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Short Communication

The Role of Artificial Intelligence in Value Co-Creation in Virtual Learning Environments: The Moderating Role of Ethical Behavior

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Abstract

Introduction: The aim of the present study was to investigate the role of artificial intelligence in value co-creation in virtual learning environments, with a focus on the moderating role of ethical behavior.

Material and Methods: The research method was correlational. The statistical population consisted of primary school teachers in Istanbul during the COVID-19 pandemic (year unspecified), from which 200 individuals were selected using simple random sampling as the study sample. The data collection tool was an electronic questionnaire. Data analysis was conducted using structural equation modeling (SEM).

Results: The results indicated that the direct effects of artificial intelligence ($\beta = 0.21$) and ethical behavior ($\beta = 0.37$) on value co-creation in virtual learning environments were positive and significant at the level of $P < 0.01$. Furthermore, the moderating role of ethical behavior in the relationship between artificial intelligence and value co-creation in virtual learning environments was significant at the level of $P < 0.01$.

Conclusion: The findings demonstrated that the proposed model had a relatively good fit with the data and was able to explain 64% of the variance in value co-creation in virtual learning environments.

Keywords: *Artificial intelligence, value co-creation, virtual learning environments, ethical behavior*

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INTRODUCTION

During the global outbreak of the COVID-19 pandemic, e-learning technologies experienced high demand and gained recognition, playing a decisive role in supporting and facilitating teaching and learning among its users [1]. From the perspective of collaborative learning, learning can be considered a value co-creation behavior between two parties: instructors and students—particularly relevant in the context of online learning. Both instructors and learners faced a new challenge: instructors had to make efforts to digitize traditional learning materials, while learners needed to rely on strong motivation and autonomy to engage in the learning process. All teaching and learning occurred in virtual environments, and online interaction can be considered a value co-creation behavior.

Value co-creation is key to generating value through the integration of individual values with

those of others and creating new value. In value co-creation, all users become part of the value creation process when engaging with a system. The concept of value co-creation in virtual learning environments has received limited attention. To transform the traditional teacher-student model, in which teachers determine the learning resources, value co-creation processes can offer a flexible structure and an active learning environment [2].

In e-learning environments, value creation is fundamentally based on interaction. Value co-creation is an interactive process in which different stakeholders—particularly customers—participate in the production of goods or the delivery of services. The concept of value co-creation, equivalent to co-generating value, is rooted in service-dominant logic and customer participation [3].

In this approach, every organization—including educational institutions—must engage in value creation through communication and interactions to achieve success. When service recipients take part in creating new products and services, it opens the organization to new possibilities and opportunities. This phenomenon is referred to as value co-creation. Value co-creation refers to the collaborative efforts and commitments of organizations and their customers in developing solutions to meet customer needs and generate value. Since value co-creation with customers requires alignment, planning, execution, and control of extensive actions at various levels of the organization—as well as on the part of customers—it is considered a strategic issue [4].

To achieve value co-creation and gain competitive advantages in new products, infrastructure plays a vital role [5]. The quality of technical infrastructure is a source of innovation in producing new types of goods and services. High-quality technical infrastructure enables business organizations to obtain sufficient, necessary, timely, and up-to-date information by implementing better communication networks. Through this high-quality network, information is transmitted not only internally but also externally when needed. Artificial intelligence, in the form of high-quality technical infrastructure, enhances the technology used in operational and production areas of companies, facilitating the quality and speed of new production [6]. Due to the continuous availability of services, high-quality technical infrastructure creates a calm, comfortable, and flexible work environment, encouraging employees to work wholeheartedly, ultimately leading to improved productivity.

Furthermore, since participation in value co-creation requires appropriate communication and interactions, the importance of ethical behavior becomes more pronounced—especially when this participation occurs in virtual spaces and involves artificial intelligence. In such contexts, attention to ethics and ethical behavior becomes significantly more critical. Therefore, the aim of the present study was to investigate the role of artificial intelligence in value co-creation in virtual learning environments, with the moderating role of ethical behavior. Based on this, the following hypotheses can be proposed:

Hypothesis 1: Artificial intelligence has a significant effect on value co-creation in virtual learning environments.

Hypothesis 2: Ethical behavior moderates the relationship between artificial intelligence and value co-creation in virtual learning environments.

The conceptual model of the research is illustrated in Figure 1.

MATERIAL AND METHODS

The present study employed a correlational research method. The statistical population consisted of primary school teachers in the city of Istanbul during the COVID-19 pandemic (year unspecified), from which 200 individuals were

selected as the research sample using a simple random sampling method. The data collection instrument was an electronic questionnaire. To measure the acceptance of artificial intelligence, Davis's (1986) questionnaire was used; for value co-creation in virtual learning environments, Rodríguez-López's (2021) questionnaire was applied; and to assess ethical behavior, the questionnaire developed by Deshpande and Joseph (2009) was utilized. The questionnaire items were rated based on a five-point Likert scale ranging from "strongly disagree (1)" to "strongly agree (5)." Based on various previous studies, the questionnaires demonstrated appropriate validity and reliability. Data analysis was conducted using the structural equation modeling (SEM) method.

