The Use of Artificial Intelligence in Making Managerial Decisions in B2B Markets

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***Abstract* — The article examines the use of artificial intelligence tools, specifically Large Language Models, to predict group consumer choice in B2B markets. Given the complexity of making managerial decisions of this kind, simulating such decisions allows organizations not only to reduce costs but also to develop a plan with the necessary predictive accuracy.**

***Keywords* — Artificial intelligence, Large Language Models, group consumer choice, consumer behavior simulation.**

I. Introduction

In B2B markets, buyers are organizations that purchase industrial products for their activities. Choice in the industrial market is mostly made by a Decision-Making Group (DMG) comprising participants with different positions, roles in the purchasing process, perceptions of the importance and salience of the characteristics of trade offers, psychographic and socio-demographic characteristics, and even motivations. Thus, consumer knowledge about a product category will be different for each DMG participant, and their individual preferences for choices may differ. The differing individual preferences of the participants are brought to a consensus sufficient to make the final choice during the group discussion process. The heterogeneity in the composition of the DMG and the difference in the motives of its participants cause the participants' perceptions of the importance and severity of product qualities to change during the process of discussing proposals. The problem is that the individual preferences of the participants change during the PGR discussion process, such as their perceptions of the qualities of the offers and the importance of these qualities to the organization as the buyer changes. However, the predictive models used of buying behavior treat these parameters as constant. Thus, their effectiveness in predicting group consumer choice is limited.

II. Problem Statement

Modelling consumer behavior is necessary for market segmentation and creating a value proposition relevant to the target audience. All models of consumer behavior described in the economic literature are united by the assumption that the consumer's evaluation of characteristics and their importance remains unchanged. This assumption limits the predictive efficiency of such models when modelling the work of a decision-making group whose members participate in intragroup discussion of alternatives during the choice process. As a result, the evaluation of characteristics and their importance may change significantly, which affects both the individual choices of individual group members and the final choice of the group. It has been experimentally proved that group polarization manifests itself during group discussion, which may be associated, among other things, with the choice of one product from several alternatives, radicalizing the initial attitudes of group participants. As a result, the initial preferences of group participants are reinforced, and the result after the discussion tends to be more of an extreme value than the average value of opinions before it [1].

The shortcoming of existing models of consumer behavior associated with the incorrect prediction of group choice can be eliminated with the help of Large Language Models. These are artificial intelligence variations consisting of billions of parameters (the importance of ‘neurons’ in the model) and trained using ‘deep learning’ and ‘learning without a teacher’ technologies on a corpus of texts containing billions of words (tokens’) capable of simulating intragroup communications of the decision-making group and changes in the evaluation of characteristics and their importance. This makes it possible to model consumer choice, considering the influence of in-group communications on the final choice. Even though this possibility is only theoretical due to the lack of practical solutions in this direction, this innovation is equally relevant both for commercial enterprises that need to know about the specifics of group consumer choice regarding their products or product categories, and for scientific research in the field of studying group influence on consumer choice [2].

III. Details

The role of the existing in the minds of the participants in the DMG of assessments of the quality of offers and the importance of these offers for the participants can be realized through the common practice of choice tables. Such tables are usually used in individual choice modelling, but nothing prevents their use in group choice modelling, with the adjustment that the number of these tables will correspond to the expected number of participants in the DMG. Another difference is that, unlike the individual choice model, where the scores are static, in the group choice model, these scores will change, reflecting changes in these scores in the minds of

the group members during the discussion of proposals from different suppliers.

However, the choice model itself does not indicate the final choice - for this purpose, one of four choice criteria is used [3]:

- *linear compensation criterion* - when all products of the importance of a characteristic are added up to the score of the corresponding characteristic,
- *combined criterion* - when options with the score of the characteristic less than the minimum set by the chooser are eliminated from the choice in turn, and in the end, one option remains,
- *separating* criterion - when the option with the highest score of the most important characteristic for the chooser is selected,
- *and lexicographic* - characteristics are ranked in descending order of importance, after which variants with a score lower than the maximum category score are eliminated until one variant remains.

Different participants in a group choice may use different choice criteria, and different choice criteria may lead to the same result. For example, the situation with the choice with lexicographic on the first characteristic looks identical to the choice with the separative criterion, because in both situations the choice was finalized on the option with the highest score of the most important characteristic, which turned out to be the only one considered during the choice.

However, it should be noted that the real participants of the DMG are not artificial intelligence, but quite natural, and their discussion of possible goods and suppliers is not done in quantitative expressions. This complicates the translation of natural language into quantitative expressions of changes in the choice model - this difficulty can be overcome by training the LLM to split the scale. This will enable the language model to translate natural language speech into the quantitative expressions needed to change the data in the choice models to simulate changes in the scores as the proposals are discussed.

In the discussion process, participants actively engage in a debate about which final choice is preferable to the organization as a buyer and convince each other of the validity of their individual choices. Although group members may use different language tools, their functions in the decision-making process are limited to changing the evaluation of a characteristic and its importance, changing the criterion used, introducing a new characteristic into the set of characteristics under consideration, increasing the perceived expertise of the communicator or decreasing that of the communicator, which facilitates the task of training Large Language Models to split the scale.

