Leveraging Artificial Intelligence to Generate Automated Insights in Customer Relationship Management

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Abstract Artificial Intelligence (AI) has reached a pivotal stage, surpassing human capabilities in complex tasks such as defeating grandmasters in Chess and Go. This technological advancement extends beyond gaming; AI is now capable of writing poetry, forecasting decisions, interacting in real-time, and processing vast amounts of data to deliver solutions in milliseconds. As AI integrates into various business sectors, its impact on Customer Relationship Management (CRM) is particularly notable, significantly enhancing customer experience (CX).This research paper explores the application of AI in CRM by examining five AI-enabled tools specifically designed to assess Consumer Awareness, Effectiveness, and Loyalty. The researchers employed a survey-based research methodology, gathering primary data through Google Forms. Analysis of this data revealed that consumers are not only aware of these AI tools but also find them effective. Furthermore, there is a marked loyalty among consumers towards these tools, indicating a positive reception and trust in AI's capabilities within CRM. This study underscores the transformative potential of AI in fostering improved customer relationships through advanced technological tools.

Keywords Artificial Intelligence (AI), Customer Experience (CX), Customer Relationship Management (CRM)

1. Introduction

Today, Customer Relationship Management (CRM) is increasingly influenced by the integration of advanced technologies. Both developers and users of CRM systems rely heavily on technology to enhance their operational efficacy. Recent technological advancements, particularly in fields such as Artificial Intelligence (AI), Augmented Reality (AR), Virtual Reality (VR), Predictive Modeling, Deep Learning, and Machine Learning, have become indispensable for companies. These technologies are critical not only in CRM but also across other domains such as Supply Chain Management (SCM) and Production.

The influence of technology extends beyond conventional applications like robotics or data management, encompassing billions of records and aiding in decision-making processes. It also plays a crucial role in knowledge management and improves after-sales support. More innovatively, technology is being used to better understand customer needs and preferences, enabling businesses to offer personalized product recommendations through AI applications. Companies like Amazon, Netflix, Google, and Facebook leverage AI to analyze customer behavior, including purchase history, time spent on various products, and social media activity, to tailor their offerings and enhance customer satisfaction.

The application of these technologies is not confined to tech-centric platforms such as Amazon, Google, Alibaba, Facebook, or Apple, which are known for delivering superior customer experiences and achieving higher business volumes. Non-IT companies like Wymo (self-driving cars), LG, Shell, American Express are also investing in emerging technologies to enhance customer service and overall experience.

This paper delves into the potential of AI as a transformative technology and assesses its impact on CRM

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systems. Businesses across various industries are investing heavily in the research and development of AI-driven tools and applications, anticipating a competitive edge. Although the universal implementation of AI across all business units might still be a decade away, AI currently supports various functional areas including Human Resources, Marketing & Sales, Finance & Accounting, Legal, Customer Service, Logistics, and Operations.

Exploring AI's role in the entirety of CRM modules is a significant challenge. Major corporations like Amazon, Alibaba, Netflix, and American Express have begun employing AI-enhanced CRM to better meet customer demands and improve service quality.

Data stands as the most critical asset for AI; every second, marketers generate billions of data points. AI processes and extracts valuable insights from each customer interaction, whether it be tweets, social media posts, online transactions, or other digital activities. These insights are then used by companies to offer products that align with customer interests.

Moreover, numerous companies have introduced AI-powered customer interaction tools such as Apple's Siri, IBM's Watson, Google's Astor email, and Microsoft Office 360. These tools, along with other AI-driven applications like Google Translate, Google Goggles, and Google Photos, are pivotal in refining customer interactions. Businesses continue to invest in AI research and development not only to enhance customer experience but also to increase sales through strategies like cross-selling and up-selling.

This research paper evaluates the effectiveness of the AI-based customer interaction tools in creating positive customer experiences, showcasing their importance in modern CRM practices.

2. Literate Review

a. Artificial Intelligence

The term "Artificial Intelligence" was introduced by John McCarthy in 1956, defined as the science and engineering of creating intelligent machines and computer programs. It is akin to using computers to understand human intelligence, though AI is not limited to biologically observable methods.

