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Artificial intelligence in financial technology

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Abstract

AI applications in health care, communications, and arts have brought about rapid and dramatic advances in these fields. Nevertheless, the rapidly expanding potential of AI in the economy and society has raised a set of challenging issues. The fields of AI and financial technology are not spared. How can artificial intelligence (AI) be utilized in financial technology (fintech)? What will be the impact? What actionable objectives are needed to realize value from AI? This research uses a systematic qualitative research methodology, Value-Focused Thinking, to identify the actionable objectives for deriving value from AI in the fintech industry. The results of this study will provide a theoretical framework for pursuing future research as more AI applications are developed in the fintech industry. The results of this research provide guidance to practitioners for achieving value in their AI ventures.

Keywords: artificial intelligence, fintech, value-focused thinking

1. Introduction

Financial technology (Fintech) is defined as "a new financial industry that applies technology to improve financial activities" (Schueffel, 2016, p.45). Nowadays, the concept is used to illustrate any innovative methods that enhance and automate financial services (Mention, 2019). The rapid development of fintech is driven by innovative technologies, such as artificial intelligence and blockchain, and it has gained attention from innovators, academics, and regulators (Mention, 2019). Startup firms promote more user-friendly products, scholars concentrate on the nature and the effect of the new technology, and policy-makers determine the expected usage of fintech (Hornuf *et al.*, 2021; Mention, 2019). Although the scale of fintech is already large (with more than 1,400 fintech firms reported by Ernst & Young), it is still expanding (Das, 2019). This paper discusses the impact of one emerging technology - artificial intelligence - on the growth and development of fintech.

Artificial intelligence (AI) aims at "making intelligent machines" (McCarthy, 2004, p.2). The concept of "AI-empowered" is gaining increasing popularity. Currently, key participants in modern finance are not entirely humans; instead, machines constitute a large proportion. They take over routine and structured tasks such as standardized analysis. Since AI can help business leaders automate time-consuming and labor-intensive operations, and it enables businesses to

offer innovative services to customers, the application of AI in the fields of finance has attracted much attention and interest (Siau *et al*., 2018; Lin, 2019). The industry is evolving as organizations that were customarily financial institutions are mutating into information technology enterprises, and vice versa (Hendershott *et al.*, 2021). With these transformations and the potential of AI, it will be important for organizations to identify objectives that need to be accomplished in order for the full value of AI to be realized.

This research addresses the following question: What objectives need to be achieved to realize the greatest value from AI in the fintech industry? This study aims at discovering the future development of the application of AI in the fintech industry. More specifically, to ensure that AI reaches its potential contribution, it will be important to understand what fundamental objectives need to be met for its value to be fully realized and what are the means objectives to achieve the fundamental objectives. Understanding the means-end objective network will provide valuable guidance for researchers and practitioners to derive value from AI in the fintech industry.

2. Literature review

Although definitions of AI are varied and multifaceted, AI can be conceptualized with five attributes to differentiate it from other technologies. These five attributes are (Hamm and Klesel, 2021):

1. Ability to resolve complex problems – AI solves issues that were once not conceivably possible.
2. Processing that imitates humans – AI mirrors humans' cognitive functioning.
3. Associations with intelligence – Some aspects of AI functions are considered intelligence.
4. Technology-based – Technology is prominent in AI.
5. Leveraging external data – AI normally utilizes external data sources for learning.

Because of its distinctiveness and potential, AI has attracted much research attention over the decades (Hyder *et al.*, 2019). The rapid advancement in machine learning has spurred the interest in AI (Wang and Siau, 2019). AI technologies and applications span from the use of deep learning in self-driving cars to natural language processing to analyze text. AI has the potential to automate tasks, engage with individuals (e.g., customers), generate insights and make decisions, and support innovation. With AI's uniqueness in comparison to other technologies, it will be essential to identify the actionable objectives needed to realize its value. Previous studies have identified success factors associated with AI adoption, such as top management support and appropriate resources (e.g., data) (Hamm and Klesel, 2021), as well as employees' perceptions and attitudes prior to AI adoption (Chiu *et al.*, 2021). What has not been identified, however, are the actionable objectives needed to derive value from AI.

Financial technology (fintech) "encompasses innovative financial solutions enabled by IT" (Puschmann, 2017). Artificial intelligence and data science are the promoters of the new generation of fintech, as they have the potential to discover previously hidden relationships among variables (Wall, 2018). Concepts and tasks in the fintech field are redefined as AI affects the operation of financial organizations, transfers the way participants interact, and raises new financial mechanisms. AI-empowered finance has promoted a new era of smart digital currencies, risk management, and lending (Cao, 2022). Considering the substantial quantity and diversity of

data in the financial services industry, AI is of significant importance (Veloso *et al.*, 2021). For example, AI in fintech includes assessing loan applications with neural networks and approving credit with rule-based expert systems. The development of AI helps improve the efficiency of financial firms and the quality of financial services and products by reducing cost, enhancing productivity, and promoting more tailored products (OECD, 2021). Based on AI technology, security companies build an "intelligent control application system" which can analyze both internal and external big data and identify and warn of hidden risks (Guo and Polak 2021, p.175). Fintech lenders use complex AI algorithms to make credit decisions quickly (Jagtiani and John, 2018). Ant Financial, a leading Chinese fintech company, promoted the "Smile-to-Pay" service based on computer vision technology. Customers can complete payment by "smiling" at a vending machine without using phones or cash (Qi and Xiao, 2018). Further, investors analyze big data to find customers' demand information with the help of AI and identify customer investment preferences (Guo and Polak 2021, p.175).

