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Article

Smart Elderly Care: An Intelligent e-Procurement System for Elderly Supplier Selecting

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Abstract: (1) Objective: to accelerate the digitalization of the elderly care service industry and the construction of the smart elderly care industry, this paper designs an intelligent e-procurement system for elderly suppliers selecting from the perspective of smart elderly care, which can enhance the efficiency of elderly care supply chains and assist manufacturers of elderly products in choosing a reliable, high-quality supplier during trades. (2) Methods: the e-procurement system, including six modules, is built with an improved dynamic Markov Decision Process selection model combined with an Analytic Network Process, bringing dynamic evolution of both inventory cost and purchasing cost into long-term reward calculation, and taking into account 15 common indexes and 7 specific indexes when evaluating suppliers' competitiveness. (3) Results: a real sample shows that when facing 50 suppliers with 50 different quotations, the e-procurement system selects a stable and reliable supplier that brings the best long-term profits for demand enterprises in ten purchase periods, and it makes the selecting process more efficient and more prompt. (4) Conclusions: the model can be used in the circumstance where an elderly product producer is forced to decide on a long-term strategy or reselect a new stable supplier since it is focused on choosing long-term and high-quality suppliers over numerous periods.

Keywords: smart elderly care; e-procurement system; supply chain; elderly products; Markov decision process

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1. Introduction

To cope with the current grim situation of the elderly population, the Chinese government proposed to accelerate the construction of a new development pattern, focused on promoting high-quality development, and organically combining the implementation of the strategy of expanding domestic demand with the deepening of the supply-side structural reform. The increased aging population leads to the rapid growth of the elderly's demand for elderly services, and hence prompts the reform of elderly services. This puts forward more long-term and systematic requirements for the development of elderly services, and urgent requirements for aggressively dealing with the aging population and developing the elderly industry. Therefore, transforming the development mode of elderly services and promoting the high-quality development of elderly services is an important strategy to solve the contradiction that the demand for elderly services is growing but the supply of elderly services is seriously lagging behind. It is also the key area to effectively deal with the problem of the increased aging population.

Digital technology and the digital economy have penetrated into every aspect of social life and are playing a crucial role. Digital technology and the digital economy, represented by the Internet, cloud computing, big data, blockchain and artificial intelligence, have become a powerful engine to promote the quality transformation, efficiency transformation and dynamic transformation of elderly care services.

Under the concept of giving full play to the dominant role of data as a new production factor in the field of elderly care services and innovatively driving the improvement of the quality of elderly care services and industrial upgrading, this paper designs an intelligent e-procurement system for elderly care supplier selection, which aims to provide an efficient elderly care supplier selection system from the perspective of smart elderly care and, as a result, promotes the high-quality development of elderly care services and fully releases the potential value of digital technology in elderly care services.

2. Literature Review

2.1. Traditional Supply Chain

Scholars have also applied various algorithms to investigate how to optimize traditional supply chain management. The research can be divided into two categories: performance measuring [1–4] and the supplier selection optimization [5–7].

For the performance measuring and operation optimization, to minimize the search space of the enumeration technique and significantly enhance the computational performance of challenging combinatorial optimization problems, Ip et al. (2003) introduced a rule-based genetic algorithm (R-GA) with embedded project scheduling [8]. Supply chain orientation, according to Jadhav (2019), can have a direct impact on the ecological and social sustainability performance of the supply chain and can do so through a variety of channels. The findings also presented that the supply chain orientation structure of the internal supply chain coordination could only have a small impact on sustainability performance. However, this impact was mediated by internal supply chain sustainability practices within the firms [9]. On the basis of the performance measuring, researchers conducted several optimizations on supply chain operation. For instance, Parast (2021) examined the effect of supply chain disruption risk drivers by conducting experiments on Chinese supply chains, to provide some advice on how to improve the organizational performance [10]. Tiwari (2023) imported blockchain and third-parties into supply chain operations and found the optimal roadmap from the perspective of stakeholders [11].

For the supplier selection, in order to further the study of supply chain management, Kang (2016) examined the relationship between supply chain integration and supply chain collaboration between supply network partners [12]. Aiming at the accuracy and efficiency of partner selection, Lu et al. (2016) proposed PSACO, a hybrid algorithm based on particle swarm optimization and ant colony optimization [13]. Xie et al. (2018) aimed to study a two-echelon closed-loop dual channel supply chain consisting of a single online direct selling platform provider and a single offline channel service provider. By comparing a revenue-sharing model and a revenue-sharing-cost-sharing model, it was found that the optimal online direct selling price and offline forward channel service level are affected by the revenue sharing ratio and cost-sharing ratio while the optimal recycling price and optimal reverse channel service level are only affected by the cost-sharing ratio [14]. Hao et al. (2018) studied how to optimize the supplier selection and order allocation in purchasing management and improve their efficiency. Backed up by enterprises of a T-JIT pull-type producing model, they summarized the multi-objective factors that affect the supply chain management of enterprises, which includes information sharing cost, delivering cost, inventory cost, purchasing cost and quality cost and adopted mathematical statistics theory and an optimization algorithm, building a two-stage analytical method for the purchasing management by using AHP-EM and TOPSIS [15]. Zhou et al. (2020) established a three-objective 0–1 integer programming model and solved it with the improved chaos optimization algorithm, effectively solving the problem of parameter selection in the traditional multi-objective optimization process [16]. To solve the problem of transnational supplier selection and order allocation, Chen et al. (2021) established an interactive fuzzy multi-objective programming model to maximize the profit of the core manufacturer and the delivery quality of the supplier under the circumstances of import quota and uncertain demand. This model considered the exchange rate, tariff, and other global factors as influencing factors [17].

