

AI2AI marketing: Foundations and research agenda

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Abstract

Artificial intelligence (AI) advances have allowed for AI's wide application in marketing. The general assumption of marketing theory currently is that AI should be used by companies to enable more effective marketing, hence it is the supply side in the 'seller-customer' relationship that should use the AI. However, this does not need to be necessarily true. This editorial introduces the concept of AI-to-AI (AI2AI) marketing where artificial autonomous agents sell to other artificial autonomous agents. The report presents the conceptual framework of AI2AI marketing and sketches some of the major consequences of this paradigm shift for the marketing mix and the marketing processes of companies. Finally, this paper maps out future research directions on this topic.

Keywords: artificial intelligence, marketing, AI-to-AI marketing, research agenda

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1. Introduction

Marketing has always been perceived as a business activity which involves only humans as buyers and sellers. While most of the marketing literature makes this assumption implicitly, the recent book by Kotler, Pfoertsch and Sponholz (2021) made it explicit and discusses ‘human-to-human marketing’ (abbreviated as ‘H2H’). The logic behind this assumption is very straightforward – humans make marketing decisions within organisations and humans make purchase decisions as customers. Such an approach had been valid for decades but not anymore. The premise of human agents on both the supply and demand sides may no longer be an assumption to be made with regard to commerce.

Advances in artificial intelligence (AI) (Russell & Norvig, 2016) have allowed its application in various industries (Ivanov & Webster, 2019; Loureiro, Guerreiro & Tussyadiah, 2021; Rust & Huang, 2021; Stahl, 2021). Within marketing, AI is used by companies for price setting (Gautier, Ittoo, & Van Cleynenbreugel, 2020), sentiment analysis of customer reviews (Wu et al., 2021), communication with customers via chatbots (Stoilova, 2021), targeting advertising audiences, and countless other tasks (Huang & Rust, 2021; Kotler, Kartajaya & Setiawan, 2021; Stone et al., 2020; Thaichon & Quach, 2023). The general assumption of marketing theory is that AI should be used by companies as a tool in their marketing activities. Hence, the marketing theory assumes that only the supply side in the ‘seller-customer’ relationship uses AI. However, this does not necessarily need to be true. Companies also use AI to evaluate the offers of suppliers while suppliers use AI to develop the offers to their customers (Cui, Li & Zhang, 2021). Thus, AI may appear on both sides of the marketing relationship. While the B2B market seems as the primary area where AI could appear on both sides of the ‘seller-customer’ relationship, the wider adoption of AI products (e.g. voice-activated devices, digital assistants, etc.) by final customers would allow them to use AI to search for and compare sellers’ offers (see also Rust & Huang, 2021). Thus, the B2C market could also involve AI on both sides of the relationship.

One of the applications of AI in the field of marketing is related to the decision-making process where artificial autonomous agents (AAs), defined as ‘software programs which respond to states and events in their environment independent from direct instruction by the user or owner of the agent, but acting on behalf and in the interest of the owner’ (Bösser, 2001), make or support human marketers/customers make marketing-/purchase-related decisions. This means that AAs make or recommend marketing decisions to the sellers or purchase decisions to the customers. When sellers and customers use AAs in their marketing/purchase decisions, we speak about AI-to-AI marketing (abbreviated as ‘AI2AI’) because the sellers’ AAs’ marketing recommendations and decisions face the purchase recommendations and decisions of customers’ AAs.

This editorial acknowledges that both sellers and customers could use artificial intelligence technologies and raises the question: *How will the marketing of organisations be transformed when sellers and customers delegate marketing/purchase decisions to artificial autonomous agents?* It introduces the concept of AI2AI marketing, elaborates on its main implications and develops a future research agenda in the field.

