Artificial Intelligence in Corporate Business and Financial Management: A Performance Analysis from Pakistan

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ARTICLE DETAILS

History:
Accepted 22 November 2021
Available Online December 2021

Keywords:
Artificial Intelligence (AI), Financial Institutions (FIs), Customer Relationship, Machine Learning, Chatbots

JEL Classification:
M0, M1, G20, G21

DOI: 10.47067/real.v4i4.205

ABSTRACT

This paper attempts to explore many signs of progress enabled by Artificial Intelligence (AI) in financial and corporate business management. It also aims to identify the benefits and cons of AI applications in social life. A systematic content analysis approach has been used to demonstrate the developmental phases of AI. Four distinct organizational maturity clusters i.e. Pioneers, Investigators, Experimenters, and Passives have been developed on basis of dataset. Data collections was carried through emails, customizable chatbots, live chat softwares and automated helpers of top ten online companies and various banking and financial institutions located in Lahore and Karachi cities for making behavioral analysis. The data results revealed that all aspects of financial managements and corporate business activities have been highly influenced by the application of AI. The study demonstrated that 80% senior business executives were of view that AI boost productivity and creates new business avenues. The results also demonstrated that 88% Pioneer organizations have understand and adopted AI techniques according to organization requirements, 82% Investigator organizations are not using it beyond the pilot stage whereas 24% Experimental organizations were adopting AI without understanding it. These results seem to reflect that AI has profound effects on financial industry to streamline its credit decisions from quantitative trading to financial risk management and fraud detection. This study also discovered that the widespread use of AI have raised a number of ethical, moral and legal challenges that are yet to be addressed. Although AI is gaining popularity day by day and it is believed that AI will improve work performance beyond human standards but it could not replace human resources fully.

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1. Introduction
Artificial Intelligence (AI) during the past few years has enabled the creation of professional business applications that had not only replaced human capital in full or in part but also improve organization performance beyond human benchmarks. The term artificial intelligence was firstly used in 1956, where with advance algorithms and enhanced computing power was used to associate human mind in learning and problem solving. In 1960, the US defense department had started training computers to copy basic human reasoning. That practice actually placed a ground floor for formal automation and it opened a new era for AI. Artificial intelligence is generally seen as a supporting tool, rather than serving as a replacement for human intelligence and ingenuity. AI is adapted to analyze troves of data more quickly than return with synthesized courses of action and streamline the decision-making process.

The development of artificial intelligence (AI) get over following four periods:

**Germination Period (1943 to 1955):** The first phase had faced limitations of computers' power for computational capacity and processing. In the mid of 20th century, Warren McCulloch and Walter Pitts introduced the early model of an artificial neuron which is also known as linear threshold gate. Later on in 1955, the first neuron computer was successfully developed by the Princeton University which further nurture artificial intelligence from budding stage.

**The Formation Period 1956 to 1980:** In 1956, the usage of computer increased in various applied fields of Medicines, Mathematics, Information Science, Psychology etc. This phase appeared with the development of artificial neural networks which imitate human brain functions, nurture machine learning systems and improved computational capacity of computers. McCarthy (1956) finally recommended the idea of "Artificial Intelligence" in a research project 1956 at Dartmouth College in Hanover, New Hampshire. This concept stimulated great interest from researchers and many scholars have begun to study people, work on artificial intelligence and received fruitful results. These results are mainly reflected in different aspects of life, chess program, theorem proving procedure, pattern recognition system and development of LISP language etc.

**The Application Period 1981 to 2000:** In this stage artificial intelligence (AI) encountered many difficulties due to immature computer technology. AI application range was small and the development speed was slow, until the American hitch chess system appeared. In 1997, IBM Super computer tested its processing power named DEEP BLUE, which easily defeat a famous chess player Gary Kasparov in several chess games (Newborn, 1997). In such type of games raw processing power was used that allowed the computer to win, but it could not improve its own performance, evolved, automatically learned and follow the computer recognized patterns. After winning the chess tournament, AI technology began to recover.

