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RESEARCH PAPER

Preliminary Investigation of Financial Technology and Financial Information System in Microfinance Institutions

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ABSTRACT

This study is undertaken for preliminary investigation of Financial Technology (Fintech) and Financial Inofrmation System (FIS) in Microfinance Institutions, providing their products/services in Pakistan. Fintech and FIS could increase financial service delivery and operational efficiency, but there are very few studies who addressed this important issue in MFIs especially in the local setting of Pakistan. It was based on in-depth qualitative research through semi-structured interviews and focus groups of relevant experts, pratitioners and professionals to analyze data by NVivo 15. Results revealed several determinants of Fintech including perceived-usefulness, ease of use, security, risk, technological readiness, innovation, and digital finance. Moreover, FIS is the composition of ICT, quality of information system, service, compatibility & agility, Transaction processing, Financial reporting, ERP and Decision Support etc. in MFIs. MFIs should increases security, innovative culture, employees empowerment, technology, and develop strategies to increase digital adoption for better performance.

KEYWORDS Financial Information System, Financial Technology, Thematic Analysis, Microfiance Institutions, Pakistan

Introduction

Microfinance institutions play a significant role in offering financial services to the underserved populations especially in the low income and rural setting where the traditional banking services are less. The need to enhance access, financial inclusion, and efficiency has compelled MFIs to go digital. Digitization and tech-oriented operations/services are more evident in the contemporary world, therefore, investigation of Fintech and Financial Information System (FIS) is getting more importance as it is linked with Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), and innovation diffusion theory (IDT) to comprehend adoption behavior by focusing on perceived usefulness, ease of use, and other facilitating conditions (Davis et al., 1989; Venkatesh & Bala, 2008). It could be associated with "DeLone and McLean Information Systems Success Model" where information quality, systems quality, user satisfaction, service quality, and the net benefits are founded on (DeLone & McLean, 2003; Mardiana et al., 2015). Integration of these models offers an in-depth perspective on exploration of different aspects behind the adoption of Fintech by employees and FIS effectiveness in operational performance of MFIs especially in the local setting of Pakistan. It is observed that world is adopting digital financial services at an increase rate, different factors that drive Fintech and FIS adoption in MFIs requiring an investigation in developing countries like Pakistan. Fintech penetration efforts all over globe are increasing at a rate never seen before and rate of uptake will be even higher in future (Frost, 2020).

Digital financial inclusion is increasing such as digital finance market reached a point of $4726.20 million in 2023, it is expected to increase to $15613.74 million in next years by 2032 with annual growth rate of 14.20% over a period from 2024-2032 (Research, 2024). It is reported that use of trust, perceived usefulness, ease of use, and enabling conditions are important components of Fintech (Azeem et al., 2023; Kalinga & Senarathna, 2023). However, the contextual factors, process, and organizational level determinants could affect

operations of MFIs. It is noticed that system quality, data strength, service support, and information quality are key components of information system (Diavastis et al., 2024; Qatawneh & Bader, 2020). Fintech and FIS are leading to change with innovative services that improve service delivery and rationalize operations. It could enable data based decision making (Gunawan et al., 2023; Weber et al., 2024). Digital economy is growing at fast rate. Smartphone shipment on annual basis is now doubled from 2010 and reached 1.2 billion in 2023. From 2023 IoT devices growth increases at sharp rate and may reach to 39 billion from 2023-2029; E-commerce sales increase approximately 60% from 2016-2022 and reached at $27 trillion (UNCTAD, 2024).

MFIs work in special circumstances where there is scarcity of resources, problems in regulatory supervision, and focuses on lower income segment. Such conditions create complicated adoption dynamics that are not fully considered by quantitative studies requiring a preliminary investigation through qualitative research to document experience, perception, and challenges of MFI employees regarding adoption of Fintech and FIS. This research contributed by context specific awareness related to MFI practitioners by exploring different determinants of FIS and FIS adoption in MFI. It aims to conduct preliminary investigations to explore the determinants/constructs related to different processes, organizational, and technological aspects that influence system usage. It is evident that green banking as an indicative of Fintech and digitization plays an important role in emerging organizations (Ahmad, 2024).

Literature Review

Digital technologies and their intervention have reshaped situation for financial service providers, especially in MFIs. Different MFIs are now adopting Fintech to provide solutions to customers including mobile lending and digital payments (Kalinga & Senarathna, 2023). Similarly, FIS provides internal solutions including transaction, accounting, and report processing (Muhtarudin & Pertiwi, 2024). Previous studies highlighted the importance of Fintech, Technological intervention and information systems that is evident from Innovation Diffusion Theory by (Miller, 2015; Rogers, 1995; Rogers et al., 2014) and Technology Acceptance Model by (Davis, 1989; Venkatesh & Davis, 2000) as basis for the adoption of Fintech and FIS in MFIs. Process of innovation adoption is associated with relative advantage, compatibility, observability, complexity, and trialability. Compatibility depicts relationship between digital solutions and work processes in the presence of perceived complexity of operating systems by observability and trialability (Offiong et al., 2024; Qashou et al., 2024). It is reported that compatible and beneficial could be readily adopted and result in operational benefits including loan disbursement and loan repayment tracking systems (Amnas et al., 2023; Diavastis et al., 2024).

