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RESEARCH ARTICLE

Designing information systems for business administration through human and computer interaction

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Abstract

AI is increasingly incorporated into business operations; it appears in every aspect of life. However, a strategy that can integrate human and machine interaction is required for long-term implementation. To identify characteristics that can enhance domain operations and interpersonal interactions. To elucidate these obstacles and underscore specific pivotal decisional considerations that necessitate resolution before the effective collaboration of cognitive machines and humans in delivering authentic financial services. This article utilizes the published framework to analyze a case study in retail banking to identify the necessary cognitive abilities, individually and collectively. Each of these capabilities provides usage examples and demonstrates how they comprise a unified deliberative architecture for human-robot interaction. Customer service is an area where this design could be advantageous. Experimental evidence indicates that explicit knowledge management at the geometric and symbolic levels facilitates the incorporation of human-level semantics into the deliberative system of the robot, thereby enhancing the quality and authenticity of human-robot interactions.

Keywords: Business administration, Human-computer interaction, Artificial intelligence, Semantics, Banking, Customer service.

Introduction

By its capability to process vast quantities of data and deliver practical insights, AI facilitates the presentation of business processes while minimizing costs, errors, and time (Chaudhuri *et al*., 2023). Recently, the ability to forecast human behavior has been simplified by technologies powered by deep data and self-learning machines. Visual image processing, labeling, categorization, and analysis enable organizations to make instantaneous decisions. This has also impacted the sector associated with monetary transactions. By conducting a comprehensive analysis of recent research and providing suggestions for maximizing the benefits of emerging trends, this article intends to establish a solid groundwork for the financial services sector. In the second step, a thorough and systematic literature review was conducted on 363 articles and multimedia materials to identify the theoretical concepts that would serve as the foundation for the conceptual framework. After its development, we tested the framework using a real-world example of a "banking service intelligence company" in India. This organization is incredibly proud to be the first to forecast the future of financial services using AI, precisely machine vision. The information for this case study is derived primarily from articles, interviews, news releases, and social media posts.

The establishment of human-robot interaction models (HRI) represents a substantial challenge within the domain of artificial intelligence (Ershadi *et al*., 2018; Ahmad *et al*., 2021). The integration of human and human cognition is a prerequisite for human-robot interaction (HRI), which Ai emulates due to its evident proficiency in every domain. Moreover, it requires the acquisition, representation, and manipulation of abstract knowledge at the human level. Integrating these elements will enhance the ability to devise decisions resulting in tangible and substantial actions. Symbolic reasoning is achieved by employing artificial intelligence techniques to process visual data (Akugizibwe & Ahn, 2020; Rout *et al*., 2021).

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However, this article aims to develop a framework that enables human-robot interaction. This framework is verified by analyzing a case study incorporating artificial intelligence. Furthermore, it seeks to clarify and illustrate various approaches investigated in the current literature review, resulting in a compilation of deliberative, knowledge-based frameworks.

Machine Learning Prediction

The introduction of machine learning has automated several processes, including object recognition (Ramya *et al*., 2019; Wu *et al*., 2017). Upon comparing apples to other fruits, machine learning discovers that additional objects resemble apples. To enable pears to be identified accurately by robotics, the code must be improved to support finer-grained detection. However, complexity increases exponentially when implemented.

Artificial neural network (ANN) modeling aims to develop models of artificial intelligence that possess cognitive abilities comparable to those of humans (Su *et al*., 2021). Rahman *et al*. (2019) enumerates numerous uses of artificial neural networks (ANNs), such as nonlinear mapping, data analysis, pattern recognition, classification, and process management. In the context of business transactions, predictions generated *via* the ANN method are more dependable and precise (Xu & Zhang, 2023). Implementing AI techniques in the financial industry can enhance the precision with which customers' loan and advance applications are assessed (Meet *et al*., 2022; Ershadi *et al*., 2018). In addition, we must select the subsequent actions, fill in the voids in our knowledge, and draw lessons from our past endeavors.