AI has undergone several developmental phases since its inception. The advent of "Big Data" in the early 21st century catalyzed AI's popularity and acceptance. Businesses began to invest heavily in AI research and development to leverage the vast amounts of data generated online every moment. Other contributing factors include the reducing costs of software development, the availability of skilled developers, and improvements in the speed and accuracy of microprocessors and storage devices, which have all supported AI investment over the past decade.

According to Andreesen Horowitz's AI playbook, it is beneficial to view AI through a lens of goals and techniques. AI's objectives may encompass tasks such as image recognition, speech-to-text conversion, or route planning. The methods to achieve these goals vary, incorporating techniques such as deep learning and supervised learning.

Tech giants like Facebook, Google, Amazon, and Apple have been pioneers in applying AI in areas like text and image search. AI experts have harnessed the power of Big Data, machine learning, deep learning, and artificial neural networks to develop groundbreaking applications such as chatbots, real-time language translators, and personalized product recommendations based on historical data.

AI is now increasingly recognized across various sectors including healthcare, sports, academia, banking, space exploration, and entertainment. In recent years, AI has become particularly influential in the business realm, notably in customer service, where it plays a crucial role in enhancing support and improving customer experiences.

b. Role of AI in enhancing customer experience (CX)

The association of AI with customer experience was initially proposed by Chor-Beng Anthony Liew in 2008, who demonstrated a significant link between knowledge management (KM) and CRM. Knowledge management itself is a direct result of AI application, setting the stage for further research in this field.

Subsequent studies have reinforced the critical role of AI in enhancing customer experience. For instance, in 2012, Babu G. Bhuvaneswari and T. developed a CRM system that employs data mining and AI techniques to bolster and refine customer relationships. In a similar vein, Kuo-Yi Lin and Jeffrey J.P. Tsai in 2016 introduced a Deep Learning-Based Customer Forecasting Tool. Major companies like Salesforce, IBM, and Microsoft now

anticipate a vital and pervasive role for AI in customer experience (CX), as evidenced by their production of white papers focusing on AI's capabilities in improving customer services.

Researchers predict that in the near future, businesses will be distinguished by their AI-enabled tools that enhance customer service. A notable study by Hojjat Salehinejad and Shahryar Rahnamayan in 2016 employed a Recurrent Neural Network approach to predict customer shopping patterns, highlighting the rapid evolution of customer service. This field is expected to undergo a significant transformation in the coming years. Various applications of AI that significantly enhance customer experience have been detailed in the referenced papers, illustrating the expanding scope of AI in this area.

c. Application of AI in enhancing CX

The papers mentioned earlier highlight various AI applications that significantly improve customer experience. Below are some examples explored in these studies:

Product Recommendation Tools – These tools act as forecasting mechanisms that predict shopping patterns, enabling companies to suggest products that align with customer interests. Companies like Amazon, Netflix, and Uber extensively utilize these tools.

Bots – Also known as web robots or interactive agents, these are real-time intelligent interacting tools that companies deploy for enhanced customer service. Bots utilize sophisticated Natural Language Processing (NLP) systems and are capable of self-learning. They process vast amounts of data in milliseconds to provide recommendations. Well-known examples include Google Assistant, Amazon's Alexa, and Apple's Siri. Chatbots are a prevalent form of bots that many companies are either using or planning to implement.

Speech Recognition Tools – These applications convert spoken language into written text through AI. An example of advanced implementation is IBM Watson's Speech Technology, which takes spoken input from customers and outputs text or graphics. Chatbots are increasingly incorporating this technology, making bots more intelligent and responsive.

Visual Perception – This AI application allows computers to identify and recognize images and videos. Companies such as Clarifai.com, thehive.ai, Google, and Facebook offer these tools for image searching capabilities.

Text Analysis and Email – Also known as text mining, this is a critical development in the realm of Big Data and is a subset of Natural Language Processing (NLP), which itself is a branch of AI. Moreno, Antonio, and Redondo, Teófilo (2016) discussed current and future applications of text analysis. They noted that text analytics could be broadly applied across industries to analyze millions of emails, customer comments on forums, and perform sentiment analysis by evaluating the positive or negative perceptions of a company, brand, or product.