Technology Adoption Model revealed "perceived usefulness (PU) and perceived ease of use (PEOU)" are the major factors of adoption behavior (Davis et al., 1989; Venkatesh & Davis, 2000) due to convenience and efficiency of systems for better financial reporting and reduced errors (Tilahun, 2019). Digital financial services are more linked to financial management as it is more accessible to underserved segment of the population through mobile banking and digital payments. It is evident that infrastructure, trust, and regulatory support are strong factors that determine adoption that enhance transactions processing and reporting reliability (Blums & Weigand, 2019; Trpeska et al., 2017). It is reported that technologies that provide sense of convenience, time savings, and processes improvement were more easily accommodated, which increased efficiency of customer satisfaction and loan disbursement (Ashraf, 2022). UTAUT and TAM models highlighted perceived usefulness, ease of use, infrastructure readiness, and trust to reduce errors (Amnas et al., 2023; Miller, 2015; Rogers, 1995; Rogers et al., 2014; Sharma et al., 2024).

Gera et al. (2023) argued that innovations could reduce cost, increase reach, and enhance services efficiency. Good information improves monitoring performance, decision-

making for risk management that increases institutional performance (Tutegyereize, 2019). Adoption depends on service quality such as responsiveness, technical support, and training that can integrate system and increase user confidence (Obore, 2019). Better quality systems can lowers financial and operational errors for institutional performance (Homaid, 2022; Mwashiuya & Mbamba, 2020). It is found that FIS ensures reliability and information quality, it can improve service delivery and digital financial inclusion and ultimately increase performance (Lehtinen, 2013; Mwenda et al., 2024; Odoyo & Ojera, 2020). Findings indicate that systems' quality, information quality, services support, and perceived usefulness are important for adoption decisions (Diavastis et al., 2024; Rizvi et al., 2020; Tilahun, 2019). It is found that operational performance increase due to technology integration in systems (Ali & Khan, 2013; Rizvi et al., 2020). Maintaining a strong cybersecurity framework does not only encourage adoption but also eliminates transactions errors for institutional confidence (Khomovyi et al., 2023; Zakirova et al., 2021). Moreover, Islamic fintech ecosystem development is an emerging phenomenon in Pakistan in the recent years (Sadiq et al., 2023).

Ahmad (2023) reported that financial innovation and cororate governance are essential elements for sustainable growth ensuring long term benefits for Islamic Fiancial Institutions operating in Pakistan. Financial reporting through system provides timely reporting to external and internal stakeholders. It increases accountability, credibility, performance and compliance as per regulations (Al-Mulla & Bradbury, 2020; Mwenda et al., 2024). Risk perceptions and privacy are strong influencers of Fintech adoption (Muhtarudin & Pertiwi, 2024) including information privacy, computer security, and secure information processing. Security increase intension to adopt and trust, especially in MFIs that have weak infrastructure that increases organizational and customer trust on services (Abdullah & Hisamudin, 2024; Jafri et al., 2024). It is expected that all transactions in next few years are likely to be digital (Alt et al., 2024), therefore, shifting of MFIs to digital platforms could be competitive, enhance efficiency, and eliminate errors in the operations (Hanu et al., 2024; Nazara et al., 2024; Şişu et al., 2024). Digital financial tools can improve transaction transparency and management of portfolio (Gera et al., 2023; Jafri et al., 2024) and rely on digital finance tend to get benefit from better service delivery, but it determined by the availability of government support, infrastructure, and competence of working employees (Abdullah & Hisamudin, 2024).

Material and Methods

This research is based on qualitative research to identify the determinants of Fintech and Financial Information Systems (FIS) in MFIs, based on employee's perspectives who have interaction and using these systems in their daily activities. The key determinants were investigated by semi-structured interview and focus groups of relevant professionals, experts and practitioners in the selected part of Pakistan who are serving MFIs. Purposive sampling technique used for interviewing fifteen professionals, who have experience in field at the point of saturation, was reached. Moreover, snowball sampling was applied to compile the response from respondents. Interviews were conducted for almost 45-70 minutes from each respondent, interviews recorded with permission and transcribed in their direct form. The confidence of results was achieved with help of triangulation, whereas ethical implications, such as informed consent, and confidentiality were considered more important and communicated to the respondents properly. Thematic analysis was used to analyze data (Braun & Clarke, 2006), by coding data to major construct.

Results and Discussion

Data was collected from target audience for preliminary investigation of Fintech and FIS, and analysis was undertaken through NVivo 15 based focus group and 5 in-depth interviews. NVivo 15 used to analyze qualitative data with thematic analysis i.e. "code, word tag cloud, tree map, and word tree" as recommended by (Braun & Clarke, 2006). Figure 1

and figure 2 show coding of Fintech and Financial information system respectively based on focus groups and interviews conducted from respondents.

