

Factors for the Adoption of Process Mining Technology in Indian Banks: Critical Review and Future Research Direction

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Abstract

This paper discusses the importance and significance of process mining adoption in the Indian banking sector. In order to monitor business processes there, exist certain process mining technological tools like, Celonis and Signavio. They give real-time feedback on any hindrances that arise due to an issue. One can query data in the process in order to get details about the event logs. Current research attempts to examine and review literature pertaining to various aspects related to the adoption of process mining technology. A review of literature has been conducted through which a conceptual framework has been developed. This has helped in identifying the factors for the adoption of process mining technology in Indian banks. These factors responsible for its adoption in the banking operations could prove beneficial to the banking operations and its systems. Important factors and finally the model that has come up in the current study will prove beneficial for further research as the published literature gives limited to no knowledge about the process of mining and its adoption in the banking sector. This is especially true in the Indian context.

Keywords: TOE Framework, Process Mining, Technology Adoption, Banks, Business, Banking Sector, India

1. Introduction

1.1 The Banking Sector

Several transactions taking place at a time could not have been restricted to the limited branches of a bank, especially in a country where the population is always on the rise. The availability of the services had to go beyond the restricted timings of a bank's branch. Therefore, banks have adopted technologies like the internet, internet banking (Malhotra and Singh, 2007), mobile banking, and the ATM (Hannan and McDowell, 1984) in the past. This is because it gives their business ease in its operations and gives faster services to its customers. Today a new technology is being embraced by the corporate world, process mining technology (Kudryashov and Markov, 2021). As this technology makes it easier to mine out errors and pitfalls in a live process in addition to real-time monitoring, it seems that it will soon penetrate the banking sector. This is because banking operations have versatile processes running at a time in a magnitude, whether it is financial or administrative.

1.2 The Technology Adoption

The TOE (Technology-Organization-Environment) framework was formulated in the year 1990 (Tornatzky and Fleischer, 1990). It identified three crucial aspects in an organization's context which influences the process through which it may adopt and implement a technology innovation: technological context, environmental context and organizational context. The technology context described the internal technologies and the external technologies useful to the firm. This included the ongoing practices and the instruments internal to the organization (Starbuck, 1976), and the set of available technologies which are external to the organization (Thompson, 1967)(Khandwalla, 1970)(Hage, 1980). Organizational context adds to the internal measures describing about the organization's scope, managerial structure and size. Environmental is the

context area in which the firm executes its operations and business—the industry, competitive rivals, and government dealings (Tornatzky and Fleischer, 1990). The reason why the TOE model has been used to study the adoption of process mining is that process mining has been referred to as technology in past research (Thiede, Fuerstenau and Bezerra Barquet, 2018). This technology takes a field of procedures that takes bits of data from an organization's computer and information systems, utilizing it promptly and making it accessible in the form of event logs.

1.3 The Process Mining Technology

As the process mining area keeps on seeing developing interest among different industry areas worldwide, it is convenient to concentrate on its effect on organizations. Albeit nonexclusive IT/IS adoption models or systems could be taken on, they will probably oblige the relevant subtleties specific to the process mining area. This review means to give a conceptualized comprehension of the adoption of process mining, its factors, and relevant hypotheses. The degree to which these relevant variables contribute to the Process Mining effect will likewise be discovered. Applying a technology adoption model will help in examining to determine an observationally approved process mining adoption model. Process mining usually draws from computational knowledge, information mining, and process science to upgrade business processes. The critical abilities of process mining methods are their capacity to find automatically the process models, highlight performance, recognize bottlenecks and asset requirements in a business process, and survey administrative execution. A few process mining devices and strategies have been created and applied in an assortment of settings with promising outcomes. It is continuously evolving in finance, programming advancement, protection, shared administration, and numerous other areas. As process mining continues to serve the corporate environment, the evidence to aid its impact and contribution to groups is primarily anecdotal. To secondary knowledge, other than reports and use instances from practitioners, tool companies, and consultants, empirically designed models or frameworks are less for assessing the adoption factors of companies. It could be argued that current adoption models might be used to measure the effect in manner mining. However, such widely widespread models or frameworks are much less in all likelihood to properly capture the precise contextual nuances that pertain to the process mining area. The process mining technology market has been assessed to keep on developing. Results from the 2021 Deloitte's Process Mining Study from 106 IT and business leaders that sixty-seven percent of the respondents have begun executing process mining (Kudryashov and Markov, 2021). And, eighty-seven percent of the non-adopters are intending to lead pilot runs (Kudryashov and Markov, 2021). Eighty-three percent of associations utilizing process mining on a worldwide scale plan on extending their drives. Eighty-four percent of respondents accept process mining conveys esteem (Kudryashov and Markov, 2021).