2. Conceptual framework of AI2AI marketing

Figure 1 presents the conceptual framework of AI2AI marketing. It includes two groups of stakeholders (sellers and customers) with different interests, both of whom utilise artificial intelligence in the decision-making process. Sellers (companies) offer a specific marketing mix (7Ps, Wirtz & Lovelock, 2022) and implement various marketing processes (marketing research and business intelligence, planning, segmentation, targeting, positioning, budgeting, new product development, etc.). The sellers may use AAs in marketing decision-making. In practice, the relationship between the humans and the AAs in the decision-making process can adopt one of the four approaches discussed in Table 1 – no AA in the decision-making process, human-in-the-loop, human-on-the-loop, and human-out-of-the-loop (human-off-the-loop) (Ivanov, 2021, 2022). The AAs can make or recommend decisions not only related to the marketing mix but to the marketing processes as well with

different levels of involvement, e.g. the allocation of marketing budgets to marketing campaigns that are expected to elicit the highest results or targeting specific customer groups.

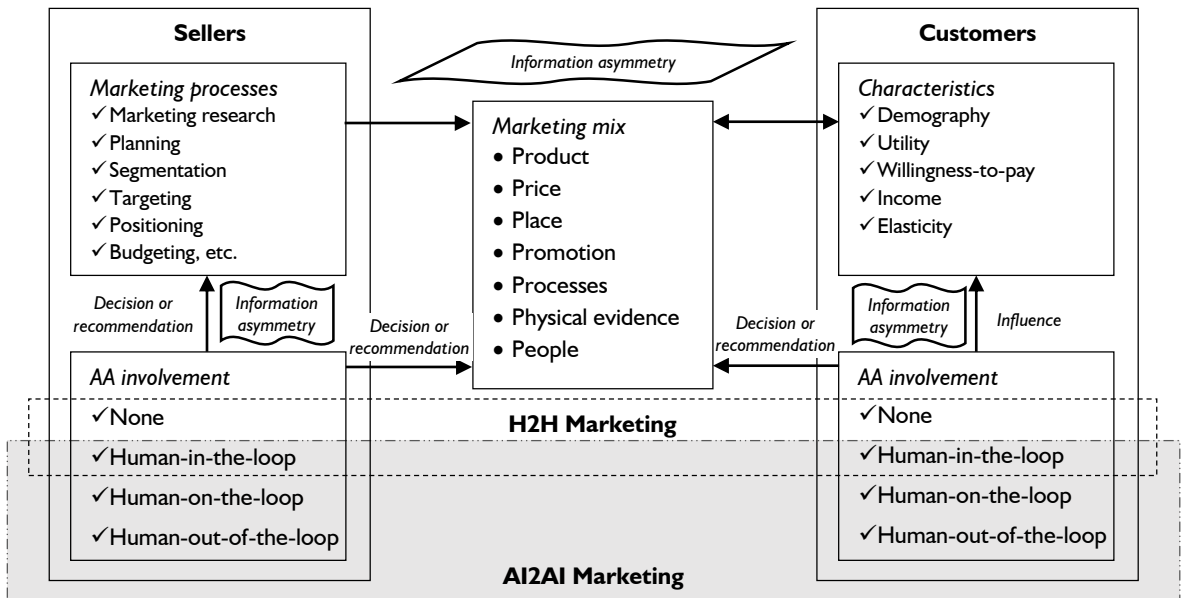


Figure 1. Conceptual framework of AI2AI marketing

Table 1. AA's involvement in the marketing decision-making process

Marketing decision-making approach	Explanation	Example
No AA is used in the decision-making process	All marketing decisions are taken and implemented by humans.	Most marketing decisions in organisations.
Human-in-the-loop	The AA recommends a decision but the human decides whether to accept the proposal or not.	Many revenue management platforms that use AI adopt this approach.
Human-on-the-loop	The AA takes and implements a decision but the human marketer can always interfere and override the decision.	The pricing software of a company may decide to increase (decrease) the price and show the new price on the websites of the company and its distributors (if a channel manager is used) but the marketer can change the price if (s)he considers that the increase (decrease) was too large (small).
Human-out-of-the-loop	The AA takes and implements a decision without any human involvement.	The visualisation of ads on social media follows this approach once the parameters of the target audience have been set in the system.

