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The Impact of AI on Business Ecosystem Development

Olga Shvetsova

Industrial Management Department, Korea University of Technology and Education (KOREATECH), Cheonan City, 31253, South Korea

ABSTRACT

The positive effects of AI implementation on the business ecosystem are manifold. AI-powered technologies enhance productivity and efficiency, automate repetitive tasks, and optimize resource allocation (Floridi, 2019). Furthermore, AI algorithms enable businesses to gain valuable insights from large volumes of data, leading to improved decision-making processes and the identification of new market trends (Martin, & McCrae, 2020). However, along with these promising prospects, there are notable concerns surrounding the implementation of AI in the business ecosystem. Ethical issues, such as privacy infringement and data security, arise due to the vast amounts of sensitive information processed by AI systems (Davenport, & Ronanki, 2018). Furthermore, the concentration of power in AI technologies among a few dominant players can lead to challenges related to market competition and access to AI-driven solutions. This study combines a comprehensive review of existing literature with case studies and expert interviews to provide a balanced assessment of the impact of AI on business ecosystem development. By analyzing real-world examples and industry cases (e.g., the e-commerce trade company "Coupang" in South Korea and "Amazon" in the US), this research aims to shed light on the practical implications of AI implementation and identify strategies to mitigate potential risks and challenges).

Keywords: AI systems, Business ecosystem, E-commerce, AI business strategy

INTRODUCTION

A wide range of industries recognizes ecosystems as a crucial part of creating and delivering value to customers through specific business processes. Powered by the possibilities of information technologies, companies are ready to reduce operational costs, making innovation a core element. According to an article in the Harvard Business Review [1, Ron Adner, April 2006], business players are relying on platforms, services, and solutions as key strategies to achieve profitable growth. These platforms can be digital solutions that connect different groups of users or customers, providing new sources of value creation, revenue streams, customer engagement, and operational efficiency. By embracing platform-based business models, companies aim to unlock new opportunities for growth and differentiation in an increasingly competitive market. However, attempts at ecosystem innovation can become costly failures if not implemented properly.

AI System Classification in Business Ecosystem

ChatGPT is an artificial intelligence (AI) technology, developed by OpenAI and released in November 2022. Such chatbot is an example of AI and Natural Language Processing (NLP) combined in one tool. Based on their level of sophistication, learning capabilities, and areas of application, other AI types can be defined, firstly, in the scope of products such as personal assistant or imagine recognition application it helps to create. Therefore analytical, functional, interactive, textual, and visual types of AI are recognized. Analytical AI on example machine and deep learning tools identifies and process meaningful patterns of data and discover dependencies to assist decision-making. Functional AI explore data to execute fast actions like in robotics field or IoT. Interactive AI is in charge of automatic and constant communication and well-used in commercial businesses. Textual AI covers natural language processing (NLP) and can transform a speech to a text or a massive amount of customer feedback into a cluster table knowledge to draw a relevant situation on particular question like customer service, for example. Like textual AI, visual AI recognize and converts both image and videos into information. Also visual AI is used in creating of augmented reality.

Another classification has the focus on process AI takes and therefore divide AI into reactive machines, limited memory machines, theory of mind and self-aware AI-based systems (Table 1). Reactive machines are the most basic type of AI designed for automatically responding to a limited set or combination of specific inputs without memory or learning capabilities. They cannot use past experiences to inform future actions. Limited memory machines can learn from past experiences to make more informed decisions in the future. Unlike the previous type, AI with limited memory has capacity to store data and use it for decision making. Most of all present-day AI process and tools like chatbots and self-driving vehicles are driven by limited memory AI technology. The next one theory of mind refers to an AI system's ability of understanding human emotions, beliefs, and intentions. Therefore this type of AI has a potential to predict human behavior and interact with people in a more natural way. The last one self-aware AI share consciousness, like humans, as well as the ability to understand its own existence, emotions or thoughts.

Table 1. AI Classification with the focus on process it takes.

Type of AI	Functions	Advantages	Disadvantages	Examples
Reactive machine	Process data; automate, control and perform simple tasks; respond to input.	Automatic respond, operate in real-time without any delay.	Simple reaction on specific situations, don't have ability to learn and adapt from previous experience.	Spam filter, Recommendation engine (like in Netflix), IBM's chess-playing supercomputer etc.