Currently, AI may present opportunities that result in highly productive and consistent systems. Its ultimate objective is to advance HCI so that machines and humans can coexist harmoniously. As AI continues to automate an increasing number of mundane, repetitive tasks, novel approaches to automation will surface. In such a scenario, human involvement will be required in the exception decision-making process of the system. Artificial intelligence will gain new knowledge from these outliers and enhance its predictive capabilities. This article will illustrate how improved artificial intelligence leads to more precise predictions. As we progress through each use case, additional exceptions will arise; AI will assist us in handling these unforeseen situations. This facilitates the emergence of novel proficiencies, improving pre-existing ones and ultimately substituting specific human capabilities with artificial intelligence. Consequently, the outcomes of AI deployment management will be distinct. These may also prove to be beneficial for the research.

Research Gap

Limited comprehensive research has been conducted on using AI by financial institutions for product prediction. Several articles delineate the methodologies employed by researchers specializing in artificial intelligence to address specific challenges.

Although a distinct AI usage framework for the financial services industry seems lacking, we have encountered applications and brands that employ AI to enhance business decision-making processes. In addition, publications, podcasts, and interviews are online platforms where the most recent works about practical applications can be found. Finally, there is a significant dearth of scholarly literature concerning the application of AI in prediction and forecasting. Chaudhuri *et al*. (2023) emphasized the need for industry-specific AI frameworks to facilitate additional research and large-scale implementations. A dearth of scholarly investigation exists regarding the utilization of artificial intelligence within the financial sectors of developing nations. As a result, this framework was developed, and its effectiveness was showcased through a limited-scale case study involving an Indian corporation headquartered in Mumbai.

Objective of the Study

Applying AI to the finance service sector requires a solid theoretical foundation (Thoppan *et al*., 2021; Kusumawati *et al*., 2021). Doing so will ensure its longevity and durability. Furthermore, it could serve as a catalyst for future investigations to test, deploy, and enhance the framework in preparation for its application to particular challenges. Determining the appropriate and inappropriate applications of artificial intelligence is challenging because of the dearth of case studies in the industry above. The financial services sector is thus an ideal application domain for this architectural design. One of the primary goals of this essay is to provide a comprehensive overview of the current AI framework and its implementations within the financial services firm. Additionally, we have made an effort to substantiate our methodology through the implementation of a case study.

Research Questions

The research objective was to implement AI in a structured and methodical fashion. Although it may be expensive, it is prudent to comprehend the domain requirements, as these are the sectors in which AI will be applied. Construct an AI implementation strategy using these requirements and their connection to the corporate specifications. The sources of information utilized in this paper were previously published works and domain expertise, given that Chaudhuri *et al*. (2023) have already established an AI framework applicable in a business context. Our initial objective was to determine how to construct a framework for AI implementation from the ground up using pre-existing literature. Furthermore, we were intrigued by the process of adapting that framework to suit the requirements of the banking industry such was RQ1.

Methodology

To collect data for RQ1, a literature review of germane papers concerning AI in the finance industry was conducted. The papers in this collection were culled from various online and offline sources, including books, journals, websites, conference proceedings, and blogs. Due to the novelty of the topic under consideration in scholarly literature, we have chosen to examine it from multiple perspectives and employ a variety of sources. From September 2023 to December 2023, we conducted a comprehensive search of Emerald, JSTOR, Google Scholar, Ebsco, and ProQuest. Before choosing titles or abstracts for comprehensive text analysis, we ascertained that they were composed in English and pertained to topics concerning the financial services industry and artificial intelligence applications. Online resources are located through Google search. Our exhaustive keyword search encompassed a wide range of subjects, including "banking service forecasting," "artificial intelligence," "AI techniques," "machine learning," "deep learning," "AI framework," "AI application in banking service industry," "computer vision," and "machine vision," among many others. The filtered publications were utilized as information sources for this study.

Although 372 documents were identified, only 157 satisfied the inclusion criteria for the review. We assessed the remaining 209 at level 6 due to our lack of relevance to the subject matter of the study. We selected articles for the second screening stage exclusively if they demonstrated the application of AI in resolving issues with banking services, specifically product estimates.