2. Objectives

The key management personnel can look at the adoption process from a management perspective. It will give the key management personnel a bird's eye view of the overall factors responsible for the adoption of process mining technology. The factors which are then missing can be improved upon to facilitate the adoption. The following are the objectives of this research:

- To explore the emerging area of adoption of process mining technology
- The study of the factors in the process mining adoption in Indian banking operations practices.
- To develop a conceptual framework examining the factors influencing the adoption of process mining technology.

3. Research Methodology

The present research relies on the review of the literature with the keywords, "TOE model", "Process Mining Adoption" and "Banking". The source of these papers was various peer-reviewed journals. With the help of a

review of the literature, a conceptual framework was designed. The model used for the development of a conceptual framework was the TOE model (Tornatzky and Fleischer, 1990). The framework helped in the categorization of the factors which fall into three broad segments. These segments are technology, organization, and environment.

4. Literature Review

This section has been divided in three parts. The first part discusses the technology adoption in the banking industry. It highlights how and when the banking industry has accepted the changes in technology and has adopted the same to serve its purpose and operations. The second part highlights the topic of business process management. It sheds light upon the practices of WFM (Work-flow Management), CRM (Customer Relationship Management), and ERP (Enterprise Resource Planning). The third section collates the results of the keywords like “TOE model”, “Process Mining Adoption” and “Banking” to synthesize the relevant literature and to check the adeptness of the model to this study.

4.1 Technology Adoption in the Banking Industry

There have been various studies focusing on the factors affecting the adoption of technologies in the banking industry. Factors affecting the adoption of Internet banking by the banking sector are the size of the bank, age of the bank, deposits, wage, expenses, ROA, market share, etc. (Malhotra and Singh, 2007). Malhotra and Singh (2007) found how that large-size banks, new banks, private banks, higher fixed assets expenses, increasing deposits, and lower number of branches have a high probability of adopting Internet banking. Banks with low market share see Internet banking technology as a mode to increase their share of the market by attracting customers through this channel of delivery (Malhotra and Singh, 2007). Another significant work in the technology adoption was the adoption of ATM as a technology in the banking industry wherein the factors it includes are size, growth, wage, and urban (Hannan and McDowell, 1984). Large banks, banks in more concentrated markets, and the regulatory environment lead to a higher probability of ATM adoption (Hannan and McDowell, 1984). Though these factors have been discussed in various studies, however, they have not been categorized into certain segments like organization, environment, or technology. The factors being studied under the technology adoption for banks are largely well under the classifications of the TOE model like the size, assets, and the regulatory environment.

4.2 Business Process Management (BPM)

The area of business process management (BPM) relates to the design, and improvement of business processes and their analysis (Dumas, La Rosa, Mendling and Reijers, 2018). In the wake of the increasing use of information technology in business processes, process mining technology has emerged as a promising tool to visualize, improve and analyze the processes of a business. The tools of process mining make use of data from the event log. Event logs are traces of activities that are structured and executed and recorded using digital technology. When the operators use a particular ERP (Enterprise Resource Planning) tool for the accomplishment of tasks, they leave behind traces that are digital in nature. These traces are in harmony with certain specific cases and reveal the various sequences in which the process was accomplished. This data can be utilized in various analysis techniques which are automatic in process mining to get detailed insights (van der Aalst, 2012). Complementary to such technologies such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM) systems, and Work-flow Management (WFM), process mining tools enable the execution in addition to the monitoring and surveillance with the analysis of business processes (van der Aalst, 2012).