When sellers' AAs take and implement marketing and sales decisions they become sellers themselves. From an accounting point of view, it is indistinguishable who makes the sale decision (the AA or the human) because both will be legally binding for the company and will elicit the same economic results. Hence, in that case, from a marketing perspective, the AAs need to be treated as sellers.

The right side of the conceptual framework deals with the customer. The use of AAs influences customers' characteristics. Obviously, the demographics are not changed but the perceptions of products' utility/value, and his/her willingness-to-pay and elasticity. For example, the product choice set visualised by the customer's AA influences the customer's perceptions about the products in it and their prices. If a product is presented in combination with much cheaper products, the customer may perceive it as too expensive compared to the situation when the same product with the same price is presented with more expensive products due to the different reference prices in each situation. When the customer gives greater decision-making authority to the AA, the latter can make purchase decisions on behalf of and at the expense of the customer. In such a case, the AA is transformed into a customer itself (Ivanov and Webster, 2017) with the customer deciding the limits to the involvement and discretion of the AA it controls.

In traditional H2H marketing sellers and customers use AI only for recommendations about potential marketing/purchase decisions ('human-in-the-loop' approach) or do not involve AI at all (see Figure 1). In both decision-making approaches, the ultimate decision is made by the human (marketer/customer) who bears the responsibility for the decision outcome and the associated costs. Hence, AAs, if used at all, play a supporting role in the decision-making process. AI2AI marketing goes much further. It incorporates all three approaches that involve AI in the decision-making process ('human-in/on/out-the-loop') but, for obvious reasons, it disregards the situations when AI is not used in the decision-making process. The 'human-in-the-loop' approach is the connection between H2H and AI2AI marketing. However, while in H2H marketing, AI plays a secondary role, the primary role is reserved for the human, and in AI2AI marketing the roles are reversed.

3. Implications of AI2AI marketing

The implications of AI2AI marketing for companies are significant. First, companies need to decide *which decisions they can transfer to AAs* and which they will keep to human marketers. The balance in the levels of involvement of AA and human marketers is essential since not all decisions have the same consequences and for political/legal reasons, some decisions may require direct and full human responsibility. Ivanov (2022) concludes that the human-out-of-the-loop approach is most appropriate for quick, standardised, frequent decisions with low negative consequences of a wrong decision by the AI which are taken and implemented within well-defined decision contexts. On the contrary, complex decisions with high outcome uncertainty and significant ethical issues require greater human involvement in the decision-making process. Thus human-in-the-loop and human-on-the-loop approaches are more suitable for them. A combination of approaches could be utilised for some decisions. For example, small price changes (e.g. $\pm 5\%$) might be taken and implemented by AA in the human-on-the-loop approach while larger price changes may require authorisation by a human marketer through the human-in-the-loop approach.

Second, in AI2AI marketing the *information asymmetry between sellers and buyers* would decrease, although it would probably not completely disappear (Figure 1). The use of AAs by customers allows them to have more information about the supply – competing offers, prices, purchase terms and conditions, product reviews, etc. Customers will make faster and better-informed decisions. Their switching costs would decrease and they would be able to change their supplier more easily. Thus, from a marketing perspective, managing the online reputation and customer relationships, and maintaining competitive price levels become even more important.

Third, and closely related to the previous implication, the *speed* of transactions and decision-making processes would increase tremendously, often beyond the capabilities of the human brain. AA sellers would change prices

every second, based on available market data. AA customers would sign, pay and terminate purchase orders while their human owners sleep. Humans may even never learn about their AAs' actions but they, as the AA owners, would be legally responsible for the AAs' decisions. From an agency theory perspective (Eisenhardt, 1989) the humans and the companies are the principals of the AAs who are their agents. However, AAs will have more information about their actions than their owner (the humans and the companies). Thus, although the information asymmetry between the sellers and the buyers on the market will generally decrease, an *information asymmetry between the AAs and their owners* will exist (Figure 1) – the AAs will have more information about the respective decision and its implementation than their human owners.

