

Agent properties

In our consumer purchasing decision model, we define two main types of agents: sellers and consumers. The sellers are characterized by four main attributes: their total number, the quality of their products, sales performance, and the influence they exert through word-of-mouth. Consumers, on the other hand, are characterized by three primary attributes: their total number, the extent of their attention span, and their social networks.

Sellers

In our model, a seller refers to any individual or entity offering products, services, or financial assets for sale (Walter et al., 2001). In this research, we assume that sellers can produce an endless supply of identical products. Thus, choosing a seller in our model is analogous to selecting a product. Each seller in the model has distinct attributes and characteristics.

Number of sellers. We assume the presence of N_s sellers in the market, represented as $S = \{S_j | j = 1, 2, \dots, N_s\}$, where each S_j is a unique seller.

Quality of products. Product quality is a multifaceted concept that includes durability, reliability, user-friendliness, and repairability, among other factors (Mussa & Rosen, 1978). Product quality is a critical determinant in consumer purchasing behavior. It is important to emphasize that, based on the research objectives of this paper—specifically, the possibility of market concentration in a homogenous product market influenced by limited consumer attention and social influence—all product qualities in the model are assumed to be identical. This assumption is made to avoid any objective differences between the products.

Sales of sellers. Sales refer to the quantity of products promoted and sold by a company within a specific period (Jobber & Lancaster, 2006). In our study, this concept translates to how often consumers choose a particular seller to buy products. Sales of sellers are denoted as $SS = \{SS_j | j = 1, 2, \dots, N_s\}$, where each SS_j represents

the sales of seller S_j , indicating the frequency of consumer selection for that seller within a certain time frame.

Word of mouth (WoM). WoM is used to denote the collective evaluation of a product or seller by consumers. WoM is based on the aggregated assessments of interconnected consumers through their social networks regarding a specific seller, which is a critical mechanism in the diffusion process, representing informal, interpersonal communication (Van Eck et al., 2011).

Consumers

Consumers are key agents in the market, participating in the purchase of products or services. They exhibit various attributes and possess decision-making capabilities, with their choices influenced by inherent properties, behavioral patterns, and interactions among themselves.

Number of consumers. The market is typically composed of numerous consumers. We denote the total number of consumers as N_c , represented as $C = \{C_i | i = 1, 2, \dots, N_c\}$, where each C_i represents an individual consumer (as expressed in Eq. 1).

$$C_i = \{\text{properties, behaviors}\}, i = 1, 2, \dots, N_c \quad (\text{Eq. 1})$$

The behaviors of consumer C_i particularly relate to their actions in the purchasing process.

Consumer's attention. Previous studies have shown that consumers display bounded rationality, incomplete information, and cognitive limitations (Simon, 1955; Wittek et al., 2013). We define these attributes collectively as "consumer's attention" (CA), which is consistent across all consumers. CA is quantified as the pre-purchase search capacity, specifically the number of sellers a consumer explores in the market over a given period. CA is a natural number greater than 1, but cannot exceed N_s . A higher CA means the consumer can consider more products before purchasing, while a lower CA indicates a more limited range of product considerations.

To illustrate this, we introduce the concept of a "consideration set" (CS) (as defined in Eq. 2), which reflects a consumer's attention level. The size of the CS is directly proportional to the consumer's attention.

$$CS_i = \{s_j, \dots s_k, \dots s_l\} \quad (\text{Eq. 2})$$

Here, CS_i is the consideration set for consumer C_i , and s_j, s_k, s_l are elements within the set of sellers \mathcal{S} . The number of items in the CS is tied to consumer C_i 's attention level (CA). For example, if CA is 3, then there will be 3 items in the CS_i .

Social network. Decision-making among consumers is a social activity, influenced by peers, whether in close networks or broader social circles (Li and Jager, 2023). Consumers' choices are significantly affected by their social interactions, where they gain insights about sellers. This social influence is closely connected with the dynamics of their social networks.