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DIGITAL INNOVATION IN RURAL FINANCIAL INSTITUTIONS: CLOUD BASED SAAS ADOPTION IN KRISHI PATPEDHI SOCIETIES

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ABSTRACT

Small banks and credit unions in rural areas often have trouble with limited IT resources and security issues. This paper examines a cloud-based Software-as-a-Service (SaaS) solution to enhance resource optimization and bolster data security for Primary Krishi Patpedhi Societies (PKPS) in rural India. A quantitative survey involving 200 respondents from 20 PKPS units was executed to evaluate existing practices and preparedness for cloud adoption. The results show that 90% of those who answered see an urgent need for software in operation, but 70% still use manual processes. More than 75% of people are unhappy with the systems they have now, but just as many think that cloud solutions are helpful. Only 30% of people currently use cloud tools, but 80% would be willing to use them if they got the right help and training. A prototype cloud-based platform was built using a web app (PHP) and a mobile app (Flutter) with MySQL/SQLite databases. It showed off features for centralized account management and safe transactions. The proposed SaaS model uses encryption and access controls to make security concerns less of a problem. The integrated solution makes things a lot more efficient (with concurrent processing and automated workflows) and makes sure that data protection rules are followed. This study finds that cloud-based solutions can improve resource optimization and security for rural financial institutions in a cost-effective way, as long as the technology is deployed with the right infrastructure and training.

Keywords: Cloud Computing, Saas, Rural Finance, Resource Optimization, Security, Financial Inclusion

1. INTRODUCTION

Rural cooperative credit institutions, like Primary Krishi Patpedhi Societies (PKPS) are playing vital role in delivering of the credit and savings-services at rural areas in India. However, many of these organizations are equipped with either manual or simple IT systems that do not serve their high demand and expose them to operational incompetence and higher security risks. Cloud computing looks like a reasonable way of updating their infrastructure by providing access to scalable, on demand IT resources without significant upfront investment. As the IT costs have been minimized and data sharing has become more available [2][3], cloud services in financial firms are becoming more

popular. Even the minor/less known ones like Urban Cooperative and regional rural banks in India have adopted cloud based core banking as well as SaaS solutions in order to share infrastructure, thus reducing cost [4]5.

Although there are many advantages to the cloud, financial firms transitioning work to cloud service providers pose concerns about data privacy, regulatory compliance, security of cyber-attacks and compromises of availability (Denial-of-service Attacks), geoindependent sto rage requirement for disaster recovery, legacy system integration and dependence on vendors [6][7][8]. However, evidence based on studies of individual cases finds that well-planned cloud rollouts can substantially improve security and operational effectiveness. For instance, in rural banks of cloud systems have been helping to resolve connectivity issues and processing timeframes for loans, enhance risk-assessment and diversify lending portfolios [9]. In the same vein, over 200 cooperative banks shifted from the manual mode of operation to a shared core banking system on cloud at NABARD's initiative, increasing compliance and saving on infrastructure costs [10][11]. These case studies testify to the disruptive nature of cloud services in rural banking.

Thus, the objectives of this study are to (1) examine how IT resources and security practices are currently utilised in PKPSs, (2) determine their level of awareness regarding cloud adoption, and (3) develop a cloud-based SaaS prototype that is specific to their requirements. The overarching goal is to communicate how cloud solutions are better at leveraging scarce IT and human capital and improve privacy protection and compliance. Dirani (2026)

2. LITERATURE REVIEW

2.1. CLOUD SOLUTIONS IN FINANCE

Cloud computing has reshaped financial activities by its provision of on-demand self-service, broad network access, elasticity and resource pooling which are all well-suited for current banking requirements [12]. There are large advantages with respect to cost savings, dynamic scaling and elasticity, rapid application development pace or employee/customer accessibility improvements 'Study say [2]. Cloud-based analytics and collaboration tools are also enhancing decision making and innovation [13].