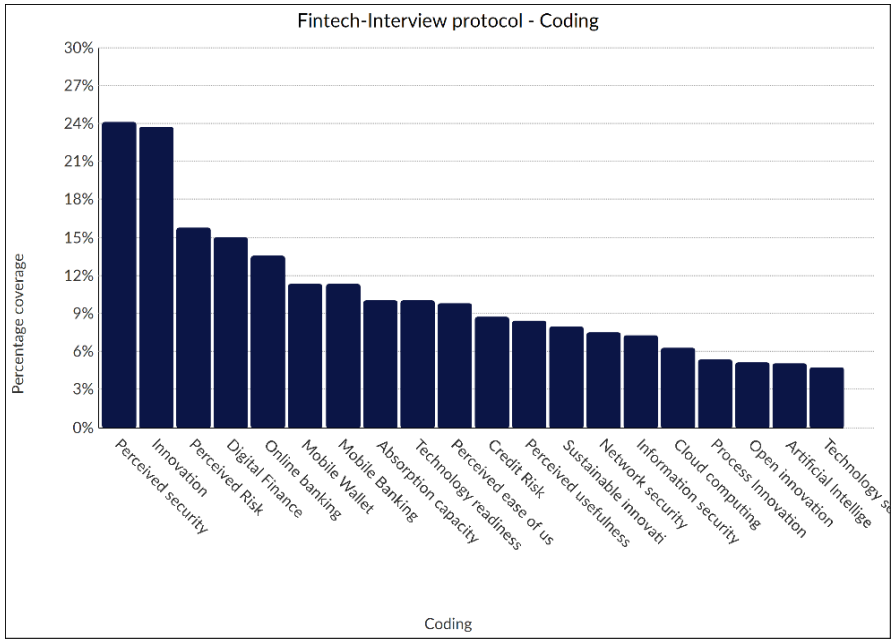

Figure 1 "Fintech-Interview protocol-Coding"

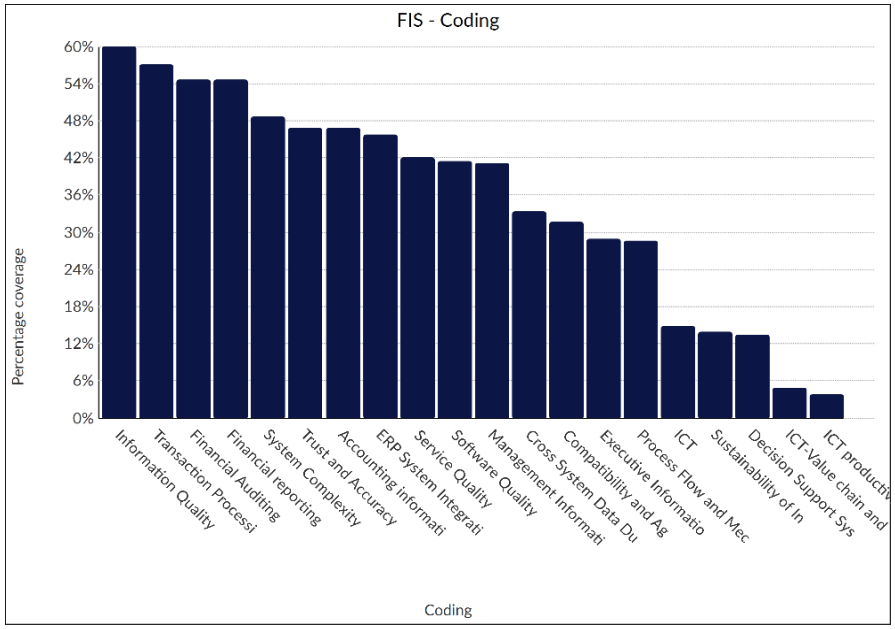

Figure 2 "FIS-Interview protocol-Coding"

Word Tag Clouds

Word tag cloud are used to show magnitude of words based on their frequency. For fintech "Security, latest, digital, different, technology, financial, innovation, information, MFIs, bank, customers, banks, services, technologies, department, and mobile" are more frequent words and significant words reflected Figure 3. Moreover, word frequency for FIS is placed figure 4 indicating "System, financial, data, reporting, information, transaction, quality, accounting, time, process, management, reports, work, integration, problem, posting, and errors".

Figure 3 “Fintech-Word Tag Cloud”

Figure 4 “FIS-Word Tag Cloud”

Analysis of Word Tree

Word tree indicates the related words, associated terms, linked and more significant words as per in-depth interviews of respondents. As figure 5 shows that the term “financial” is associated with inclusion, platforms/ mobile banking/mobile wallet, services, technological adoption, traditional ways, account detail, digital, disruptive innovation, next era, and banking channels. And in figure 6 shows, term “technology” that, is associated with readiness, security, systems, protecting, digital, cybersecurity, ready to use, technological advancement, financial, and MFI survival.