As an emerging technology, AI also brings new risks and challenges to the financial industry. Wall (2018) claimed that the AI algorithm could identify relationships that are not causal. This could lead to biases against some protected classes (i.e., gender, race). Since the decision processes are complex and invisible, it is hard for humans to regulate and intervene (Jagtiani and John, 2018). Some studies found that it is hard to convince people to trust financial services and advice provided solely by automated systems (Fenwick and Vermeulen, 2017). Researchers also found that Fintech lenders may undermine existing financial regulations (Braggion *et al.*, 2019). Therefore, regulations that promote policies to protect consumers while encouraging the innovation and development of new technologies need to be further improved (Jagtiani and John, 2018). For AI's potential contribution to be realized, it will be important to identify the value that AI can provide and objectives that can be achieved to realize this value. Previous studies have focused on other aspects of AI in fintech, such as the effectiveness of using machine learning in P2P lending and methods of removing bias (Fu, Huang, and Singh, 2021), algorithmic trading systems integrating investors' dispositions (Martínez, Román, and Casado, 2019), and investor reliance on humanized robo-advisors (Hodge, Mendoza, and Sinha, 2021). However, research is lacking in discerning the value that can be derived from AI in fintech and the objectives needed to realize this value.

3. Research Question, Methodology, and Procedure

The application of AI in the fintech industry is relatively new, and much is unknown about the domain. In this research, we employ a systematic, qualitative research methodology, Value-Focused Thinking (VFT), to identify the values of AI in the fintech industry. VFT has been utilized in many IS studies (e.g., Nah *et al.,* 2005; Sheng *et al.*, 2010; Rzepka, 2019; Smith and Dillon, 2019) and is considered to be an effective methodology in the contexts of emerging IT (Sheng *et al.*, 2005, 2007).

In the context of decision-making, values should be the ultimate guide (Keeney, 1996). Although alternatives are utilized in making decisions, they are utilized to achieve what one values. Values are what we care about, and values are principles used for evaluation (Keeney, 1996). In this case, values are used to evaluate the actual or potential consequences of action and inaction of proposed AI alternatives and decisions. To derive values from AI in fintech, one should start with identifying what one values. Values can encompass "ethics, desired traits, characteristics of

consequences that matter, guidelines for action, priorities, value tradeoffs, and attitudes toward risk" (Keeney, 1992, p. 7). VFT provides specific procedures for articulating values by identifying and structuring objectives qualitatively. These objectives include fundamental and means objectives. Fundamental objectives are "the essential reasons for interest in the situation" (Keeney, 1992, p. 34). Means objectives are important to achieving fundamental objectives or other means objectives. The means objectives are differentiated from fundamental objectives by using the "Why is it important?" test. If an objective is important because it helps to achieve another objective, it is a means objective. Otherwise, it is a fundamental objective. The means-ends objective network is derived from the objectives identified and relationships that emerge through this process. Values are represented as objectives in the means-ends objective network. The VFT process is depicted in Figure 1.

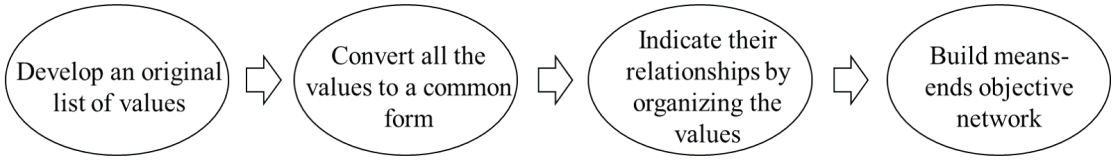

Figure 1 Process of Value-Focused Thinking Approach

The interviewees (i.e., subjects) for this research will be fintech professionals and business executives in these fields. We will interview each of them individually and ask questions to solicit the values that he or she believes are important in utilizing AI in the fintech industry. When the interviewees do not generate any further new concepts (i.e., the point of saturation is reached), we will remove duplicate objectives and combine similar objectives. The consolidated list of objectives and their relationships describe the values of AI in fintech. Prompting questions used in the interviews include:

- What would you like to achieve with AI in the fintech industry?
- What potential benefits can be derived from AI applications in the fintech industry?
- If there were no limitations to AI in fintech, what are your expectations?
- What issues do you see in AI applications in fintech?

This research will use snowball sampling, which is a type of convenience sampling, to recruit subjects for this study. Fintech professionals that are known to the authors will be the initial recruits for participation. These professionals will be requested to nominate other potential participants who are also fintech professionals or are associated with the fintech industry (chain-referral sampling method). The participants will need to have at least three years of experience in the fintech industry as well as an understanding of AI to be eligible to participate.

The size of the sample will be determined by the point of saturation. The saturation point is attained when further data collection does not contribute to the research. Saturation is a common standard and a methodological principle in qualitative research.

4. Pilot Study and Expected Contributions

The pilot study for this research is ongoing. As one of the first studies in this stream of research to identify the values of AI for fintech professionals using a systematic and well-accepted

qualitative research methodology, Value-Focused Thinking (VFT), the results of the VFT study in the form of a means-ends objective network will provide a theoretical framework for advancing this area of research. For practitioners, the means-ends objective network can help them to understand the means to achieving the value of AI, and assist business executives in planning for AI applications in the domain of fintech.

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