These SaaS models are particularly attractive for small banks because it does away with the expensive on premise servers and IT staff, but allow to use sophisticated core banking systems without heavy investments [1]. In India, the co-operative banks have begun implementation of shared cloud-based core banking systems with high resource utilization to minimize infrastructure cost [4][11]. These community cloud models illustrate that remote banks can gain access to state-of-the-art banking technology using hosted data centers and dependable connectivity [5].

2.2. SECURITY AND ADOPTION CHALLENGES

While cloud is a benefit in terms of cost, speed and scalability for financial banks it comes with challenges about data security privacy and regulation adherence & system integration. According to [6], it is mandatory for banks to establish robust encryption, authentication and data segregation mechanisms to safeguard customer sensitive information. Adoption in more regulated environments (e.g., health care and finance) is even slower because of regulatory hurdles like data residency laws, fear of vendor lock-in/legacy system integration etc [7][8].

However, cloud vendors have solved many of these problems with compliance-certified environments [14], strong SLAs, and hybrid cloud models that keep sensitive workloads behind the private infrastructure. Available evidence indicates that competent cloud service providers provide more secure, resilient and reliable services compared to poorly resourced on-premise systems used by small institutions [3]. Cloud technology also underpins financial inclusion by facilitating systems that can operate in less than ideal power and connectivity conditions which 2 are commonly experienced in the rural areas [15]. Given sound governance, cloud offerings can safely contribute to greater efficiency and outreach of rural finance.

3. METHODS

This study used a dual approach, namely (a) quantitative survey to gauge usage of IT resources, challenges and cloud readiness in rural PKPS institutions; (b) design of a cloud-based SaaS prototype to serve as practical response that fits identified needs.

3.1. SURVEY STRUCTURE AND DATA COLLECTION

A structured interview schedule was administered to the employees and managers of PKPS working in Karnataka–Maharashtra border region. Items asked general information and technology use, data managing, knowledge of cloud solutions and attitudes towards the adoption. Its items were 20 in number and were mixed-format (Yes/No, multiple choice, Likert scale and limited open-ended). A brief definition of cloud computing and SaaS was presented to the respondents before they took part in our survey to guarantee a common understanding.

3.2. SAMPLE AND SAMPLING

A total of 20 PKPS units were selected by purposive sampling from rural areas of Belagavi, Sangli and Kolhapur. About 10 interviews per block were conducted resulting in a sample of 200. Because of low internet penetration, data were collected off-line through in-person interviews and paper-and-pencil questionnaires in native languages. Responses were processed through the use of descriptive statistics and cross-tabulations to detect relationships among tech readiness and security behaviors.

3.3. CLOUD SOLUTION DEVELOPMENT

The centralized basis and cloud-based service-oriented prototype (SaaS) was created working on web and mobile. The system consist of a PHP web application, Flutter-based android app and MySQL cloud database with SQLite for mobile offline usage. Basic modules followed: such as account, deposits, lending, user management. Secure the application with HTTPS/SSL, role based access control, and store data in an encrypted form. The system was based on multi-tenancy in logical data segregation and developed iteratively through agile methodology.

3.4. ASSESSMENT

The prototype was then shown to a sample of stakeholders in order to gather qualitative feedback about usability and perceived usefulness. Summary of the survey outcomes and stakeholder feedback are provided in Table 1 and were used as a foundation for the Results/Discussion section. All participation was voluntary without collection of any personal information, and institutional ethics were adhered to.

4. RESULTS AND DISCUSSION

4.1. CURRENT STATE AND NEED ANALYSIS OF SURVEY RESULTS

The survey results make it plain what these rural banks are doing with their resources today, and how much they want to bring technology up to par. A full 90% of respondents said that their campus "must have software for financial operations to run smoothly." This is evidence that there a consensus among nearly everyone that manual methods should be discarded (Fig. 1). A little over 10 percent said they didn't need the software quickly. Maybe they were running very small businesses, or didn't understand what IT would do for them. This strong consensus that software is required also aligns with similar patterns observed elsewhere for situations where digital tools are needed to improve rural banking [10].