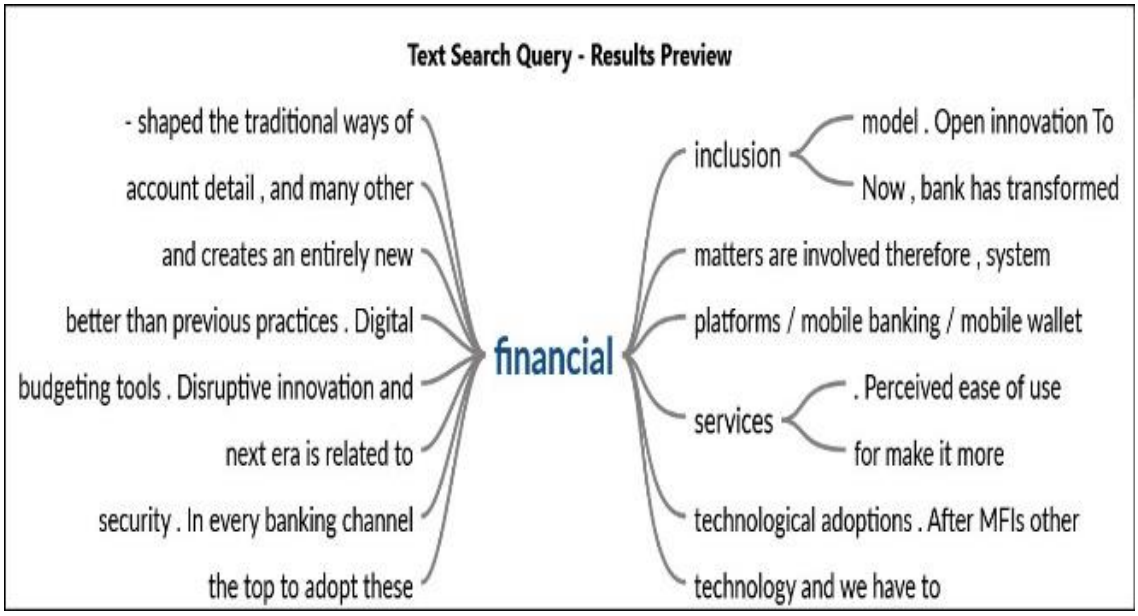

Figure 5 "Financial-Word Tree Analysis"

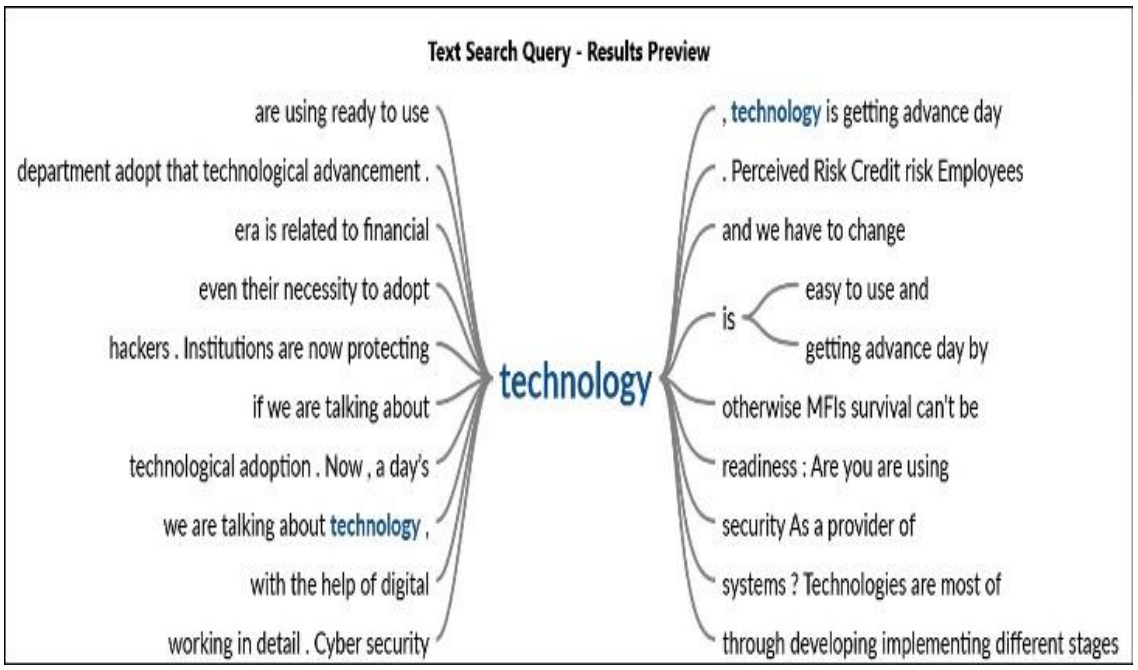

Figure 6 "Technology-Word Tree Analysis"

Moreover, Figure 7 shows significant words of "System" that are, regular basis, report, information, accounting, management, sustainability, efficient, executive, manual ERP, financial reporting, checking, system output, human errors, management, reconciling, workflow, real time, directly recorded, financial control, prevent wrong entries, clarity, reliability, financial work, decision support system, transaction and reporting, software quality, budget planning, complexity, data duplication and information subsystem, timeliness, consistency, minimize errors and delays.