**The Integration Period (2000 to Present):** This periods defines the recent paradigm shifts of artificial intelligence and its applications for smooth interact of human life and machine intelligence. At this stage, the experts of computer technology developed various systems that were capable to fulfill users’ requirements and hence the AI technology promoted rapidly.

Integration of Artificial Intelligence in Corporate Business: The acceptance of artificial intelligence in mainstream society is a new phenomenon, although it is not a new concept. Most of us interact with this technological reality in some form or another on daily basis. Today, AI is even a household name presented as-hi! Alexa. Artificial intelligence has a wide range of uses in almost
every kind of business. As artificial intelligence technologies proliferate, every business process in every industry is already disrupting virtually, so it become an imperative for businesses that want to maintain a competitive edge (Skilton and Hovsepian, 2017).

These traits of artificial intelligence make it highly valuable throughout many industries from simply helping visitors and staff in managing corporate campus efficiently to as complex as monitoring the self-drive cars activities. Many organizations in corporate sectors use AI technology and machine learning to improve products or gain a strategic edge. Netflix (NFLX), Intel (INTC), Alphabet’s (GOOGLE) and Microsoft (MSFT) are Amazon (AMZN) are all spending big bucks on AI technology. These organizations are putting AI in consumer products and services, such as voice-activated smart home devices. Google and Facebook use AI tools in digital advertising. Amazon uses AI to customize online retail offerings and recommend products to website visitors. The analytics tools of business organizations process these data points to optimize their customer acquisition strategies and business operations to correlate with customer purchase decisions. To grow company’s revenue, organizations engage in search of potential customers and to persuade them to make more frequent purchases. Businesses need insights across several areas to improve every step of the cycle i.e. (i) how to improve their online reputation; (ii) how to engage prospective customers with their visible brands and physical point of sales; (iii) how to improve and measure their customer experience; (iv) how to benchmark and monitor against competitors. This virtuous cycle repeat itself as in Figure 1.1.

![Figure 1: The Customers’ Experience Flywheel](image)

Integration of Artificial Intelligence in Financial Management: As financial institutions (large commercial banks, insurance companies, cooperative banks and microfinance banks) are considered as lifeblood of today’s economy. They play important roles in handling cash, credits and other financial transactions. Artificial intelligence is renovating finance practices to modernize and enhance progression extending from credit disbursement to quantifiable risk administration.
Financial services over time has been transformed to great innovations, besides the nature of profession (Fasnacht, 2009). All facets of financial institutions are influenced by AI ranging from back office support to algorithmic business trading to issue debt. Based on customer preferences for financial spending, AI has expanded a range of offerings and suggest various customization.

AI has definitely brought the cost down by providing multiple services at affordable price which is good for a customer. AI can proactively detect fraud in financial system and keep all things secure before any chance of theft. Similarly there is no longer need to arrange specific personnel to answer questions about financial service offerings. AI itself process the customer’s information to solve queries and suggest the best possible solution without human intervention. AI make it possible that no human persuasion or opinions are needed to forecast the demand of financial services. The clients also use AI for trading of hedge funds and assets.

Artificial Intelligence in Pakistan: Pakistan is becoming a huge market for AI implementation. Improvement in financial security infrastructure, aerial warfare, installing surveillance cameras to make safe cities, facial recognition system in personal identification and cybersecurity are some examples of AI implementation in Pakistan. Proliferation of AI education has been initiated through a public sector initiative “Presidential Initiative for Artificial Intelligence & Computing (PIAIC)”. Currently the government of Pakistan has allocated Rs. 1.3 billion for AI infrastructure in universities.

Under auspicious of Higher Education Commission (HEC), different universities (NED UET Karachi, Comsats Institute of Information Technology (CIIT) University, NUST, University of Engineering and Technology (UET) Lahore) have started degree level programs. However, massive work and focus are required to improve this technology adaptation. Private sector in Pakistan started working on developing technologies like robotics, 5G broadband, autonomous vehicles, 3D printing and blockchain-distributed technology. There is not enough research in Pakistan to look at the expansion of AI in financial management and its potential role in development of business environment. Therefore this study is an attempt to fill this gap and aim to get knowledge for development and implementation of AI structure in the corporate business and financial management of Pakistan.