But here's the thing: Technology isn't getting a lot of use right now, either. As seen in Fig 2, around 70% of the participants responded that manual/offline tools such as ledgers, spreadsheets and stand-alone PCs not connected to internet were used for core banking. Read Stat Just 30% of respondents use any kind of digital asset to track their cash. This is an important sign of a gigantic digital maturity gap: no one yet exploited such integrated banking software, and this also took place ten years ago at times when still hundreds of cooperative banks were working partially or even entirely manually[16]. Slower transaction processing, an inability to aggregate accounts and more mistakes are just some of the things that happen when you still have manual processes. It also creates the security issues since manual recording involves chances of lost information and unauthorized tampering(l e.g., ledgers could be changed or forgotten). Our survey's finding of a 70/30 split shows some advancement (with the 30% using those digital tools — possibly just a simple accounting software), but there is still ample space for digitization.

With that scene in mind, it should come as no surprise when users are unhappy with what we have today. We found that nearly three in four (or 72 percent) are unsatisfied with the way they currently manage their money (Fig. 3). The other struck figure was that only 25%of the people replied in affirmative with the statement that they are satisfied. Respondents said they were running into issues like: wasting too much time updating ledgers; not being able to access information in real-time and difficulties generating reports. "Our system cannot adapt to the rapid growth of transactions." Another response was "Process isn't scaling with business" shows how frustrated they are with manual processes. And this makes the resulting data, where 75% are unhappy, very sobering information on which recommendations for change can be based. It relates also to itch for software (90% agree), since people with painful experiences want better solutions. Some of these interviewees said the obvious basics of security were not being followed — records going un-backed up (records are everything to them), access controls left wide open (anyone on staff can handle the ledger books). Such behaviors elevate the level of risks regarding data loss and fraud to an absurdly high degree. The quantified dissatisfaction gives the information that for neither efficiency nor security reasons does the current design prove satisfactory. This is consistent with the proposition in the literature that modern cloud based systems are required to supersede manual outmoded systems [9].

The survey suggests people are optimistic that cloud offerings can aid this situation. While the actual pick-up is relatively low -- 75% of responses by those who answered was that cloud-based systems would work well for their company (Fig. 4). That likely means people are relatively aware this could be a good thing, maybe thanks to the short article and their general sense of how banking works today. Respondents said they anticipated such advantages as centralized data, access from anywhere, automatic updates and stronger security if professional cloud operators ran the services. These assumed advantages correspond to the continuously mentioned potential benefits of cloud computing in finance, i.e., lower costs, higher flexibility and enhanced data security due to professional management [17]. Three-quarters of respondents who replied were uncertain or pessimistic about the cloud. This was largely due to concerns around the trustworthiness of the internet or fear over their data's security. Asked about certain concerns, a few cited security of cloud and several acknowledged that "cloud providers have better security than we can afford" – signifying an increasing faith in cloud security when appropriate measures are taken.

But only about 30 percent said they now used any cloud-based tools (which could include basic cloud storage or email services, as none of them had full-cloud core banking yet). This low adoption is perhaps not surprising, given that we also found IT usage in general to be low. The good news is, 80 percent of respondents said they would be open to working with cloud-based financial software providers if offered the proper guidance and training. And this willingness comes from people who aren't currently cloud users (which is to say, most people) – indicating that the fundamental challenges are not in terms of attitude but a lack of understanding and resources. For this one, the term support means assistance in implementing the plan, training staff members on how to use new systems and ensuring that all connections remain reliable. The other 20% who don't want to or don't know why will usually give some version of being afraid of change/afraid the cloud subscriptions will never go away. However, the fact that up to 80% of Insiders are willing to take on cloud systems suggests that if priced affordably, easy-to-use and supported by training, the community is prepared for cloud solutions. This conclusion is consistent with similar studies on technology adoption in microfinance, which has highlighted the importance of organizations adopting innovations when they have a clear value add and receive sufficient external assistance [18][1].