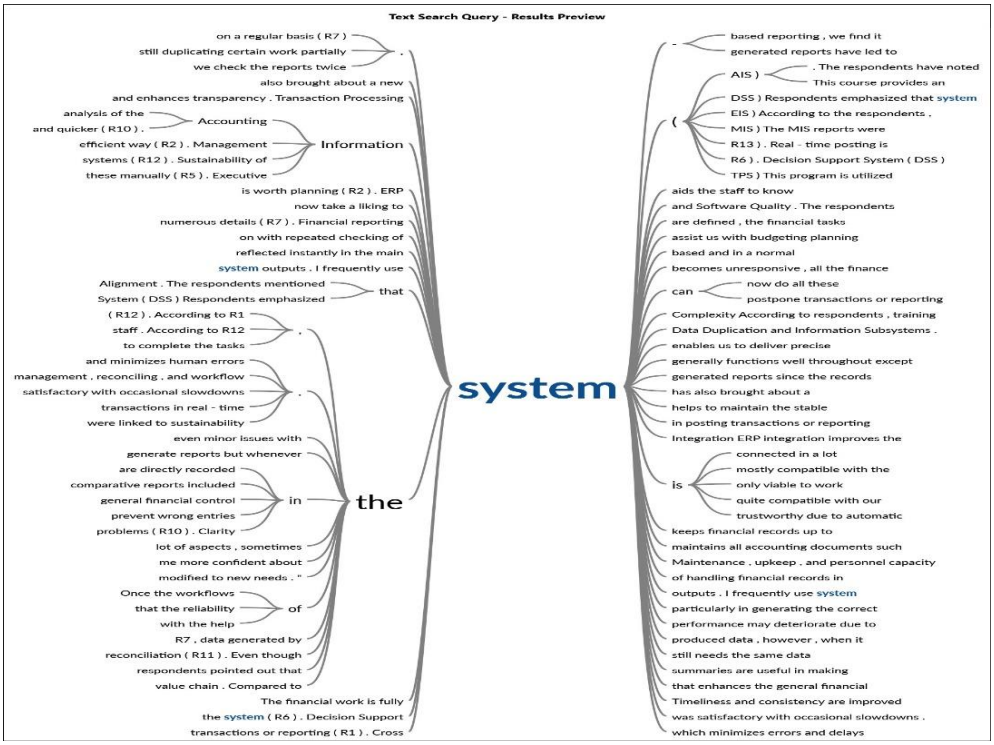

Figure 1 "System-Word Tree Analysis"

Tree Map Analysis

Analysis of tree map shows comparative significance of all determinants. In case of fintech, figure 8 shows that digital finance (online banking, mobile wallet, cloud computing, AI, and mobile banking), innovation (process innovation, sustainable innovation, product innovation, process innovation, open innovation, and disruptive innovation), perceived security (network, smartphone, information, technology, and app security), technological readiness (absorption capacity) are more focuses determinants. Perceived ease of use, perceived usefulness, user design interface, and perceived risk are extracted but smaller in size according to discussion.

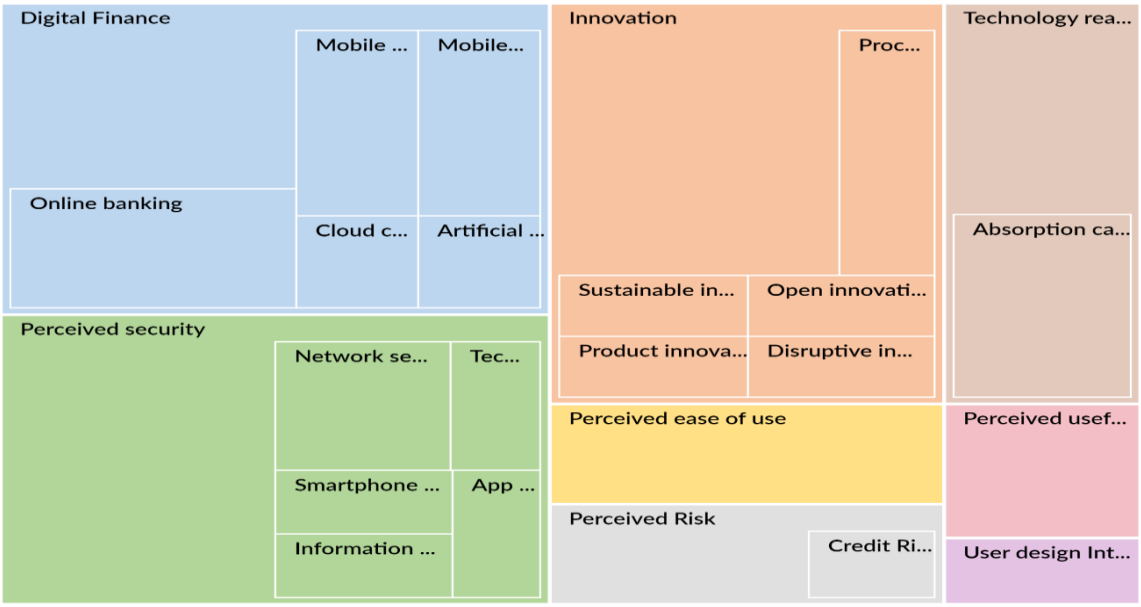

Figure 8 "Fintech- Tree Map Analysis"