4.3 Process Mining Technology and the TOE Model

The literature search was conducted using specific keywords like “TOE model”, “Process Mining Adoption” and “Banking” to collate process mining adoption literature from the Indian banking domain. This limited literature indicated that it still largely fell in its early stage only. An initial version of a conceptual model for process mining adoption has been derived from the TOE model. The Technology-Organization-Environment model was first mentioned in a publication in the year 1990 (Tornatzky and Fleischer, 1990). It discovered three important parts of an organization that run the overall process of the adoption with the implementation of technology. These three dimensions were the technological context, the environmental context, and the organizational context. The TOE model forms the model for the adoption of process mining as process mining has also been established as a technology in research (Thiede, Fuerstenau and Bezerra Barquet, 2018). These process mining techniques inculcate the concepts from a model oriented process analysis (simulation is one such example), data-oriented techniques for analysis like data mining and machine learning. Process mining has been used for a wide spectrum of business procedures in various industries (Thiede, Fuerstenau and Bezerra Barquet, 2018). As applications advance and improve, their use and implementation become complex and more versatile across different industries (Diba, Remy, and Pufahl, 2019). One of the prominent benefits is that the results of process mining reveal how business processes really work in detail. This is opposed to analysts’ documentation in process participants’ reports or handbooks or in interviews (Dumas, La Rosa, Mendling and Reijers, 2018). Furthermore, increasing adoption is fueled by the availability of digital trace data and the need to optimize the organization’s business processes with its performance (van der Aalst, 2012). This technology can provide a solid ground to find additional levers for upgrading process work. One example is automation with robotic processes or predictive analytics tools. The process mining technology takes bits of data from processes through the organization’s computer and information systems, effectively uses it, and converts it into event logs format. The context of the technology described the technologies which are internally and externally useful in a firm. These entailed the practices and instruments which are internally present in the organization (Starbuck, 1976). Organizational context adds to the internal measures describing the organization’s scope, managerial structure, and size. The environment is the factor in which the organization operates the business—the overall industry, business competitors, and government policies (Tornatzky and Fleischer, 1990). Research in the area of process mining is primarily emerging from the computer science domain, (Thiede, Fuerstenau and Bezerra Barquet, 2018). This area has numerous works that organize and improve algorithmic codes and process mining techniques. The objectives of these works were to get precise measures, to unveil different dynamics of process, integration of organizational and social information and to account for the contextual factors. Process mining poses some adoption challenges too. Especially for those who are not computer science experts (van der Aalst, 2012), (vom Brocke and Mendling, 2018). As an example, such challenges refer to the selection of appropriate vendors for process mining which duly falls into the environmental factors (Turner, Tiwari, Olaiya, and Xu, 2012). Process mining deals with the identification of suitable steps for process mining (Thiede et al., 2018). Integrating and cleaning data is also essential (Dumas, La Rosa, Mendling and Reijers, 2018), and the making of process mining is an effort that is ongoing and continuous (van der Aalst, 2012).

5. Conceptual Framework

Based on the various research articles reviewed, it can be said that the existing generic technology adoption models might be used to measure the relevancy of the factors in the adoption of process mining. However, generalized models or frameworks are less likely to capture the important nuances that pertain to process mining adoption. This could hamper a deep understanding of the nature of factors that process mining adoption provides and hinder its potential to provide the optimum value as an investment in technology.

Based on this intention and motivation, this research proposes an extensive conceptual model that identifies and evaluates the factors responsible for process mining adoption.

The framework TOE (Technology-Organization-Environment) in Fig.1 conceptualized in this research has relevant factors under each segment. For the segment of technology, there are factors like 'Relative Advantage', 'Technology Awareness', 'Risk and Insecurity', 'IT Infrastructure', and 'Compatibility' (Maroufkhani, Wan Ismail and Ghobakhloo, 2020). The organization segment has factors, 'Top Management Support', 'Organizational Readiness', and 'Organizational Size' (Maroufkhani, Wan Ismail, and Ghobakhloo, 2020). The environmental factors are 'Competitive Pressure' and 'Government Regulations' (Maroufkhani, Wan Ismail and Ghobakhloo, 2020).