The survey findings indicate that there is a high demand for a cloud-based solution to improve the operations and safety of the rural PKPS. A lot of such people know they need a solution (high) — and very few are using one right now (low). That suggests there can be targeted intervention. The vast majority of people dislike the way things are and want them to improve. At the same time, most are pretty receptive to the idea that cloud/SaaS might help, if anyone would just take their concerns seriously and coach them through. We used these insights to develop our recommended approach, ensuring that it focused on the core issues (manual processes and security), while addressing the constraints (rural connectivity, training needs, cost sensitivity).

4.2. CLOUD-BASED SAAS SOLUTION: FEATURES AND SECURITY CONSIDERATIONS

Demonstrable Based on the requirements listed with the survey, a cloud SaaS platform was built: RuralFinCloud (prototype) for small rural financial cooperatives. The solution is designed to increase efficiency by consolidating computing workloads in the cloud, automating timing-consuming manual procedures and integrating next-generation security measures consistent with industry standards.

The system offers a wide range of core banking features through web and mobile interfaces in multi-tenant setup where a PKPS can work in a logically segregated data atmosphere. A single dashboard allows authorized personnel to maintain member records, saving accounts, deposits, loans and recurring deposits and govt schemes without having multiple ledgers or software tools. [0036] Centralized data entry promotes consistency and avoids duplications as well as increases operating efficiency.

Staff responsibilities are accommodated though role-based interfaces. Manager users can update the government scheme details which are automatically incorporated in processes including loan eligibility and processing. This replaces hand-kept records, eliminates error and increases accountability with user-based audit trails and time stamping actions. The loan processing module provides staff with directed processes through validation guided workflows which allow for dramatic time and errors savings over manually operated systems.

A Principle Of Designing For Security is used. The software uses encryption (in-transit and at-rest), role-based access control, audit log, data-at-rest encryption and real-time cloud backup. The security and reliability of the system is higher than what many isolated rural institutions would be able to achieve by themselves, with hosting data onshore as required for compliance with residents' legal demands [22][23][6].

For the software service, there will be no local hosting of servers for the e-health applications and IT personnel allocated to managing them (from a resource point of view) so infrastructure costs will also decrease [19]. Automation frees up staff to concentrate on customer-facing operations, while cloud elasticity can facilitate future scaling without extra branch level investment [20][21]. User worries about accessibility and connectivity are met via local language interface, streamlined workflows, offline mobile capability and phased onboarding. While subscription charges are there but they can be compensated by reducing operational cost and through federated or subsidised deployment models (as in NABARD driven initiatives [24][11]).

4.3. DISCUSSION: POLICY IMPLICATIONS FOR RURAL FINANCIAL SECTOR

The results of this study suggest a significant policy implication for rural cooperative finance. The substantial disparity between high levels of awareness of the significance of technology and low current use findings seem to indicate that policy makers' strategies should first focus on getting adoption going, rather than persuasion. Almost 80% of respondents are ready to embrace cloud solutions, which demonstrates good potential for digitalization in the industry. Organizations such as NABARD and co-operative federations could capitalise on this preparedness by enabling shared cloud platforms, group SaaS pricing negotiation and focused training programmes. Resistance to technology is low, the study found; instead barriers are mainly structural and relate to a shortage of infrastructure, skills and financial resources. Targeted capacity-building programmes and partially subsidised pilot roll-outs could thus stimulate adoption.

SME DAS SaaS Prototype has successfully demonstrated the technical feasibility of cloud-based services in rural environment. Positive user feedback and good performance with limited connectivity suggest that properly designed systems can address rural challenges. This is a “leapfrogging” moment that will allow institutions to leapfrog from manual operations right to the cloud-search era, without the need to purchase expensive on-premise equipment.

“Although the security concerns persist, cloud adoption will likely enhance the level of security for small institutions relative to what they currently have going—a relative lack of encryption, backups and professional IT management. Prudent selection of vendors and conformance to banking security standards [25,7] in addition to enabling policies like the recent RBI advisory paper on cloud adoption are important.