Figure 9 shows, tree map of FIS, in which most focused determinants are "information quality, Transaction processing system (TPS), system quality, Financial reporting system, financial auditing, service quality, compatibility and agility, trust and accuracy, Decision Support System (DSS), Management Information System (MIS), Executive Information System (EIS), Accounting information system (AIS), ERP System Integration, System Complexity", as compared to "ICT, Process Flow and Mechanism, sustainability of the Information System, Cross System Data Duplication and Information Subsystems."

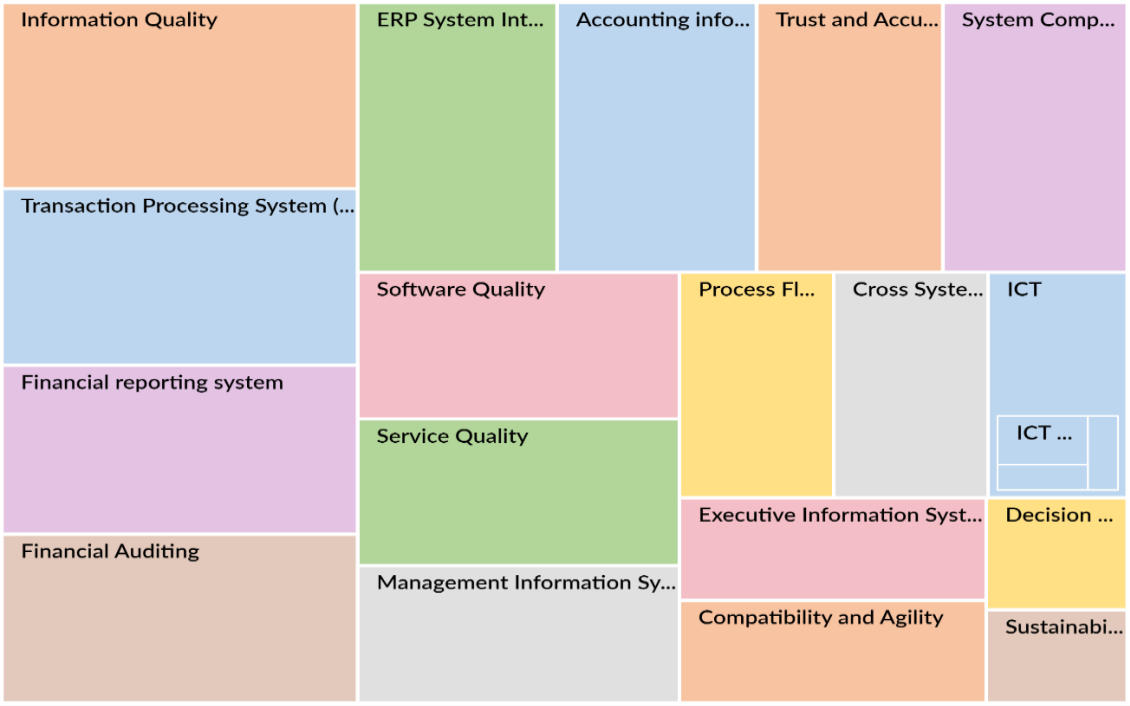

Figure 9 "FIS- Tree Map Analysis"

Financial Technology

Findings indicate several factors that are associated with adoption of Fintech in MFIs and themes extracted. Results indicate that Fintech has redefined the way financial services are delivered and acceptability by users of MFIs which are reported as below:

Perceived usefulness is of key in adoption of Fintech, especially via account online access, digital payments, and differentiated financial services". Other respondents reported that *"Fintech has changed daily operations of finance, as it is easier and convenient to use various services through digital platforms for payment, and track transactions."*

It was reported by a respondent that *"current Fintech applications require technical skills as it can be complicated to use for customers who are illiterate or having low qualification and skills".* But majority of the respondent reported that, *"Latest platforms are user-friendly and helped them being "user-friendly system and training programs can reduce operational complexity."*

One of noticeable determinants is perceived security as reported by the respondents, *"there are different levels of securities in MFIs such as information security, application security, network security, and device security. Secure mechanisms are essential in safeguarding transactions, fraud prevention, and to increase customer confidence in institutional services provision.* Another respondent says that *"cybersecurity monitoring systems, biometric checking are implemented to avoid unauthorized access to data leakage."*