(Continued)

Table 1. Continued

Type of AI	Functions	Advantages	Disadvantages	Examples
Limited memory machine	Complete complex tasks, learn from past data to make predictions, personalize user experience, recognize patterns.	Store and recall past experiences, improved decision-making	Require a lot of data to operate, need time to learn and adapt, experience limited by data input	Autonomous vehicles, self-driving car, music recommendations based on previous listening history,
Theory of Mind	Process human commands, social interaction.	Acknowledge shifts in emotional and behavioral patterns in person's behavior.	Require a lot of testing and abstract thinking.	Humanlike robots
Self-Aware AI	recognize and replicate humanlike actions, think itself, self-guided	Human-level consciousness	- Do not discovered yet	- Do not exist yet

Source: made by author

Case Study of Korean E-Commerce Business

According to the recent publications [Russell, & Norvig, 2022 and Shin, 2021], in just the last two years, Coupang's patented innovations have grown by over 80%, and Coupang now owns a disruptive end-to-end AI network to manage the entire process. Referring to our business innovation model, author considers Coupang's business core to be divided into three main components: the inner process, specifically the logistics segment as the primary configuration; a reliable e-commerce platform as the offering; and fast delivery service as the experience provided.

The end-to-end AI management system handles 1) task coordination for workers and drivers, 2) future predictions of labor demands during rush hours and holidays to prevent extended delivery delays, and 3) the automatic generation of a unique delivery route for each customer order, from the moment the order is placed to the specific spot in the delivery vehicle where it should be loaded. While points (1) and (2) primarily serve internal process needs, point (3) provides up-to-date information to customers in real-time, ensuring that they have access to the most current information. This enables an accurate and efficient data flow, allowing both small businesses using the e-commerce platform to stay fully prepared and customers to make informed decisions about purchases and delivery options [Schwab, 2017].

AI is not the only factor driving Coupang's innovative business model. Therefore, we see that Coupang's primary configuration revolves around internal processes, logistics, and fast delivery, which together form the core value experience. As a result, automated technologies are essential. Coupang has implemented three types of automation: automated guided vehicles (AGVs), which transport approximately 100 units of goods per trip to the pickers' workstations; sorting robots, which sort goods by delivery area within seconds using an address scanning tool; and driverless forklifts, which help store and retrieve pallets in the warehouse. This simple technological

scheme has increased Coupang's capacity and reduced the overall workload by around 65% [Marr, 2022].

Model Conceptualization and Evaluation: Quantitative Approach

In the context of evaluating a company's performance using various parameters, it is necessary to reveal the impact of the intensity of AI tool usage and the directions of implementation on key company indicators. In the case of the retailing industry, the parameters that contribute cumulatively to a company's results could include the number of customers on the E-commerce platform (reflecting the general outcome of customer-business communication and integration within the e-commerce strategy) [Davenport, & Ronanki, 2018], online retailing sales revenue (indicating the volume and effectiveness of the commercialization policy), and e-commerce market share (showing the company's growth, particularly in the South Korean market).

In this case study, it is essential to analyse these parameters over a specific period, such as three years (from 2021 to 2023), to account for new trends and recent developments. This approach helps evaluate changes in a company's results and identify certain trends in those modifications.

Thus, the relationship between selected indicators of a company's annual performance and the prevalence of AI in its business ecosystem and strategy must be considered quantitatively. This method allows us to assess the influence of AI on business process outcomes. Consequently, we can draw appropriate conclusions about these relationships and predict future trends and strategies based on the analysis. Since company performance results can be used as statistical data, it is relevant to apply a statistical method to examine any dependencies between the number of AI tools used and key company indicators in online retailing.

In this paper, statistical analysis using Pearson's correlation method is appropriate. The Pearson correlation test, a method of parametric statistics, enables us to determine whether a linear correlation exists between two quantitative variables and measure its strength and statistical significance. In other words, this test helps us assess whether changes in one variable are accompanied by corresponding changes (either positive or negative) in another.