Finally, enhanced efficiency and security through cloud-led systems may help to promote financial inclusion by allowing credit to be disbursed more quickly, providing safer means of savings and facilitating better regulatory compliance. These results are consistent with international development targets to increase access to trustworthy financial services in underbanked areas [26]. Taken together, this research shows that SaaS solutions hosted in the cloud provide a feasible and scalable approach to improve resource utilization, security and extension services for rural financial institutions.

5. CONCLUSION

This paper attempted to examine the possibility of using cloud computing in order to enhance resource utilization and security in small rural cooperative financial institutions (Primary Krishi Patpedhi Societies). While the research took the form of an organized set of interviews with stakeholders and development of a cloud-based Software-as-a-Service (SaaS) prototype, it revealed a high need for digitalization. Even though a large majority of banks still depend on old-school practices, this gap represents an exciting opportunity for modernization where embracing cloud technology – even slowly or partially – can lead to a significant leap in efficiency, availability, and quality of service.

The SaaS example provided above shows that by centralizing and automatically managing blood banking for a bank, there is fantastic operational value that benefits an organization and to also surround data with encryption and controls. The findings confirm that cloud computing can deliver substantial economic and service delivery (and regulatory compliance) benefits -results which are typically difficult to achieve in resource-poor environments. This positions cloud more of as a capacity multiplier in that for smaller financial institutions, they can scale much more gracefully because you don't have to add infrastructure or people at the same rate to add functionality.

The focus of this study is surely regionally limited the prototype and simulation as well based systematic investigation, but it provides a solid track to take for realization in future. Next steps are piloting, long term cost benefit analysis and user centered change management. Overall, the study demonstrates that SaaS based cloud solutions offer a credible, secure and scalable path to fortify rural financial institutions and promote financial inclusion in agrarian economies.

Figure 1

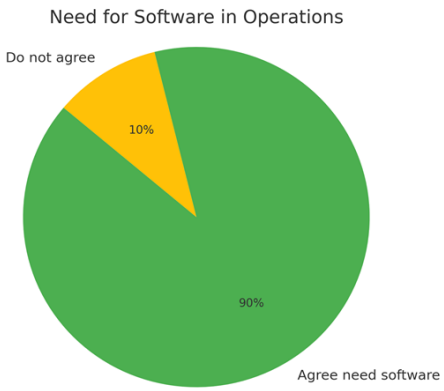

Figure 1 Survey Response on Need for Software in Operations. An Overwhelming 90% Of Participants Affirmed That Introducing Software Systems Is Necessary to Improve Their Financial Operations, versus 10% Who Did Not See a Need.

Figure 2

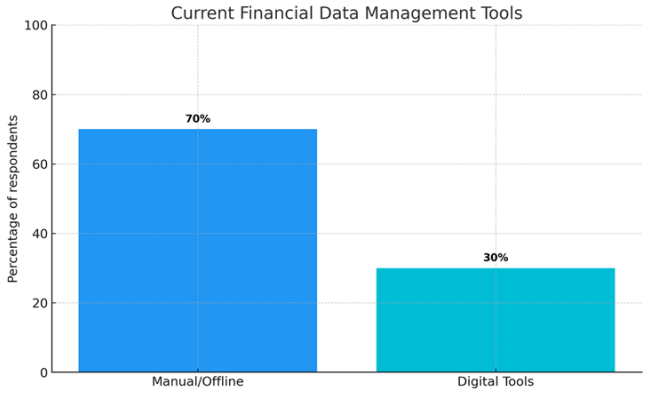

Figure 2 Current Financial Data Management Tools in Use. About 70% of Respondents' Institutions Still Operate with Manual or Offline Methods (Pen-Paper or Isolated Excel Sheets), Whereas only ~30% Use Any Digital Tools for Core Operations. This Highlights the Gap In iT Adoption.