We therefore cited the 56 articles above. The products comprised electronic books, journal articles, conference proceedings, and online articles from prominent periodicals and newspapers. Furthermore, we incorporated hyperlinks to various supplementary materials, including the Twitter and YouTube pages of notable corporations like IBM, a limited number of company homepages, a solitary podcast, and a doctoral dissertation from MIT. Furthermore, we have perused several books to augment our knowledge of AI and anticipating dynamics. Our data extraction procedure includes, in addition to author names and affiliations, the following information: the journals that published the research, the year of publication, the DOI, particulars regarding the parameters that influenced the AI applications, and the criteria employed to identify the samples.

Furthermore, we were capable of precisely determining the location where these investigations were conducted. We utilized third-party websites, including 'cite this for me' and 'citation machine,' in addition to the referencing functionalities offered by the databases when compiling our references. A compilation of articles, blogs, Twitter posts, the organization's official website, and YouTube videos featuring the company's founders was reviewed to develop a case study methodology (Ebneyamini & Moghadam, 2018) to validate our framework and address RQ2. A subsequent evaluation of the case studies was conducted utilizing the organization's reported annual performance.

Theoretical Construct

An extensive literature evaluation developed our theoretically sound architecture and components. Typically, three primary sources of input data are utilized by banking service product AI systems, according to our literature review. This set comprises billions of data points, including information from social media profiles, online transactions, and other sources. Both structured and unstructured content is available on this site. One of the most recent developments in artificial intelligence is machine learning; these tools enable the programming of computers and other devices to extract actionable insights from data (Olivares-Alarcos *et al*., 2019). Algorithms for computer image processing based on deep learning can identify products in images from e-commerce websites and apps within a specified time and location (Garcia, 2023). The capacity of brands to track consumers and aggregate textual and visual data from the information they disclose publicly does not give rise to any concerns regarding privacy. It should not be too difficult to determine what individuals purchase and do using this information. The current body of research divides the most widely used AI techniques into four overarching categories. Artificial neural networks (ANNs) are indispensable for generating human-like recommendations, machine learning, deep learning (which improves image processing), natural language processing (which is prevalent in chatbots and STT), and other applications. Conversely, conventional methods of banking service forecasting, such as those that depend on expert opinion, intuition, observation, or mere trend-following, can be enhanced by human intelligence. An expanded framework dubbed "environmental scan" now includes them. An additional source of data has been identified. As a result of the importance attributed to design, aesthetics, emotions, sentiments, comfort, appearance, texture, fit, and finish in financial service products, our approach places greater emphasis on human opinion. We present a methodology in which artificial intelligence (AI) aids human judgment in the technological prediction of near-perfect products. However, item evaluation and entry of sales and markdown (discount) data occur at the point of sale (POS). This information is present in images, text, and characters. The AI system utilizes this data to enhance subsequent decision-making processes by implementing deep-learning and machine-learning algorithms. A sufficient amount of time will pass before the AI system has amassed sufficient data to simulate human decision-making.

Deep learning algorithms commence operation at this juncture, as they operate on the assumption that more data

is required for model training and produce more precise outcomes in contrast to machine learning. The theoretical framework is illustrated in Figure 1.

The effectiveness of our model is illustrated through a case study of an AI company that aids organizations in forecasting "what will sell" by utilizing computer vision and machine learning on data gathered from social media platforms and online retailers. This Indian-based company's current customer base represents established and emerging nations.

This organization has successfully resolved tangible challenges within the financial services sector by employing visual intelligence and established an international niche market for AI applications in less than four years.

Case study: HDFC Bank validates framework

The cognitive platform of HDFC Bank enables the enterprise's knowledge assets to be integrated promptly, thereby facilitating the rapid realization of solutions. It has the potential to serve as a fundamental basis for constructing solutions. As depicted in Figure 2, the integrated runtime can be deployed and provided as services in cloud environments such as Amazon Web Services, Azure, IBM Bluemix, or Google Cloud Platform.

HDFC AI Framework Validation

An artificial intelligence (AI) ecosystem that encompasses a wide range of AI functionalities, facilitating the seamless integration of exceptional features into AI applications and chatbots by developers. The AI CoE at HDFC Bank collaborates with other AI services and contributes distinctive expertise in various domains, including machine learning (ML), natural language processing (NLP), and more. The organization must have a resilient, flexible, and dynamic AI ecosystem to effectively integrate AI capabilities into its ecosystem.