These applications of AI are reshaping how companies interact with and serve their customers, paving the way for more personalized and efficient customer experiences.

2.1. Objective

Based on the literature review researcher has established that AI developers and business organizations strongly feel that AI will enhance the CX. As we have already discussed that many organizations have started using AI to provide better services to their customers. Organizations and academia both are investing millions on the research and development of AI tools. Customers are using AI enabled tools knowingly or unknowing and have started experiencing the effect of AI around them. Considering the role of AI in CRM, researchers want to study the awareness of AI enabled tools among customers, and their effect on CX and loyalty. The objectives of this research are as follows: Objective –1) To identify user awareness for AI enabled tools Objective –2) To assess the effectiveness of AI enabled tools Objective –3) To assess customer's loyalty for AI enabled tools.

2.2   Research Methodology

The following table gives a brief overview of Survey Methodology.

Table No .1

RESEARCH / SURVEY METHODOLOGY	
Type of research	Quantitative Research
Scope of research	Scope limited to the 5 AI tools identified in Section C of Review of Literature
Design of Survey Questionnaire	Close ended
Sampling	Non Probabilistic
Data collection	Primary data collection
Data Collection Tool	Google form
Data Analysis Techniques	Descriptive and Associative
Hypothesis Test	Non parametric (Chi Square)

Table No 2

Research Parameters for CX	Questions
Awareness (Yes or NO)	**Question.1)** Have you used the following **applications that are Artificial Intelligence enabled**?
Effectiveness (Used 5 point Likert scale, where 1 is highly dissatisfied and 5 is highly satisfied)	**Question.2)** Please rate the AI enabled tools in term of **user friendliness** (easy to use) **Question.3)** Please rate the AI enabled tools in term of how helpful they were while **making any decision** **Question.4)** Please rate the same set of AI enabled tools in term of **providing additional updates or information** after completing your task successfully. **Question.5)** Please rate the same set of AI enabled tools in term of **overall satisfaction level**
Loyalty (Used 5 point likert scale where 1 is highly unlikely and 5 is highly likely)	**Question.6)** Please rate the same set of AI enabled tools in term of how likely you would reuse the tools/functionality. **Question.7)** How likely you would recommend the AI enabled tools to others.

2.3   Hypothesis Testing

Researchers have also evaluated using Statistical Hypothesis testing to compare awareness, effectiveness, and loyalty for tools under study. As the data type is discrete, Chi Square test to compare multiple proportions is used. Hypothesis test is conducted at 95% confidence level and 5% level of significance.

2.4   Data Analysis

Through the data collection method researcher collected data from 150 individuals. Based on the three objectives and seven hypothesis mentioned in this research paper, researcher used Descriptive analysis (Pie Chart) and Associative analysis (Chi square Test). The inferences drawn from detailed analysis of the data is mentioned below.
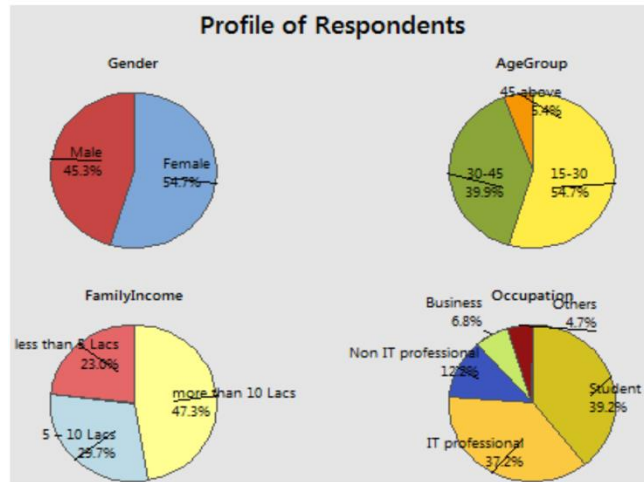
1- Profile of Respondents