Figure 3

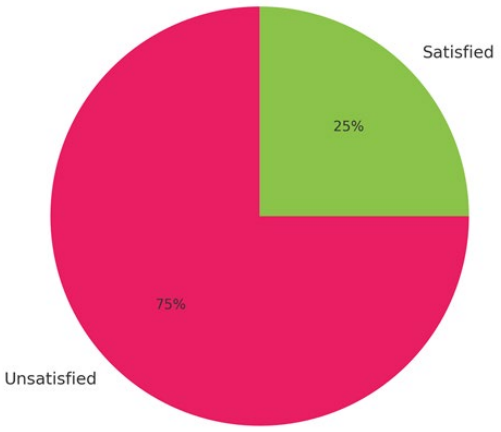

Figure 3 User Satisfaction Levels with Current Systems. A Majority (75%) Of Respondents Reported Being Unsatisfied with How Their Current Financial Management System Works, While Only 25% Are Satisfied. This Indicates Widespread Frustration and the Need for Better Solutions.

Figure 4

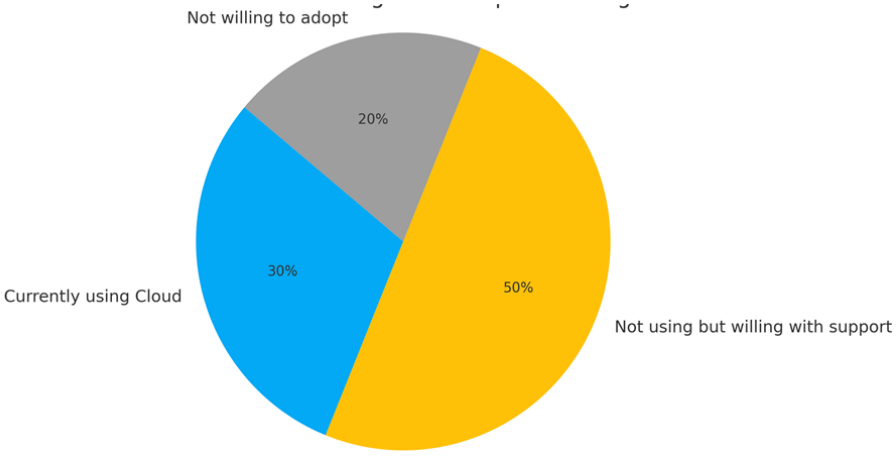

Figure 4 Cloud-Based Tools Usage and Adoption Willingness. Only ~30% Of Surveyed Institutions Currently Use Any Cloud Tools. However, A Large Portion (An Additional ~50%) Are Not Using Cloud Yet but Would Be Willing to Adopt a Cloud-Based System Given Proper Support/Training – Making About 80% In Total Open to Cloud Adoption. About 20% Remain Not Willing to Adopt.

Figure 5

Figure 5 Screenshot of the Admin Home Page of the Cloud-Based System. This Main Dashboard (Web Interface) Provides Navigation to Modules Like Master, Share, Savings, Deposits, Investments, Loans, Pigmy, Etc., For A Cooperative Bank. The Interface Is Accessible Via a Web Browser Over the Internet, And It Centralizes All Core Functions in One Platform.

Figure 6

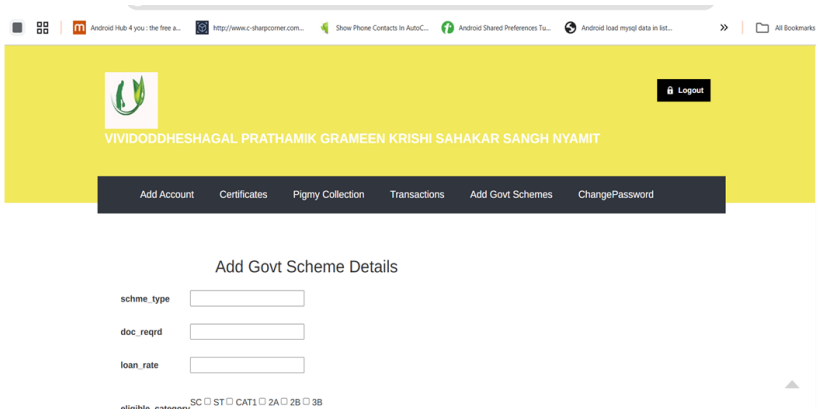

Figure 6 Manager's Interface for Adding Government Scheme Details. This Screenshot (Web Module) Shows A Form Where Managers Enter New Scheme Information (Scheme Type, Required Documents, Loan Rate, Eligible Categories, Etc.). Such Cloud-Based Forms Replace Manual Record-Keeping, Ensuring the Data Is Centrally Stored and Accessible Across the System.