AI modules constitute the second element of the platform and enable the construction of hybrid solutions and the selection of optimal functionalities. Additionally, custom services in the fields of DL, ML, and NLP can be developed and integrated utilizing the modules. The AI platform at HDFC Bank leverages plug-ins to access the most effective amalgamation of its diverse services, encompassing NLP, ML, and additional cognitive endeavors.

Thirdly, the cognitive engine (C), which also functions as an orchestrator for the other components, facilitates the activation of the AI services.

It furnishes the infrastructure and backend services required to deploy an extensive array of AI applications. Utilizing enterprise knowledge assets and domain language, intelligence is rendered more contextual.

The fourth section is devoted to channels. The platform empowers users with increased autonomy by facilitating the disseminating AI functionalities across multiple channels.

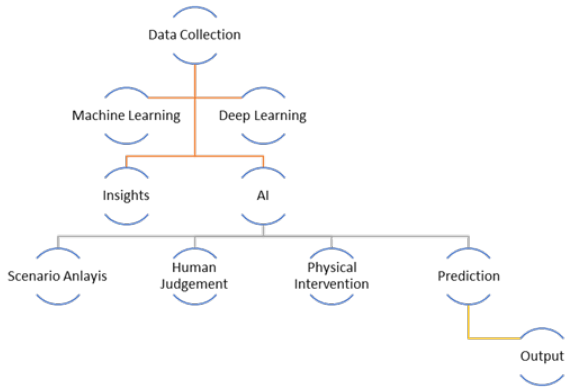
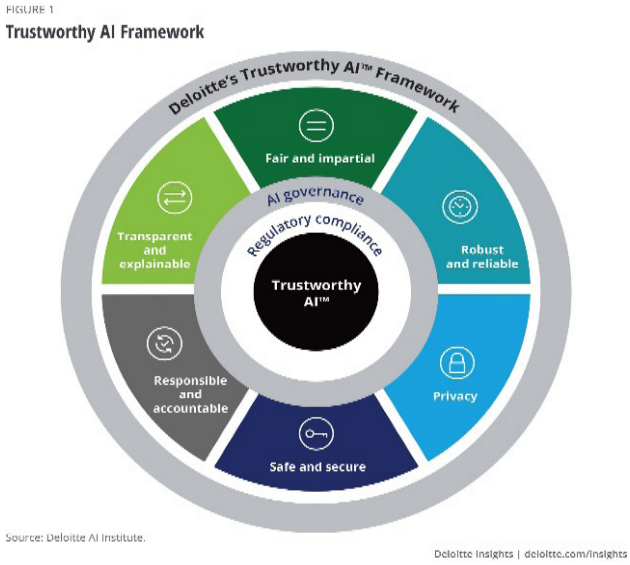


Figure 1: Theoretical constructs



Source: Deloitte

Figure 2: AI framework trustworthiness

Presently, the platform offers support for an extensive range of channels, encompassing the web, Facebook, Slack, WhatsApp, and numerous others. Additionally, it can accommodate any channel integrations that they may desire in the future.

The sixth section specifies enterprise adapters. These adapters play a crucial role in establishing connections and leveraging the data within these systems, given that the platform is designed to deliver intelligence concerning the enterprise's knowledge assets and diverse transactional functionalities. A multitude of internal and external enterprise systems contain these assets.

The sixth building block, domain vocabulary, is utilized to furnish an AI or NLP engine with domain-specific information exclusive to the organization and its field. We maintain and revise domain vocabulary about banking and finance to provide current information to AI solutions, such as the Chat Bot.

As fundamental services for platform administration, the platform offers setup and configuration in addition to analytics and reporting. These services round out the offering when considering the customization of the entire platform.

HDFC Products Using AI Platforms

The primary objectives of the solutions are to tackle three distinct value propositions.

Modifications in individuals' perspectives Impress the client with an unprecedented level of engaging and organic immersion, and they will be left in awe. AI assists in acquiring intelligent, highly pertinent content, similar to how Uber employs AI to deliver an experience. Two potential strategies for accomplishing this objective are incorporating contextual intelligence into user interactions and touchpoints and offering an engaging interface.