Figure 1: Demographic profile of respondents.
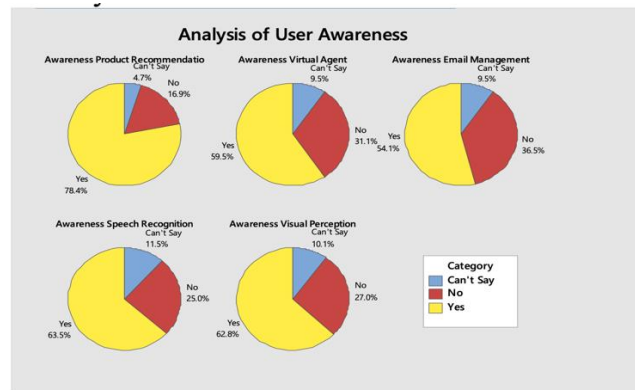
2- Analysis of Awareness of AI Tools

Figure 2: Analysis of Awareness of AI Tools

Figure: 2 depicts that 54% respondents have awareness about the in-scope AI Tools. "Product Recommendation" being the most popular and "Email Management" is the least popular. This could be due to the limited user base and recency of the email management tool. Whereas "Product Recommendation" tool is used by companies like Amazon, which is an ecommerce site and popular in most of the age groups. Difference in popularity - A hypothesis testing using Chi Square resulted in p vaue 0.070, which tells the difference in popularity is not significant. This implies that the respondents have similar awareness level for all the 5 tools.

As the objective of this paper is to measure the CX considering Awareness, Effectiveness and Loyalty for 5 AI enabled tools identified in the previous section of this paper; the researchers chose to conduct a questionnaire based closed ended survey. Researchers used Google forms to conduct this survey. The mapping of the research objectives with the survey questions is depicted in the following table.

As mentioned earlier, to assess the effectiveness and loyalty of AI Tools, researchers have chosen four criteria and two criteria respectively as referred in table no.2. Thus, in the following analysis, researchers have presented the outcome for each of the criteria separately followed by a conclusive inference/opinion. Before presenting the outcome of analysis, it is worth mentioning here that the respondents have either not used to the tool (marked as "No" in awareness) or are not sure (marked as "Can't Say") have been excluded from the following study to minimize any bias in the survey output.

2.5 Analysis of Effectiveness of AI tools

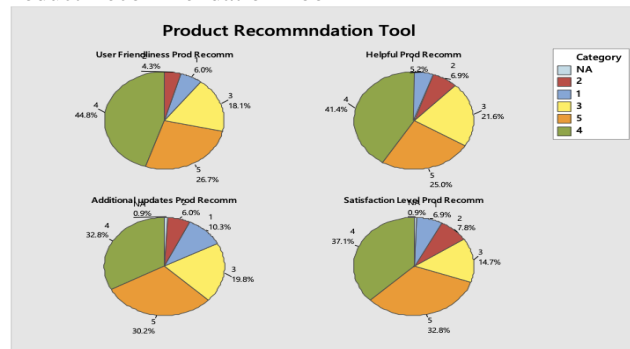### 2.5.1 Effectiveness of Product Recommendation Tool

Figure 3: Product Recommendation Tools

The Figure: 3 depicts that about an average of 13% of the respondents are dissatisfied or highly dissatisfied from the "Product Recommendation Tool" in all the four criteria. Thus, it can be inferred that AI enabled "Product Recommended Tool" is effective and consumers are satisfied from this tool.

3. Conclusion

The aim of the present research was to analyze the CX in terms of the awareness, effectiveness, and loyalty of the consumers for 5 AI enabled tools (Product Recommender, Virtual Agent, Email Management, Speech Recognition and Visual Perception). The analysis of the research data showed that people: a) Have awareness about the AI enabled tools that they are using in various company sites. b) The AI enabled tools are effective and possesses a positive CX. c) Are loyal and using these tools repeatedly and are recommending these tools to others also. Thus, researchers are agreeing with the industry and the academia to invest heavily on the research and development of AI for future business opportunities. Researchers also recommend that in future companies would be aggressively offering AI enabled services to consumers for better business volumes. Researchers also believe that in future AI will give a new dimension to the present business and the business will not be the same in near future. With the emergence of AI many businesses will find it difficult to exist and many new businesses will emerge. The researchers studied the general AI enabled tools, future scope of study could be considering specific AI tools, comparing between two similar tools.

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