2. The Review of Literature

Artificial Intelligence (AI) aims at replicating human intelligence through the use of computers and algorithms (Zhongzhi, 2011; Russell & Norvig, 2002). According to Legg and Hutter (2006) artificial intelligence is the ability to adapt environment changes effectively, either by changing environment itself or by making a change in one-self or by discover a new path. The components of artificial intelligence includes Computer science, Psychology, Neuron science, Biology, Mathematics, Sociology and Philosophy.

According to Davenport et al., (2001) all coordination and procedures to manage, improve, facilitate marketing & sales forces, related interactions with customers & business partners throughout the enterprise develop a customer relationship management (CRM). Customer Relationship Management and artificial intelligence are a very powerful combination.

Artificial intelligence has significant impacts on customer relationship management (Mishra & Mukherjee, 2019). Customers have instant access to collect information about latest product
offerings, users’ trend, contact information and geographical locations through using mobile applications and search engines. Online business companies also store customers’ feedback via review sites, social media and custom surveys (Chang & Chen, 2008).

Agriculture use AI from indoor farming to big market speculation and helps to feed more hungry mouths (Yiyan and Cunjin, 2020). AI is great in educating people by arranging AI tutors. AI helps accountants to be more efficient and accurate in completing repetitive, time consuming tasks such as document analysis. Even small business are using AI based accounting programs to manage their business affairs. According to a Harvard Business school research study, AI will add an estimated $13 trillion to the global economy over the next decade. AI is going to create an estimated 58 million new jobs in the world by 2022 (World Economic Forum, 2017).

It is also reported that AI techniques generally handle noisy data better. The choice of forecasting models is influenced by many factors such as length of the forecast, data characteristics (noise, distribution) and type of the financial series. According to Elliotee and Timmermann (2016) the optimal forecast model is one that minimize the loss function that is often measured by mean squared error (MSE).

The deep learning allows the development of much complex and more efficient neural application system in real world (Zhongzhi, 2011). The unique difference between deep learning and the previous types of AI is the lack of human intervention in the system. Up till now, artificial intelligence has penetrated into all aspects of people’s social life and businesses ranging from healthcare to defense (Martınez and Aldea, 2005 ;Dautenhahn, 2007; Haenlein and Kaplan, 2019).

### 3. Objectives of the Study

The specific objectives of this research were:

- To explore major impacts of artificial intelligence on corporate businesses and financial institutions in Pakistan.
- To conduct impact assessment of artificial intelligence on businesses performance and organizational maturity.

### 4. Research Methodology

#### 4.1 Research Design

The study employed an analytical method of research. The research methodology for this paper comprise of two stage research plans. In primary stage plan, the "Observation" and "Documents" used as methods to collect appropriate dataset. Observations involved the direct witnessing of AI applications. The Document method involved collecting information from business papers and frequently asked questions (FAQ) sites. Much reading outside the target area was also done, to gain complete understanding of AI technology. In secondary stage plan, a survey approach was used. The use of questionnaire or the interview method, or the written correspondences, or any combination of these methods was the choice of busy executives in companies.

#### 4.2 Data Description

The secondary source information for this study was comprised on dataset that was available in published research journals, business magazine and news articles. The published literature contains papers from broad journals’ database such as Scopus and SSRN. The primary source information involved the field work and interaction with executives and supporting staff of top ten
online marketing companies and corporate business. The corporate businesses were from petroleum, telecom, banking, insurance, medicine, merchandise and electronics etc. The survey was articulated around major financial and business indicators in perspective of AI application. These organizations were selected with the purpose of collecting primary information directly related to AI. To exchange opinions with companies using artificial intelligence, E-mail correspondences, Chatbots, virtual assistants, simulated subordinates and Live messengers were used. A structured questionnaire was also utilized to collect customer and clients’ feedback about AI applications. Certain corporate business indicators such as: risk recognition, risk assessment, risk mitigation and risk control were enquired from available respondents. Similarly financial indicators such as credit risk calculation, credit rating & efficiency, bond rating, forecast & bankruptcy and fraud detection were also probed during online survey.