Innovation is reported as one of the key factors indicating process, product, open, disruptive, and sustainable innovation, "*MFIs invest heavily in R &D to bring effective processes, user-friendly platforms, and digital products. The process innovations were linked to less processing time and increase service provision whereas product innovations enhance financial access and convenience."* The other aspect reported by respondents as *"MFIs are focusing on innovation that deployed to achieve their sustainability goals, such as providing training on financial literacy, and digital opportunities usage to enhance social inclusion."*

Technological readiness was extracted as important aspect of fintech reported as *"MFIs are likely to possess adequate digital platforms and qualified personnel to exploit new technologies. The training and introduction to digital tools were considered to increase potential to adopt technological change.*

Digital finance is considered as another aspect of Fintech which involves internet banking, online platforms, mobile banking, and mobile wallets. The respondents describes MFIs relevance in digital finance innovation through collaboration with fintech businesses reported as*" MFIs are offering 24/7 access to services, biometric authentication, real-time monitoring of transactions and fraud automated detection that considered to be a main contributor in increasing accessibility, customer interactions, and security."*

Perceived risk (particularly fraud risk and credit risk) was identified as barriers to adoption that is reported as *"MFIs take care of risks by conducting verification, biometric controls, risk management units and adherence to regulations. Risk management are balance of factors that determine Fintech usage in MFIs, rather than specific technological factor."*

Financial Information System

Information and communication technology is considered as important factor for smooth financial operations. Some of the respondents reported that *"Financial work is fully system based and in a normal operation with internet connectivity to process transactions and generate reports but whenever system becomes unresponsive, all finance workings are affected."* It is found that *"automation boost the productivity and reduce human efforts & errors".* Another respondent declares that *"the system enhanced the accuracy and speed of tasks."* Findings indicate that *"FIS presented new ways of record management, reconciliation, and workflow".* In addition, alignment of market structure and value chain is an important indicator, mentioned by respondents as *"system-generated reports have led to increased transparency, compliance, and more coordination in value chain."* Moreover, another says that *"compared to system-based reporting, it is easy to respond to the regulatory and customer requirements, which enhances efficiency of institution and trustworthiness".* Findings are consistent to the literature as good internet connectivity and operating hardware could influence the posting of transactions, reporting and increase efficiency (Liu et al., 2024).

According to respondent *"data generated by system is trustworthy due to automatic calculation, however, the level of information quality is preconditioned by information quality."* Another respondent says that *"the system helps to maintain accurate information as mistakes are insignificant whenever we check reports twice or multiple times."* It is reported that financial information system increases information quality, recognize flaws, and manages potential problematic situations by addressing them. It has been claimed that automation enhances data quality but data entry is an important factor (Rozycki, 2006).

It is found that *"system functions are working efficiently throughout year except during closing of month as it becomes slow, that can affected reporting schedules.* Another respondent says that *"despite some lags of software, it is usually stable and can facilitate all of our regular accounting and financial processes."* Previous studies indicate the important aspect of FIS is system/software quality (Gorla & Lin, 2010).

Service quality is another determinant of FIS, as respondent says that *"quality of information system is important. The reason is that, even minor issues with slow and inefficient system can postpone transactions or reporting assignments, therefore, quick support is necessary."* Moreover, Compatibility and Agility were noted from interviews as important determinant of FIS. The respondents says that *"system is mostly compatible with currently used processes but needs to be modified as per new needs."* Other respondents report that *"It can be easily adjusted when systems can be modified as per changing regulations and organizational structure with the help of customizable features which save much of manual work."*

Trust and Accuracy is extracted as one of the determinants of FIS from interviews. It was reported that trust was growing as time after checking system outputs. As respondents say that "*we frequently use system produced data, however, it requires cross-verification with manual data to eliminate errors."* Another respondent says that *"the data used many times over the years in generating the correct financial statements."* Financial Audit to record transactions with more accuracy is reported by respondents as *"Auditors now consider system generated reports as records of transactions are transparent and can be tracked easily."* According to interviewees, *"the system enables us to generate records in a short time and enhances transparency."*

Transaction Processing System is another aspect of FIS for MFI to manage large volumes of transactions. Respondents also stated that *"control and accuracy are enhanced by posting transactions in real-time."* It is also stated by respondent that*, "The system keeps financial records up to date. Daily transactions such as loan disbursements and loan recoveries are recorded in banking system.* Respondents highlighted that system summaries are useful in making decisions by management that is Decision Support System as reported by respondents, *"reports generated systemically are used by management team to evaluate financial performance and to make decision."* Another respondent says that *"comparative reports included in the system assist in credit planning in an efficient manner."*

Management Information System is an important determinant to enhance control that is stated by the respondents as *"management uses MIS reports to track expenses and recoveries, on regular basis to identify the financial problems."* Another interviewee reported, *"MIS reports enable the managers to easily identify differences of deposits and credits to make decision of more micro credit loans."* Similarly, Executive Information System as important aspect of FIS is stated as summary for strategic review, "*the top management mostly prefers financial statements rather than detailed reports, which can help them in the strategic plan."* As another respondent says that, *"the summary of financial reports with key indicators enables the senior managers to make the decisions and without the necessity of being overwhelmed by numerous details."*