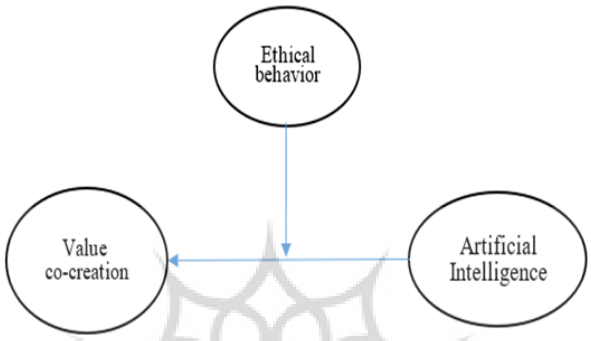

Figure 1: Conceptual model of research

RESULTS

To predict value co-creation in virtual learning environments, the proposed conceptual model was examined using the structural equation modeling method, and based on the research hypotheses, the Partial Least Squares (PLS) approach was used for model estimation.

Additionally, the bootstrap method (with 500 subsamples) was used to calculate T-statistic values to determine the significance of path coefficients. The tested model showing the relationships between the research variables is presented in Figure 2.

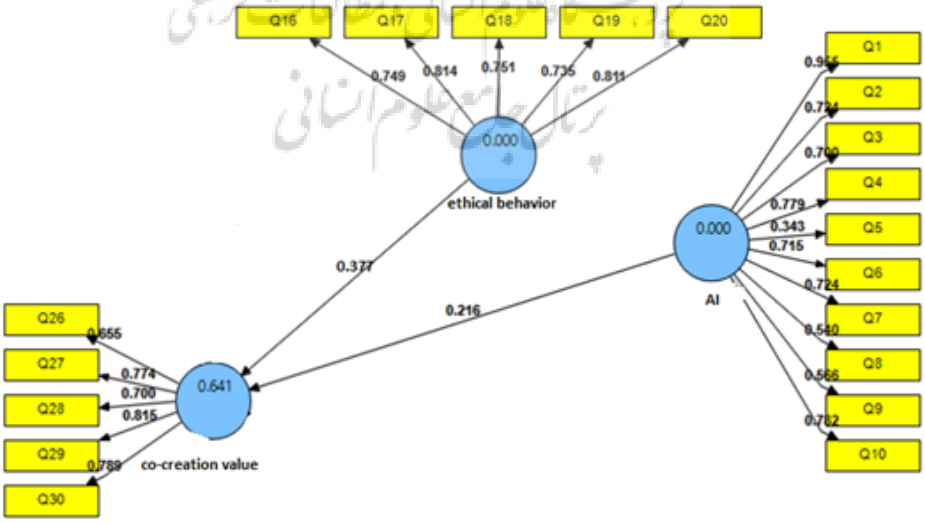

Figure2: Tested research model in standard mode

Table 1 reports the estimated path coefficients and explained variance of the research variables. The path coefficients of all relationships are reported in the table.

Table 1: Summary of the results of the structural model of the research

Path	Path Coefficient	t-value	Sig.
AI →Co-creation of value in virtual learning environments	0.21	3.23	0.01
Ethical behavior→ Co-creation of value in virtual learning environments	0.37	3.42	0.01
Mediating role of ethical behavior in AI→ Co-creation of value in virtual learning environments	0.31	3.09	0.01

In the present study, for the tested model, the absolute fit index GOF value of 0.52 obtained for this index indicates a proper fit of the tested model.

DISCUSSION

The results of the structural equation modeling showed that the direct effects of artificial intelligence and ethical behavior on value co-creation in virtual learning environments were positive and significant at the level of $P < 0.01$. Additionally, the moderating role of ethical behavior in the relationship between artificial intelligence and value co-creation in virtual learning environments was also significant at the $P < 0.01$ level.

In interpreting these findings, it can be stated that the starting point of artificial intelligence lies in the computer's ability to manipulate symbolic terms that can represent all behaviors of objects, including knowledge of object structures, their functions, people in the world, beliefs and goals, scientific theories, and even the computer's own action plans. Artificial intelligence initially deals with symbolic representations of knowledge and heuristic reasoning methods—that is, the use of common assumptions and rules of thumb. The approach of AI researchers is largely empirical, supported by some mathematical theories. Just as researchers in other sciences develop tools to carry out empirical investigations, in AI, researchers develop computer programs. These new programs are created to explain different theories about how intelligent behavior can be achieved.

One of the applications of artificial intelligence is in network marketing. Selecting target markets is not possible without simultaneously formulating an overall marketing strategy for each segment. Since its emergence, e-learning has undergone various adaptation processes to enhance implementation and keep up with evolving technology. Users can access educational materials, search for information, collaborate, and experience learning regardless of physical location constraints. Moreover, technology helps educators prepare students for 21st-century life skills—one of which is the use of digital environments and information retrieval. On this path, ethical considerations must undoubtedly be outlined and implemented in this new virtual space. The findings of this study are consistent with the results of previous research [7–11].

CONCLUSION

The results show that artificial intelligence brings innovation and agility to production, which value co-creation in virtual learning environments depends upon. From the research findings, it can be concluded that ethical behavior can serve as a significant moderator in the relationship between artificial intelligence and value co-creation in virtual learning environments, as it strengthens their mutual interaction. Therefore, it is

recommended that administrators and teachers in educational and training institutions adopt a combination of artificial intelligence and ethical behavior in virtual environments to ensure students' academic success and development.

ETHICAL CONSIDERATIONS

Ethical issues (such as plagiarism, conscious satisfaction, misleading, making and or forging data, publishing or sending to two places, redundancy and etc.) have been fully considered by the writers.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interests.

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