4.3 Analytical Techniques
The dataset has been processed through different statistical and analytical techniques. To analyze relevant literature publications, a systemic content analysis was conducted to illustrate the development stages of AI. The recorded information and data analysis provided insights into directions of current research. An organizational maturity cluster analysis was developed on the basis of opinions and feedback of executives and field staff participating in AI applications. Several technical indicators related to financial management and corporate business were calculated based on the information of this research.

5. Result and Discussion
State Bank of Pakistan has reported that local e-commerce merchants carried out 3.4 million online business transactions valued 18.7 billion rupees (Pakistan today, 2018). It is reported that Pakistan is second largest e-commerce based market in South Asia and experts believed that current business volume may double during 2020. The dataset has been analyzed and results are presented below according to different aspects of businesses.

5.1 Behavior Analysis of Ten Online Marketing Companies
Great companies make tremendous efforts to better understand their customers’ behavior and needs. This research used the data of top ten online merchandising companies and observed how these online companies are using AI to learn the taste & preferences of their potential customers. The results showed that on the basis of previous buying pattern, the software greet the customer with his or her name and give them recommendation to make a purchase decision.

During surveying different CRM benchmarks were used to make behavioral analysis between customers and companies.
The analysis results showed that retaining customers in business is highly profitable. Due to utilization of AI tools and techniques, these companies like Daraz.pk; symbios.pk and shophive.pk gathered all related information about customer taste & preferences and apply this information to approach target customers with motivations. Figure 2 showed the behavioral analysis of companies regarding different CRM indicators which companies used to achieve the economies of scale over the market competitors.

5.2 Results of AI and Marketing Tactics Operated in Digital Businesses

On the basis of extensive interactions with marketing agents of ten online companies, a framework was developed to understand how AI will impact marketing tactics and customer behaviors. In doing so, six dimensions such as customer database, customer selection, customer satisfaction, purchase analysis, customer targeting and implementing relationship marketing were integrated to understand how much substantial impacts AI has had on marketing tactics.
Figure 3. Marketing Tactics of Top Ten Online Companies

The outcomes of Figure 3 showed that implementation of AI by Daraz.pk for indicators of customer selection is high than purchase analysis whereas other indicators lies in the range of 90% to 95%. The Wbminternational.pk and Symbios.pk ranked second and third for target indicators respectively.

5.3 Results of Rank Scale Analysis for AI Adoption in Corporate Businesses

The collected data was analyzed and sector-wise rank scale was developed to determine the hierarchy of artificial intelligence among corporate business. The result showed that Pharmaceuticals, Automotive and Telecommunication sectors were top in rank showing percentage of 58%, 54% and 52% respectively. This proved that these sectors are adjusting with technological progress more rapidly. In can be seen from Figure 4 that acceptance level of AI in public sectors is low i.e. 32 percent.
5.4 Results of Top Preferences of Business and Technology Executives for AI Impacts

The opinion of business and technology executives was pursued for top preferences of AI impacts they wished to witness. A list of top choices was prepared and responses were analyzed.

The outcomes of Figure 5 showed that 40% business executives looked for AI impacts with regard to predictions on their machines faults and business economic health; 24% respondents wanted the AI impacts on automation and repetitive tasks, 13% preferred to look monitoring & security impacts; 11% wanted to increase quality of communication with customers; 8% favored to fix the internal issues and remaining 4% did not have any specific choice for impacts of AI.

![Figure 5. Top Preferences of Corporate Businesses for AI Adoptions](image)