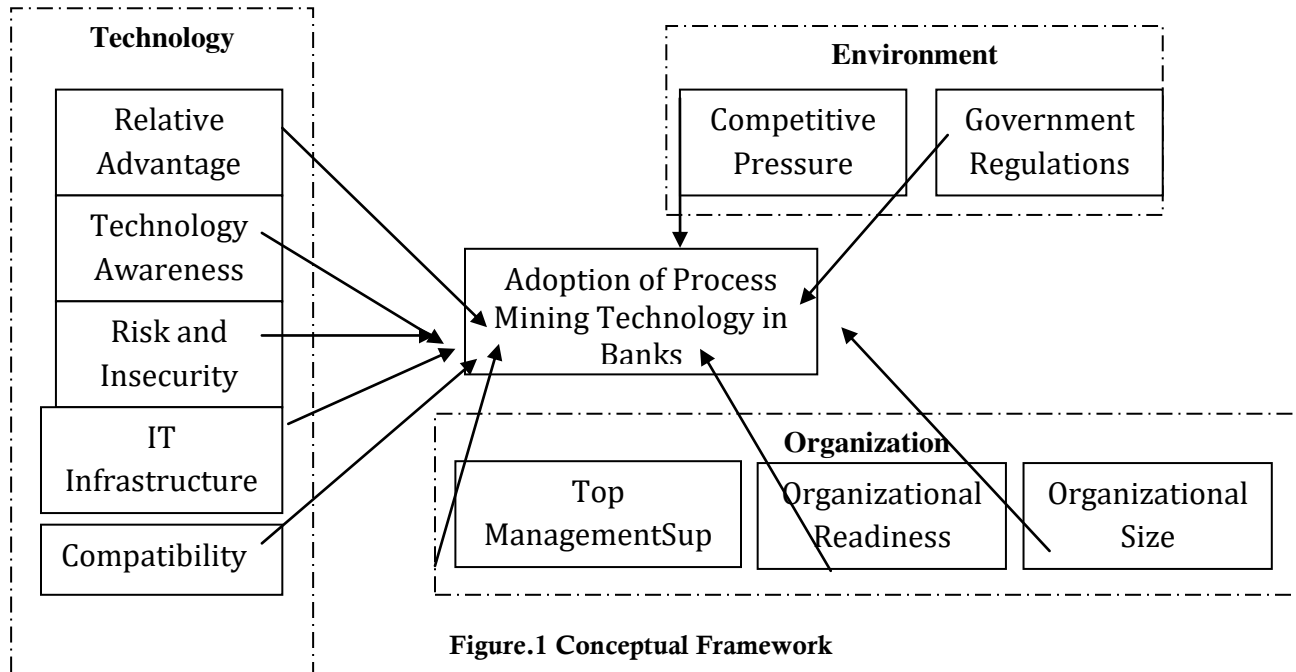


Figure.1 Conceptual Framework

Source: Author's compilation

6. Conclusion

This paper presented a review of the literature and the conceptual framework with the factors for the adoption of process mining technology in Indian banks. It was found that process mining has been discussed in limited research works. The review of the literature and the conceptual framework on the adoption of process mining technology in the Indian banking sector offers the basic factors applicable to the Indian banking sector. The study has shed light upon the relationship between technological, organizational and environmental contexts, and the process mining technology adoption in the Indian banking sector. The findings also demonstrated that technological and organizational elements as the determinants of process mining adoption.

7. Future Scope of Research

Further studies can examine the factor responsible with respect to the nature of the bank. The banks can be categorized in the form of national banks and private banks. It could also take into account the other financial institutions and see the factors which are relevant to their research. The adoption of process mining could also

be researched in other industries like defense, construction, and particular segments of the logistics industry. Further research work can be done to investigate the efficacy of other models which are oriented towards the adoption of technology like the UTAUT i.e. Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis and Davis, 2003), TAM i.e. Technology Acceptance Model(Adams, Nelson and Todd, 1992),and DOI i.e. Diffusion of Innovation(Kinnunen, 1996). More variables may be explored for the proposed model.The role of a moderating variable or other variables may be examined

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