Figure 7

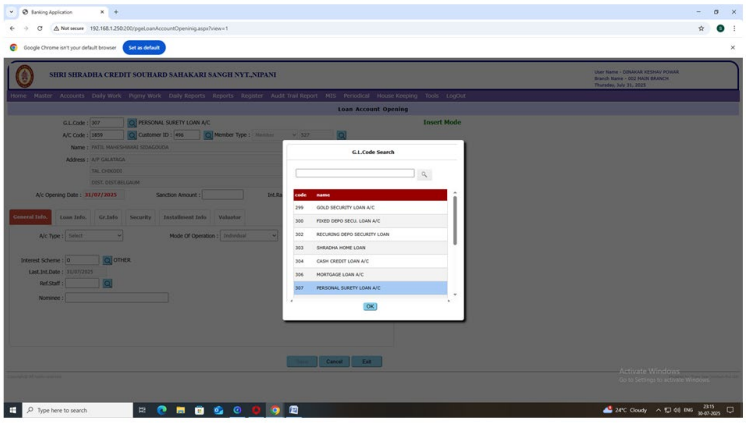

Figure 7 Loan Account Opening Dashboard (Loan Dashboard) In the Cloud System. This Screenshot Illustrates the Process of Creating a New Loan Account for a Member, Including Entering Loan Details, Selecting Loan Scheme (Via GL Code Search), And Capturing Relevant Information Across Multiple Tabs. The Cloud-Based Application Ensures All Loan Data Is Securely Stored and Readily Available for Processing and Audits.

Table 1

Table 1 Survey Methodology Summary

Aspect	Description
Research method	Quantitative field survey (structured questionnaire)
Instrument content	Section A: Demographics & basic info; Section B: Tech usage & needs
Target respondents	Staff of rural PKPS units (managers, officers, clerks)
Sample size	20 PKPS units; ~10 respondents each (Total N = 200)
Sampling approach	Purposive (selected digitally active and diverse institutions)
Data collection	Offline (in-person questionnaires), with prior cloud brief
Analysis tool	Microsoft Excel (data entry, descriptive stats computation)
Supplementary info	Cloud/SaaS overview provided to respondents before survey

Table 2

Table 2 Population and Sample Overview	
Characteristic	**Details**
Target population	Primary Krishi Patpedhi Societies (rural cooperative credit societies)
Region (operational)	Karnataka–Maharashtra border areas (selected rural districts)
Geographic coverage	Districts: Belagavi (Karnataka); Sangli, Kolhapur (Maharashtra)
Example locations	Villages/Towns: Nipani, Sankeshwar, Karadaga, Adi, Akol, Chikkodi, etc.
Number of units sampled	20 PKPS units (cooperative societies)
Total respondents	200 individuals (approx. 10 per society on average)
Sampling criteria	Active in providing financial services; interest in tech upgrades
Rural infrastructure	Most units lack full IT systems; many operate semi-manually

Table 3

Table 3 Summary of Key Survey Findings	
Survey Aspect	**Key Finding / Response**
Need for software in operations	90% Yes (majority see software as necessary)
Reliance on manual processes	~70% still use manual/offline tools (only 30% use digital)
Satisfaction with current system	75% Unsatisfied (current methods not fully suitable)
Perceived benefit of cloud solutions	75% believe cloud-based systems would be beneficial
Current cloud tool usage	Only ~30% currently using any cloud-based tools
Willingness to adopt cloud (future)	80% Willing if provided proper support & training

CONFLICT OF INTERESTS

None.

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