5.5 Analysis of Organizational Maturity Clusters for Artificial Intelligence

The dataset of survey questions has been used to develop an organizational maturity clusters with regards to AI understanding level. These four distinct organizational maturity clusters are Pioneers, Investigators, Experimenters, and Passives. The clustering of these organizations has been formulated on the basis of four benchmarks of artificial intelligence i.e. Technology Implications; Business Implications; Workplace Implications; and Industry Implications. These broad benchmarks have been further segregated in some questions. Five points Likert scale was used during surveying of these businesses and results of maturity cluster analysis have been demonstrated in Table 1.
Table 1. Organizational AI Maturity Clusters

| To what extent do you agree with the following statements about your organization? | We understand........ | Pioneers | Investigators | Experimenters | Passives |
|---|---|---|---|---|---|
| TECHNOLOGY IMPLICATIONS | Required technological breakthroughs to succeed with AI | 88% | 82% | 24% | 15% |
| | Data required for AI algorithm training | 87% | 78% | 22% | 11% |
| | Processes for AI algorithm training | 85% | 69% | 21% | 7% |
| BUSINESS IMPLICATIONS | AI-related changed ways of Business value generation | 91% | 90% | 32% | 23% |
| | Development time of AI-based products and services | 85% | 76% | 19% | 15% |
| | Development costs of AI-based products and services | 81% | 69% | 11% | 8% |
| WORKPLACE IMPLICATIONS | Required changes of knowledge and skill for future AI needs | 89% | 84% | 23% | 19% |
| | Effect of AI in the workplace on organization's behavior | 73% | 77% | 18% | 16% |
| INDUSTRY IMPLICATIONS | AI-related shift of industry power dynamics | 89% | 86% | 26% | 21% |

1. Pioneers: Table 1 demonstrated that Pioneers business organizations claimed that they have 88% understanding for required technological breakthrough to succeed with AI, have 87% algorithm training. Under business implications, Pioneers have 91% changed ways for value addition, 85% have allocated time for AI and 81% development costs for AI-based products & services. In workplace implications, these organizations have 89% adapted to the future knowledge & skills and 73% workplace behavior. Similarly in industry implications, Pioneers have 89% adopted power dynamics according to the organization need.

2. Investigators: Results for Investigators in Table 1 showed that these business organizations have achieved 82% understanding for required AI technological knowledge; 78% data training, and 69% algorithm process training. In business implications, Investigators have changed 90% ways for value generation, 76% have allocated time and 69% development costs for AI-based products & services. Under category of workplace implications, the organizations have 84% adapted to the future knowledge & skills and 77% workplace behavior. In industry implications, Investigators have 86% shifted power dynamics of their business.
3. Experimenters: Findings for Experimenters in Table 1 exhibit that these businesses have acquired 24% information for required AI technological requirements; 22% data training, and 21% algorithm process training. Under business implications, Experimenters have modified 32% ways for value addition, 19% time allocation, and 11% development costs for AI-based products & services. Experimenters in case of AI workplace implications have 23% adapted to the future knowledge & skills and 18% workplace behavior whereas for industry implications, Experimenters have showed 26% shift in power dynamics.

4. Passives: The Passives in Table 1 disclosed that these businesses have acquired 15% required AI technological knowledge; 11% data training, and 7% algorithm process training while towards business implications, Passives have altered 23% procedures for value addition, 15% time allocation, and 8% development costs for AI-based products & services. Similarly for workplace implications Passives have 19% adaptation for future knowledge & skills and 19% workplace behavior while for industry implications, Passives showed 16% transformation towards power dynamics.

5.6 Results of AI Performance in Financial Institutions of Pakistan

This study investigated significant impacts of AI on financial institutions. In Pakistan 36% banking sector is already using AI technologies in different aspects of financial management. Financial institutions including banks and insurance companies are using AI applications to recommend, execute tailored financial advice and forecast the future market progress. There are following 12 Pakistani banks which have taken AI initiatives over the last few years.

| i. | Habib Bank Limited (HBL) | ii. | National Bank of Pakistan (NBP) |
|---|--------------------------|---|-------------------------------|
| iii. | Meezan Bank | iv. | MCB Bank |
| v. | United Bank Limited (UBL) | vi. | Allied Bank |
| vii. | Faysal Bank | viii. | Bank Alfalah |
| ix. | Soneri Bank | x. | Askari Bank |
| xi. | Standard Chartered Pakistan | xii. | Bank of Punjab (BoP) |

Source: State Bank of Pakistan, 2021

The feedback of financial institutions’ executives revealed that AI enabled banking industry to ensure customers’ satisfaction, portfolio management, credit evaluation, fraud detection and cybersecurity, establish innovative products & services and market sentiment analysis. On the basis of this study dataset, AI impacts in various financial management activities are briefly discussed.