Now, group consumer choice is simulated with the help of focus group research, which is a planned discussion of four or more people on a certain topic - in relation to marketing research, it is most often the relationship to the product, brand or marketing communication (creative'). Focus groups are used in the planning of quite a large number of marketing tasks, but despite their advantages, they have a number of rather significant disadvantages - difficulty in finding narrow-sector specialists to participate and limited topics of discussion, high cost, impossibility to extrapolate insights without quantitative research (which a focus group is not) and high risk of reducing the quality of research due to such mistakes as intragroup leadership, incorrect transcription of answers, lack of trust in the research, and the absence of the right to use a focus group.

In this situation, such a subspecies of artificial intelligence as Large Language Model (LLM), which performs the functions of analyzing human languages and creating answers to user queries with their help, can come to the rescue. LLM has appeared relatively recently, but the breakthrough of this technology into mass use, which began several years ago, has had a significant impact both in public life in general and in the field of marketing. LLM is already quite actively used in such areas as [4]:

- content creation (mostly text-based),
- Customer Relationship Management (LLM-based chatbots),
- customer experience personalization (personalization of banner ad backgrounds based on target audience data),
- marketing and communication analytics (when data is in text form),
- target group research (some companies are already actively using LLM to analyze comments and reviews) and
- search engine optimization (when LLM itself selects the target audience).

The penetration of LLM into the activities of companies is more active in oligopolistic and monopolistic industries in the B2C sphere, which is due to the large number of customers and their data in companies, but this does not mean that the penetration of LLM into the activities of industrial companies does not occur - there are quite interesting cases with unusual, and most importantly - effective uses of LLM. Grand View Research estimates that this market has exceeded $4.35bn and will grow at a CAGR of 35.9% from 2024 to 2030 [5].

The creation of texts and images on demand by artificial intelligence is no surprise to anyone nowadays. However, the creators of LLM Sales Buddy went further and created a language model-assistant for a sales representative [6].

It has been trained on many presentations and marketing materials of industrial companies and is capable of both providing information necessary for presentation preparation and independently creating drafts of such materials on request. After that, the user, if necessary, can independently finalize it at his/her discretion. The result is a 2-fold increase in the efficiency of the sales department and a 15-fold reduction in the time required to prepare a presentation from scratch. This is particularly impressive considering that B2B markets, are characterized by a high degree of personalization in marketing communications. In addition, in most B2B markets, there are so few buyers that the most logical thing to do is to use a personalized marketing strategy, which, judging by the results, LLM does quite well.

Another example of the use of LLM in B2B marketing is a search engine with personalization based on a large language model. This innovation is relevant primarily for wholesalers with a wide range of products, one of which is office equipment wholesaler CDW, which implemented such a search engine to provide a better user and customer experience to increase website conversion. LLM as part of the search engine is needed to analyze user behavior (history of requests and interaction with the site, location (determined by IP

address), and other characteristics) and tailors the search engine to each individual user. As a result, both SEO parameters (search relevance and site performance) and conversion rates have improved [7].

LLMs cannot only work autonomously with data, but also, in a more applied manner, advise on rather complex B2B product development activities. For example, researchers from Delft University of Technology (in the Netherlands) tested the ChatGPT language model in the role of an engineer creating a concept for a tomato picking robot [8].

The experimenters intended to start using ChatGPT in the middle of the work and see how far the language model would get in a situation as if the queries were sent to it by a person with little knowledge of engineering. However, the experiment exceeded expectations ChatGPT got involved right from the start, made no noticeable mistakes, and even made some sensible decisions. For example, he advised using a silicone gripper to 'reduce the risk of fetal damage' and a Dynamixel servo motor as an actuator and wrote code to make the robot work. The researchers only need to create drawings and assemble a workable prototype based on the language model's recommendations.

Given the success of LLM in other industries, it seems at least theoretically possible to use Large Language Models to model group consumer choice. This is because both the decision group discussion takes place in human languages, which the LLM analyzes and responds to. This makes it possible to build a 'group discussion' between several LLMs, where each LLM will fulfil the role of one participant in the DAG. In measuring the persuasiveness of communicators, it is possible to allow the LLM itself to 'go from an initially set value'. Since persuasiveness is also unstable and includes quite a lot of variables that are grouped into expertise and trust, and any AI is basically used in a situation where there are quite a lot of such variables, and it is difficult or impossible to isolate them separately.

IV. Conclusion

Although there are no practical solutions in this area yet, in theory, simulation of group consumer choice using LLM will solve the problems of conducting focus groups with narrow target audience (when it is difficult or impossible to collect the necessary number of focus groups), long duration (more than 1 hour is the standard for focus groups) and high risk of errors during the research. For manufacturers of industrial goods, this means knowing about the specifics of group choice in their industries. This will allow us to develop a marketing strategy considering this specificity and to carry out more effective marketing communications. At the same time, producers of industrial goods are also buyers of industrial goods. From the point of view of these buyers, the benefit is a better match between products and customer needs. In B2B markets, this means increased competitiveness of the buying companies. All this leads to a greater conformity of the products to the expectations of the final consumers, positively influencing the economic system.

Since, at the moment, there are neither theoretical nor practical developments in the direction of simulation of group consumer choice, the aim is to create them, which can be divided into several tasks: to develop a mathematical model of group consumer choice, to provide the possibility of two-way communication between two or more LLMs, to describe an algorithm for training LLMs in the procedure of scale splitting, to describe an algorithm for training LLMs to change scores in choice models and, if possible, to implement training of language models [9].

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