not recognize the mobile banking business model type as a factor that influences them in adoption of m-banking. This may be due to the fact that banks are the majority of the respondents (60%) and they have long experience with computer systems and computer applications. Consequently, they collaborate with computer services providers, mobile network operators, and telecommunications companies, and work with them through different types of business model to adopt technology applications.

Regulatory Issues

Regulation (H10) is rejected and it contradicts with prior studies, such as Khattab et al. [56]; Ismail et al. [59]; and Elhadi et al. [73] results, which support enabling regulatory as a significant factor in m-banking adoption. This means that the regulatory environment is not one of determinant factors of mobile banking adoption by MFPs in Sudan. This may be due to the fact that most of staff fill the questionnaire are not aware with the need to regulate M-banking, because some banks are already providing M-banking services. This is clear in the responses of the senior staff in the interviews who claim the importance of mobile banking regulations. This argument is also supported by the findings of Mobile Banking Study, (2013) which report that from 73 MFIs investigated in the study, only six (6 MFIs) respondents were aware that their country had regulations regarding m-banking, and few respondents believe that there should be some changes to the regulatory environment related to mobile. In addition, Yousif et al [50], interviews revealed that MFIs often overlooked the importance of building internal support by regularly communicating.

Enabling Regulatory Environment and Business model link

Business model and regulatory environment relationship is accepted and it correlates with prior studies, such as Merritt [74]. Different business models have emerged in the field of Mobile Money around the world due to difference in the regulatory environment, consumer climate and demographics [74]. The regulatory regime is likely to be different from country to country and this can be an obstacle for the service provider, depending on the business model that has been adopted. Regulatory laws for example may prevent the MNO from operating Mobile Money without any involvement of the financial institutions. In Sudan as mentioned earlier Hours [61] study reveals that there is no m-banking regulation, hence it is important to quote Yousif et al. [50] "the regulatory environment influences everything.

Partner's Collaboration

Stakeholders Collaboration is accepted and it correlates with prior studies, such as Lee [75] whatever the type of business model, implementing Mobile Financial Services involves a large number of stakeholders, which is never simple. In any case, the MFS provider needs to make sure that all parties have a common interest in developing the system [61]. Regulatory policies should be stated to ensure full collaboration of all concerned parties [60]. Interview results indicate that government can take a coordination role between different stakeholders (banks, mobile operators etc).

CONCLUSION AND IMPLICATIONS

Based on the explanations above, it can be seen that the adoption of mobile banking by MFPs in Sudan is affected by several factors which are business partner's collaboration, ICT infrastructure, market and products, MFP size, top management support and the relationship between regulation and business model.

The significance of this study include the fact that its findings could provide guidance to policy-makers, donor agencies and other development partners as a guide in the formulation and direction of policies aimed at financial inclusion. In addition, the results of this research are significant to the MFIs, banks, MNOs in Sudan. It contributes greatly to the understanding of how to deliver financial services for microfinance clients in Sudan using m-banking [76]. Besides, the qualitative approach through interviewing the experts concerning M-banking adaption from different related sectors that must be involved in adapting M-banking in Sudanese microfinance has been implementing. By doing so the study has filled the gaps in past studies in this research area. In this note, using PLS as new phenomena tool to analyses the primary data of quantitative approach for both customers and microfinance providers' data has added mew empirical value to the literature in this research area.

Furthermore, the stud findings are expected to contribute to the adoption literature in the area of M-banking in the Sudan and developing nations as well around the globe. More specifically, to bridge the gap that exists for Sudan by serving as a starting point for further research. The findings from this research can be used by microfinance providers to improve M-banking facilities and to identify those factors that can either contribute to the failure or success of the M-banking services and this could be further used for decision making [77,78]. To academia, the research would serve as a source of academic reference for further studies.

However, the paper also contributes to the body of knowledge by introducing five new factors on the intention to adopt m-banking namely the impact of regulation on the business model, products and markets, Perceived Benefits, firm size, and top management support. These factors are rarely mentioned in prior Sudanese studies.

RECOMMENDATIONS

Based on the results of the study and within technology context, internal ICT infrastructure need to be addressed specially within the context related to mobile banking adoption. Support can be provided by CBOS microfinance unit, with cooperation of microfinance alliances such as Islamic development bank, IFAD, and UNDP.

The three organization significant factors recognized in this study are top management, organization size, and market and products. MFPs top management need to be aware about mobile banking benefits, this will enhance their knowledge about the service and lead to their comment to adopt it. MFP size show significant impact but negative path. Previous studies show that larger firms are known to have plenty of resources at their disposal while a small firm will find it very challenging to acquire such systems due to resource limitations. This issue needs to be looked at by CBOS to support the small MFPs in the adoption of mobile banking. The third factor related to market and products should be considered jointly by CBOS MFU and MFPs. They need to identify the services to be rolled and the targeted market. HOURS [61] can be a good reference for this process.

The last two significant factors are related to the environment context, namely regulatory environment and partner's collaboration. Both need to be tackled by CBOS and ministry of Telecommunication. The major partners in the mobile banking system are MFPs and MNOs. Proper regulatory environment, respecting user guidelines, trusts, rights and protections, proper integration and partnership between mobile network operators and MFPs, are necessary to issues to be resolved.

Success of M-banking implementation highly depends on the dedication and specialization of capacities of the MFPs. Microfinance customers need safer; more reliable, affordable and convenient ways to manage the little money they have. A deep and realistic understanding of financial needs, constraints and opportunities of the microfinance customers are needed to address in its proper designing.

As mobile banking is a new phenomenon in microfinance sector, there is huge scope to do further study. More qualitative and quantitative studies should be conducted to measure the impact of mobile banking on microfinance institutions outreach based on large sample. Research should be done to identify the barriers for usages and adoption of using mobile financial services.

Proper regulatory environment, respecting user guidelines, trusts, rights and protections, proper integration and partnership between mobile network operators and MFPs, adequate staff training and introducing client literacy for proper use, developing reliable and adequate ICT infrastructure and better product and service design are necessary to implement M-banking.

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LIMITATIONS

There are several limitations evidenced in this study. These limitations should be considered for future research and improvement. Firstly, most of MFPs contributed in the questionnaire are banks with good organization setup (technical, managerial, and financial). Secondly most of the face-to-face interviews were carried with senior knowledgeable MFPs staff most of them were exposed to microfinance experience inside and outside the country. This provided good information and facts about Sudanese microfinance institutions and customers and relevant to other countries that should be considered in the future studies.

Since the adoption and usage of mobile technology are highly varies across countries with different adoption levels and perceptions. Hence, researchers may want to further research on multi-nationalities through expanding geographical areas to gain better generalizations in future studies.

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