Fourth, as a consequence of the information asymmetry between AAs and their owners, the sellers and customers will *lose control* over some aspects of the marketing and purchase decisions of their AAs while remaining legally responsible for the outcomes of these decisions. This loss of control is a result not only of the greater involvement of AI in the decision-making process and the decreased role of the human in it but it is due to the opacity of AI systems as well, i.e. the lack of transparency in AA's decision-making process (Müller, 2021). AAs could make decisions based on some predetermined decision rules (e.g. buy/sell a certain number of shares if the x-day moving average of their price is above/below the y-day moving average) or through various machine learning techniques to identify patterns in the data. In the former case, the rules are determined by the human owner of the AA, they are understandable for him/her, and the AA will act within the scope of the rules. Automated trading algorithms (Dimov, 2022) and rule-based chatbots work in that way. Although the AA may use the 'human-out-of-the-loop' approach in decision-making, the human is indirectly in control through the set of rules that are programmed in the AA. The use of machine learning techniques blurs the decision-making process because it is not clear to the human owner how the AA reached the decision, i.e. there is little transparency and traceability of the decision. AAs' owners may not be sure about AAs' decisions, and how they were made and justified. In that context, trustworthy AI design becomes a must (Baker-Brunnbauer, 2021; Larsson & Heintz, 2020) while companies may need to develop *communication campaigns targeting the AA owners* to eliminate their doubts about AAs' decisions. With the improvement of the technical capabilities of AAs, humans' trust in their decisions may increase.

Fifth, the adoption of AI by both sellers and buyers changes the market demand curve of each company and transforms it into a *kinked demand curve* (see Figure 2). The increase of AA sellers on the market would lead to better forecasts, faster price changes, and hence more efficient markets. Any price decrease by an AA seller will be quickly matched by the other. The more AA sellers, the greater and faster the change in the market price. Hence, the lower part of the demand curve rotates clockwise. Oppositely, the increase in the number of AA customers on the market means that any price increases will be quickly identified by AA customers who will redirect their purchases to alternative suppliers. The more AA customers, the smaller the price change. Therefore, the upper part of the demand curve shifts counterclockwise. In the extreme situation when there are only AAs on the market, the demand curve becomes rectangular – any price changes by AA sellers will not elicit changes in the quantity because AAs will have nearly perfect information and will react fast in contrast to the markets dominated by human sellers and buyers.

Sixth, in AI2AI marketing the customer decisions may become *more rational and less emotional* compared to human-to-human marketing. Although AI can correctly identify human emotions (Huang and Rust, 2021), an AA customer that works on behalf of a human may struggle to understand the role of emotions and passion in the purchase decision. It may focus on the price, discounts, delivery terms, product certification, product rating, warranties, the potential resale value of the product, and other purchase decision factors that are easy to code and quantify, and disregard the fact that the t-shirt has a print of a 'Revenge of the Jedi' poster (the short-lived title of Episode VI of the Star Wars franchise) that is close to its owner's heart. Although the more data the AA has about its owner, the more relevant purchases it would make, the role of emotions and impulsive decisions

in purchases may decrease. Therefore, ads directed towards AA customers would need to emphasise the factors that the AI considers in the decision-making process.