Financial reporting system is a significant determinant of FIS that is reported by the respondent, *"the majority of financial statements are developed with the help of the system which reduce errors while reporting."* Another says that *"automated reports also provide consistency of report in simpler and quicker manner."* Moreover, Accounting information system helps in standard practices and minimizes human errors, as respondent says that *"system maintains all accounting documents such as journal and ledger uniformity in the financial reporting."* Sustainability of Information System is extracted as another aspect as it is linked with maintenance, and personnel capacity according to views of respondents, *"system performance may decrease due to lack of continuous maintenance and support, therefore long-term sustainability must be planned."*

ERP System Integration improves synchronization in banking system. According to respondent, *"improvement of coordination has been achieved because of ERP integration."* System Complexity is observed through responses. According to respondents, training is needed to use latest complex modules, *"New personnel find it difficult to use such complex*

features, and chances of error may increase, as multi-branch reporting need additional guidance." Process Flow and Mechanism is important aspect in FIS, as it increases efficiency related to clear process flow as report by respondent, *"once the workflows of the system are cleared, the financial tasks can flow without any problems. Clarity in the system prevent wrong entries in the system in posting transactions."* Cross system data duplication and information subsystems are identified in banking system. As respondents say that *"although system is connected in a lot of aspects, sometimes the system needs the same data to be entered again which makes work more time consuming and challenging. It increase workload and sometimes create duplication in reconciliation"*

Table 1
Explored Determinants of Fintech and FIS

Fintech		**Financial Information System (FIS)**	
Determinants	**Sub-determinant**	**Determinant**	**Sub-determinant**
Perceived Usefulness		ICT	ICT on innovation
Perceived Ease of use			ICT on productivity
User design interface			ICT on market structure
Perceived Security	Cybersecurity		ICT-Infrastructure
	Technology security	Information/ Data Quality	
	Network security.	System/software Quality	
	Smartphone security	Service Quality	
	App Security	Compatibility and agility	IT modularity
Innovation	Product Innovation		Organizational agility
	Process Innovation	Trust and Accuracy	
	Open Innovation	Financial Auditing	
	Disruptive innovation	Transaction processing system	
	Sustainable Innovation	Decision Support System	
Technological Readiness	Absorption capacity	Management Information system	
Digital Finance	Digital financial platforms	Executive Information system	
	Internet banking	Financial Reporting System	Internal Control
	Mobile banking	Accounting information system	Efficiency
	Mobile wallet		Synchronization
	Cloud computing		Assurance
	Artificial intelligence		Flexibility
	Internet of things		Transparency
Perceived Risk	Credit Risk		Information flow
	Fraud Risk		Reliability
			Relevance
			Timeliness
		Sustainability of information system	
		ERP system	
		Complex system	
		Process Flow & Mechanism	
		Cross System data duplication	

Conclusion

This research enhanced understanding about Fintech and FIS in MFIs by identifying determinants of fintech and FIS because of preliminary investigation based on focus groups and in-depth interviews. Thematic analysis performed through NVivo 15 software to extract different determinants are linked with Fintech, and FIS. Several factors and determinants of Fintech were identified including perceived usefulness, PEOU, perceived security, technological readiness, innovation, perceived risk, and digital finance. Moreover, different aspects of FIS were explored such as ICT, information quality, system quality, quality of service, compatibility and agility, trust and accuracy, financial auditing, Transaction processing system (TPS), Decision Support System (DSS), Management Information System (MIS), Executive Information System (EIS), Financial reporting system, Accounting information system (AIS), sustainability of the Information System, ERP System Integration,

System Complexity, Process Flow and Mechanism, and Cross System Data Duplication and Information Subsystems. This research is conducted regarding MFIs who are operating in the selected part of Pakistan. This study extended existing models of TAM and IDT that provide context-based evidence and robust approaches related to digital transformation in MFIs. Data is based on individual perceptions that may create response bias. Furthermore, cross-sectional nature restricts dynamic evolution over time related to Fintech and FIS. In future empirical research may be conducted to investigate the impact of these variables on performance of institutions. This research has implications for practitioners, policy makers and other stakeholders to have integrated, reliable and secure digital systems that help in promotion of digital infrastructure and cyber security policies.

Recommendations

This research has several recommendations, as it explores Fintech adoption and FIS in MFIs. Fistly, MFIs may invest in technological readiness initiatives by upgradation of digital infrastructure by providing training programs to enhance system familiarity and technical skills of employees. Secondly, mechanism of organizational support could help to develop culture that increases innovation adoption and reduce perceived risk with digital system. Employees involvement, leadsership support, and clear communication in implementation process may enhance fintech and FIS acceptance. Thirdly, regulatory and policymakers authorities may develop regulatory framework and policies that helps in digital transformation in MFIs. Financial incentives and tailored guidelines can assist institutions in reduction of resource constriants and increase technological adoption.

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