Intelligent systems furnish the content that maintains individuals' interests. Devices manufactured by cognizant, designed to perform tasks that humans have traditionally carried out, strive for intelligent automation by considering all the points of interaction where humans are involved. This significantly expands the potential for intelligent automation. Financial crime due diligence, automated trade finance, and know your customer (KYC) customer enrollment are a few examples. In this instance, AI will collaborate with established automation engines such as BPM, RPA, and the IT automation suite to perform a portion of the previously manual labor.

Heirloom powered by AI Organizations can benefit from integrating AI with their pre-existing knowledge assets. Most of a company's knowledge assets are probably stored in conventional enterprise systems. Consequently, the ability to provide AI-powered contextual decision support during interactions with these legacy systems is a highly desirable quality.

Research Contribution

As far as is evident, AI can resolve any issue organizations encounter. However, this seems to be the case in theory and practice, including in the laboratory. In this study, an endeavor has been made to establish a connection between theoretical comprehension and tangible implementation. The paper employs a framework and verifies its validity through case studies to demonstrate that retail banking AI implementations can be enhanced in various ways. The research findings could potentially assist the bank's leadership in optimizing forthcoming AI endeavours. State and federal administrations must initially increase their support for forming technology companies.

Furthermore, the academic community and the financial sector must enhance their relations and prioritize greater collaboration to attain a mutually beneficial outcome involving the exchange of critical resources and shared expertise, both of which are vital for the progression of artificial intelligence. Furthermore, the commercial sector, academic institutions, and regulators must collaborate to establish shared norms and standards that are indispensable for implementing artificial intelligence in the financial industry. In conclusion, the demands of the banking sector and the AI field should be regarded equitably, given their interdependence.

Discussion

As of this writing, the incorporation of artificial intelligence into retail banking is nascent. The dynamic field of AI has substantial practical implications in various industries. Until now, machine learning has only achieved success in sectors involving repetitive duties; however, that is expected to change shortly. Consider the finance industry: For an extended period, it has been widely believed that human ingenuity and innovation are the driving forces behind its success. In contrast to other sectors, AI will primarily serve as a tool to validate human assessments in this industry.

Our AI, on the other hand, is intended to support human decision-making, not inhibit it. Although AI may suggest features and benefits that can potentially increase a product's sales, humans must make the final decision. According to our methodology, consumer-favorite products are produced through human and machine labor. By integrating gradual learning derived from human judgment, our approach enhances the functionalities of artificial intelligence. Our conceptual model has been demonstrated to be consistent with the case study. MIT uses data from multiple online sources to populate this case study, whereas FIT trains the model with its data. The logical justification for this is derived from our theoretical framework, which suggests that the computer could acquire knowledge from human judgment and AI predictions.

Strategic value could be derived from our research if our proposed conceptual model is implemented to develop AI-powered banking solutions. This is because algorithm development is the foundation of all computer programs, and conceptual frameworks serve as the bedrock of algorithms.

Research Limitations and Constraints

Because not every paper was indexed or accessible to the public, it is possible that our analysis failed to consider certain significant publications.

Conclusion

Future artificial intelligence will face its most significant obstacle in practical implementations, even though most current research is devoted to new developments. Observing how contemporary staff members adjust to these cutting-edge instruments will be intriguing. Roles such as leadership, ethics, problem-solving, supervision,

and accountability could gain advantages from human's enhanced creative and judgmental capabilities. While AI has the potential to reduce employment in the design industry by 30%, it can also generate novel opportunities through the improvement of the entire design process. If designers in the financial sector had access to more data, they might be able to make more informed product decisions, which could motivate them to exert more effort. Although some progress has been made in applying AI to the development of financial products, there remains scope for enhancement of both precision and efficiency. Numerous industries and customers stand to benefit from artificial intelligence (AI), which will become an absolute necessity for organizations rather than a discretionary item. The outcomes generated by our model may prove valuable for future research endeavors. It could be pretty beneficial to have numerous variations of the concept, each tailored to the particular needs of value, premium, and luxury retailers. Possible future iterations similar to this one could be constructed using its foundation. Like any other, for our conceptual model to attain extensive adoption and utilization, it must endure the proof of time. Researchers may develop future iterations and modifications of our model.

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