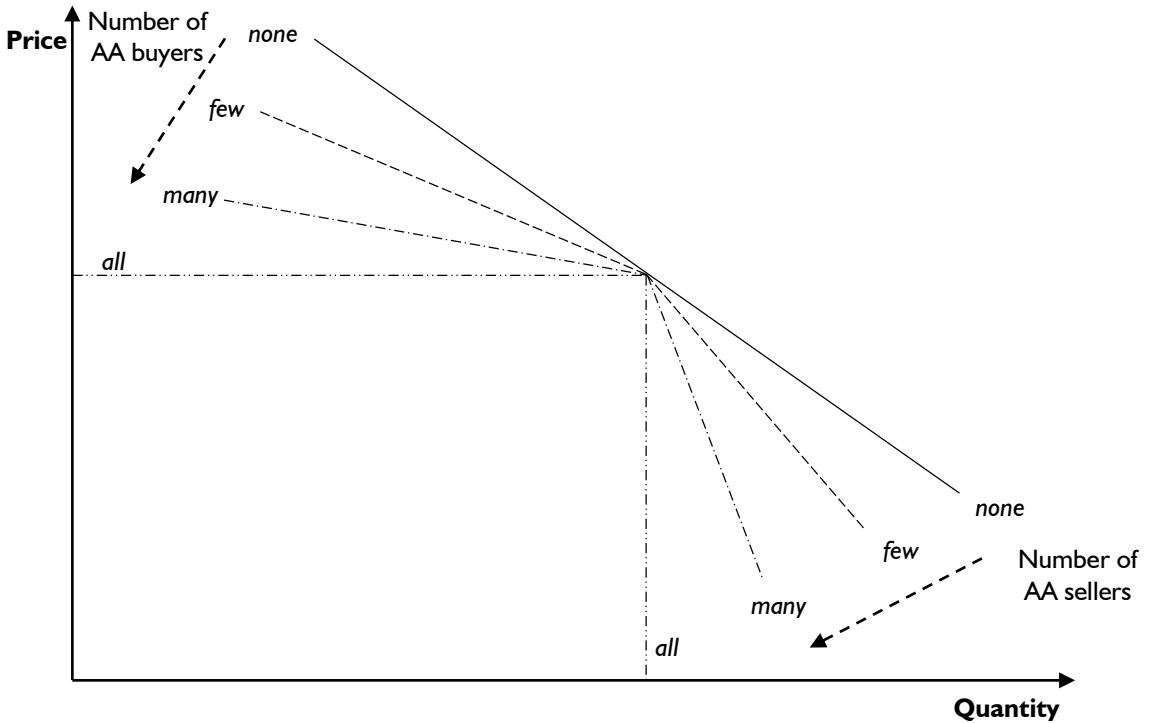


Figure 2. The impact of artificial autonomous agents as buyers and sellers on the market demand curve

Seventh, the use of AI algorithms in the decision-making is inevitably linked to *biases* due to the quality of the data or the decision rules (Ferrer et al., 2021; Ivanov & Umbrello, 2021; Kordzadeh & Ghasemaghaei, 2022). AAs' decision may put some customers in a disadvantaged position, i.e. an AA may decline a loan to another AA based on the demographic characteristics of the owner of the second AA. This raises the question of whether the agent (the AA customer) should reveal or strategically misrepresent who is its owner because doing so would hurt his/her financial interests. However, concealing the identity of an AA's owner opens the door for numerous opportunities for misrepresentation and manipulation allowing the AAs' owners to take advantage of discounts, terms and conditions they are otherwise not entitled to. Therefore, legal mechanisms may need to be established to verify the real owner of an AA while AA sellers may devise sale prices, terms and conditions, based on the level of details provided by the AA about its owner (e.g. higher prices for the AAs with anonymous and unverified owners).

Eighth, while in the future humans will still be the users of most products, the fact that AAs recommend humans purchase decisions or directly decide and implement purchase decisions on behalf and at the expense of the humans would force companies to reorganise their marketing activities to *focus on the AA customers*. This means that all elements of the marketing mix need to appeal not only to the human users of the products but also to the AA customers who take fast (mostly) rational and well-informed decisions based on large quantities of data. The latter means that the positioning of companies may need to focus more on rational rather than emotional factors. However, the design of some AAs may incorporate ethical decision factors such as sustainability and fairness although they are notoriously difficult to code (Helberger, Araujo & de Vreese, 2020). Thus, besides the functional characteristics of the product (e.g. dimensions, durability, usability, etc.) these AA customers

would consider other factors as well. The purchase decision may put greater weight on the sustainability of the seller's operations along the whole supply chain. In the world of data abundance and transparency, the sustainability claims of sellers can be easily and quickly checked. The focus on the AA customers would give ground to segment a product's AA-dominated market based on the technical characteristics and capabilities of the AA customers. Additionally, companies may be forced to develop more sophisticated AAs to nudge the AA customers, not only their human owners (see also Wagner, 2021).