For the implementation of the correlation method, let us first denote Pearson's correlation coefficient as "r_{xy},", where "x" is the number of AI tools and directions used by a company (in our case, Coupang's e-commerce sector) in a certain year, and "y" is the value of the selected indicator. Equation (1) expresses how the Pearson correlation coefficient will be calculated.

$$r_{xy} = \frac{\sum(d_x \times d_y)}{\sqrt{(\sum d_x^2 \times \sum d_y^2)}} \tag{1}$$

d_x and d_y – a deviation from the arithmetic mean by x and y. These figures can be calculated using the equations (2) and (3).

$$d_x = X - M_x \tag{2}$$

$$d_y = Y - M_y \tag{3}$$

$M_x(M_y)$ – the arithmetic mean.

$$M_x = \frac{\sum X}{n} \tag{4}$$

$$M_y = \frac{\sum Y}{n} \tag{5}$$

n - data sample size.

The importance of calculating the Pearson correlation coefficient lies in interpreting its absolute values. The possible values of the correlation coefficient range from –1 to 1 ($-1 \leq r_{xy} \leq 1$). The greater the absolute value of r_{xy}, the stronger the relationship between the two variables. In this case, this will help us identify whether there is a relationship between potential changes in Coupang's e-commerce performance and the artificial intelligence tools it uses.

To evaluate the statistical significance of the correlation coefficient r_{xy}, a t-statistic must be calculated. This statistic demonstrates the importance and statistical impact of the correlation coefficient. The t-statistic can be calculated using Equation (6).

$$t_r = \frac{r_{xy}\sqrt{n-2}}{\sqrt{1-r_{xy}^2}} \tag{6}$$

When checking the correlation between the intensity of implemented AI tools and a company's performance results, it is necessary to create and formulate hypotheses:

- **Ho** – The variables are related; there are certain relationships between the level of AI usage in a company and changes in its performance. The impact can be identified.
- $\mathbf{H_2}$ – The variables are unrelated; there are no noticeable changes in the company's performance while using and applying AI features.

To perform a correlation analysis in the case study of the Korean retailer Coupang's performance, it is essential to identify the values of the chosen parameters for analysis. Table 2 shows Coupang's e-commerce results over three years (2021–2023).

Table 2. Input parameters for Coupang e-commerce company.

Year	Name of Parameter	Value
2021	Customers (millions)	11.79
2022		14.85
2023		17.90

(Continued)

Table 2. Continued

Year	Name of Parameter	Value
2021	Sales revenue in online retailing (Trillion South Korean won)	7.14
2022		13.97
2023		20.36
2021	E-commerce marker share (%)	11
2022		13.3
2023		15.7

Source: https://www.statista.com/topics/8214/coupang-inc-of-south-korea/

For correlation analysis based on AI implementation within Coupang's ecosystem, it is necessary to understand the extent of AI tools used in each of the mentioned years. Since Coupang began implementing its end-to-end AI network in 2021, the efficiency of this model may have evolved over time. It can be assumed that there has been a progression in the use of AI tools as part of Coupang's strategy for online retailing.

To rank the intensity of AI tools used, let's consider that in 2021, Coupang was just beginning to implement its new e-commerce strategy with updated features and a new database. In 2020, during the COVID-19 pandemic, the company focused on faster online delivery and improved the efficiency and effectiveness of its data networks and customer interactions. Finally, in 2021, Coupang started to emphasize robotics systems, automation, and the visualization of its e-commerce platform [Martin, & McCrae, 2020].

Therefore, it is possible to assign ranks of 1, 2, and 3 to reflect the intensity and quality of AI tools used in 2021, 2022, and 2023, respectively. These ranks represent the evolution of AI instruments over time.

CONCLUSION

The further Pearson's correlation is going to be calculated. Author can't assert that an increase in the intensity of applied AI and its development are a cause of an increase in the number of customers, however, the expected results mean that there is a strong relationship between these two parameters. For instance, different changes in the level of AI can be supported with some ships in a customer volume. Similarly, considering other parameters using the presented correlation formula, it can also be confirmed that there is a strong relationship between the selected parameters and the level of AI usage.

Therefore, the impact of AI on Coupang business strategy in e-commerce can be noticed by comparing and analyzing different parameters. As a summary of provided research, it could be several forecasts and behavior predictions that might be provided be company's stakeholders to expect certain possible changes in their performances by changes in AI implementation in business ecosystem.

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