- **Customer Satisfaction:** AI helps the financial institutions to provide more personalized customer services, faster decision making and establish good customer relationship.
- **Digital Wallets:** Banks have developed apps which serve as digital wallets to provide digital money. Customers can purchase any item online or avail public utility service either with a mobile phone or a computer.
- **Chatbots:** It is an automated chat program that follows a pre-determined path. Chatbot use AI in the form of robotics to deal with financial activities. Chatbots provide efficient customer service and are available 24/7.
- **Personalized Financial Assistance:** AI provide up to date information to customers on current market structure. It make easy and quick financial decision as well as provide suggestions on which stocks and bonds customers should invest.
• Fraud Detecting: AI captures banking fraud through facial recognition and scanning thumb impression. AI track down any unorthodox activity or irregular behavior and helps in immediate action to minimize banking fraud.

• Credit Assessment: Banks are using AI to observe the pattern and behaviors of customer to determine whether they can really be a creditworthy customer or not.

• Risk Management: AI helps in real time scanning of suspicious transactions, measure client creditworthiness and enable risk analyst with appropriate action to curb risk.

• Portfolio Management: AI techniques on basis of customers’ investment limit make their customized portfolio profiles. Financial institutions are at a vantage position to unleash digital disruption. AI has made every aspects of financial institutions more efficient ranging from money transfer to back-end operations

5.7 Top Barriers to Choose and Implement AI in Corporate Sector

An exploration was made for major barriers across financial institutions and corporate businesses to gain AI traction as a core business technology. The outcomes of survey information have been documented in Figure 6.

![Figure 6. Top Barriers to Choose and Implement AI](image)

The results showed that major barriers for most of the financial institutions and corporate businesses was their lack of knowledge in day to day changing technology of AI (68%). Training & education and companies internal culture for use of AI was followed with percentage weightage as 42 % and 41% respectively. However, during survey it was noticed that with continued experimentation, time and investment, these barriers will eventually be overcome, giving rise to a whole new generation of advanced AI applications.

6. Conclusions

The specific objectives of this research were to examine impacts of AI on business performance, efficiency and financial service delivery. The maturity levels of business organizations has also been explored. The study used analytical methods to draw conclusions from information provided by ten online business organizations. The analysis of AI and marketing tactics showed that businesses can get up to 95% customer selection on account of AI application. Pharmaceuticals,
Automotive and Telecommunication sectors were top in rank showing percentage of 58%, 54% and 52% respectively.

The dataset of survey questions has been used to develop an organizational maturity clusters with regards to AI understanding level. These four distinct organizational maturity clusters are Pioneers, Investigators, Experimenters, and Passives. The clustering of these organizations has been formulated on the basis of four benchmarks of artificial intelligence i.e. Technology Implications; Business Implications; Workplace Implications; and Industry Implications. The Pioneers business organizations claimed that they have 88% understanding; Investigators organizations have achieved 82% understanding; Experimenters businesses have acquired 24%, and the Passives businesses have acquired 15% understanding for required technological breakthrough to succeed with AI.

The study revealed certain significant impacts of AI on financial institutions. In Pakistan 36% banking sector is already using AI technologies in different aspects of financial management. The feedback of financial institutions’ executives revealed that AI enabled banking industry to ensure customers’ satisfaction, portfolio management, credit evaluation, fraud detection and cybersecurity, establish innovative products & services and market sentiment analysis.

Certain legal, moral and technical challenges with regards to financial investment, culture, employee training & education and maintenance of AI have also been reported in this study. Customers showed their concern that companies integrate customer relationship management (CRM) data, transaction data, demographic data, and online transactions data for irrelevant advertising and marketing drives.

The study suggested although artificial intelligence is generally seen as supporting tool but it cannot be used as a complete replacement of human intelligence. However, with continued experimentation, time and investment, these challenges will eventually be overcome, giving rise to a whole new generation of advancement.

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