Finally, AI2AI marketing could be associated with a war on the default settings of AAs in particular, and of technological products, in general (Webster, 2022). As every technological product has some default settings determined by the manufacturer and may come with some preinstalled applications, the competition between companies would be for their application to be the default application to be used by the AA customers. For instance, a virtual assistant that purchases pizza for its owner would place the order with its default application for pizza delivery. Although the human owners of AAs have the opportunity to change the defaults, many would not bother to do so. Therefore, one of the roads to the wallets of human customers would go through the default settings of their customer AAs.

4. Concluding remarks

The advances in artificial intelligence and its greater involvement in decision-making would transform the marketing practice. The question will not be whether to use AI to gain a competitive advantage but which decisions and tasks to delegate to it. Marketing theory needs to respond to the new technological realities and answer various research questions to become more relevant to the forthcoming robonomic society. Some of these research questions include:

RQ1: Marketing decisions and decision-making process:

RQ1.1: Which marketing decisions could be transferred to AAs and which should remain to humans?

RQ1.2: How do the characteristics of the marketing decisions determine the appropriate decision-making approaches?

RQ1.3: What are the drivers of the resistance to the use of AAs in marketing?

RQ2: Marketing processes and strategies:

RQ2.1: How should marketing processes in companies be reorganised to reflect AAs' involvement in marketing decision-making?

RQ2.2: How should companies' marketing strategies change in the advent of AA customers and sellers?

RQ2.3: How should companies maintain relationships with their AA customers and suppliers?

RQ2.4: What will be the effects of AA customers and sellers on their owners' competitiveness?

RQ3: Market effects:

RQ3.1: How does the use of AAs by companies and customers in an industry change its market structure and competitive forces, and the demand curves of different companies?

RQ3.2: Does the use of AAs by buyers and sellers increase market volatility?

RQ3.3: Could AI cause market crashes and crises? If yes, how could these crises be avoided/mitigated?

RQ4: Customer characteristics and purchase decision-making process:

RQ4.1: How does the implementation of AI by customers change their willingness-to-pay and price elasticity?

RQ4.2: What are the characteristics of those humans who are willing to allow AI to be more involved in their purchase decision-making?

RQ4.3: What are the drivers of customers' trust in the purchase decisions of their AAs?

RQ4.4: How can seller AAs influence the value perceptions of the customer AAs and their owners?

RQ5: AA rights:

RQ5.1: Should AAs be granted some (limited) economic rights that reflect their involvement in the purchase and selling of products?

RQ5.2: What economic rights do people accept AAs to have?

RQ5.3: What are the economic, social and legal implications of granting (limited) economic rights to AAs?

RQ6: Marketing ethics

RQ6.1: What are the AI2AI marketing ethics issues that arise?

RQ6.2: How could the AI2A marketing ethics issues be solved or mitigated?

RQ7: Economic aspects

RQ7.1: What are the economic costs and benefits associated with using AAs in the marketing/purchase decision-making process?

RQ7.2: What are the drivers of the costs of using AAs in the marketing/purchase decision-making process?

The future of marketing is an unwritten brave new world of automation, non-human sellers and customers, rapid decisions, and new marketing rules and realities. The forthcoming age of robonomics will challenge many of the marketing truths that marketers now take for granted. While the basic principles of marketing may not change (i.e. customers will choose a product with the highest perceived value regardless of how 'value' is defined), the way companies operationalise these principles into specific marketing processes, marketing mix elements and marketing actions will be different due to the greater involvement of AI in the decision-making process on both sides of the seller-customer relationship. Marketers will need to stop viewing advanced technologies as *tools* that support them to 'create, communicate, deliver, and enhance value across the customer journey' (Kotler, Kartajaya & Setiawan, 2021) but as *agents* that can make decisions with tangible economic outcomes. And the world of marketing will be different. Not everyone will like it and I am hearing C-3PO exclaiming: "Oh, my goodness! Shut me down! AI selling to AI. How perverse!". But the world of AI2AI marketing will be definitely exciting!

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