As mentioned above, some research into the supply chain has been conducted, but there are also some gaps: Firstly, previous research has focused a lot on traditional supply chain management, but little on elderly care supply chain management and optimization considering its specific evaluation indices. Secondly, research on elderly care supply chains focuses more on the evaluation indices setting, but less on the dynamic interaction between the supplier and the producer and supplier choice. Thirdly, many earlier studies on supply chains only consider short-term gains, ignoring the significance of long-term gains. To compensate for these flaws, this paper applied a Markov dynamic process to elderly care supply chain optimization, embedding a specific elderly care index assessment system into the elder care product supplier selection system to help choose the optimal supplier. We also take into account ten procurement periods to calculate a long-term profit and finally select a stable optimal supplier.

2.2. Elderly Care Supply Chain

At present, there is little research on the management and optimization of elderly supply chains. In these few studies, most focused on the management of elderly service quality and elderly evaluation indices.

For elderly care supply chain quality, Shi (2013) concentrated on how the elderly service integrator is the best choice among multiple senior service providers, considering the elderly service integrator is the core component in elderly service supply chains [18]. Gill (2016) proposed an IoT-enabled information architecture pattern for emergency information in supply chains, and introduced the driven approach "Resalert", which is useful to the effective delivery of emergency information to elderly people [19]. Generally, home health care is becoming a popular health care service model. In addition, the growing aging demand also results in the home health care service supply chain becoming busy. To solve this problem, Salehi-Amiri (2022) used IoT systems to optimize the process of home health care and facilitate the home health care supply chain [20].

Later, Shi (2018) analyzed the supply chain considering elderly service suppliers and elderly service integrators, selecting the optimal strategy of service integrators under the premise of demand, and found out the influencing factors of service supply chains [21]. Zhao (2019) suggested a new community-based elderly healthcare service supply chain (EHSSC), built an optimal model for EHSSC, and defined the roles and functions of each participant of EHSSC, since the community-based elderly service model is not yet widely used in China [22]. Recently, Zhao (2020) applied game theory to figure out how elderly service integrators and elderly service providers cooperate and compete to make the best decisions. He also conducted three case studies to examine the model to find out whether the obtained optimal result is suitable for the community-based elderly healthcare service supply chain [23]. Zhao (2023) studied the channel coordination of a two-echelon elderly healthcare service supply chain consisting of an elderly service integrator and a service provider by using a loss-sharing contract [24].

For the evaluation indices of elderly supply chains, based on the Delphi method and five service quality dimensions of SERVQUAL [25], Wang (2007) created a methodology for the evaluation of elderly service institutions' service levels. Kadlubek (2014) also used the SERVQUAL method to measure the logistic customer service level from the perspective of the recipients of offered transport services [26]. Cho (2011) created a framework for measuring the performance of the service supply chain, which emphasized the performance measurement of service supply chain processes, such as demand management and customer relationship management. Additionally, it used an extent fuzzy analytic hierarchy process to prioritize service supply chain performance assessment indicators [27]. Zhao (2014) evaluates the performance of supply chains through constructing a performance index evaluation system to improve the quality of elderly care services [28]. Tomasović (2015) conducted a study that was specifically focused on the distinctions between elderly and young people in terms of the market distribution for health tourism [29].

2.3. Intelligent e-Procurement Systems

Artificial intelligence (AI) is widely used in many areas, but it is still in its infancy in procurement in supply chains, despite its potential. Scholars who are working on supply chains have also conducted some work on the intelligent e-procurement system for supplier selection and multiple task processing.

For supplier selection, Sun (2012) introduced an agent and web service based on architecture for exception handling in e-procurement by using agent technology and genetic algorithms [30]. Jemmali (2018) proposed an intelligent DMPA model to employ pre-selected preferences to evaluate suppliers' offers [31]. To help select suppliers for multiple products in a vertical collaboration between supply chain dyad and the suppliers, Zair (2019) designed a smart configuration of the agent-based system, which includes a dyadic supplier pre-selection, a dyad-supplier negotiation, and a purchasing company final selection [32].

Later, research on how to optimize digital processing and multiple task processing appeared. Goncalo (2019) proposed an agent-based negotiation model to automate the negotiation and selection of suppliers in the electronic purchasing modality [33]. Barrad (2020) proposed an architecture to discuss how analytics and complex event processing can be explored and used to reduce the cost during procurement [34]. To identify how digital procurement and information processing impact the intention to optimize the procurement process, Bag (2020) proposed Partial Least Squares Structural Equation Modelling and conducted a simulation to evaluate how Industry 4.0 automation can influence the organizational procurement process optimization [35]. Additionally, to further investigate the performance of digitalization in supply chains, Hallikas (2021) proposed a conceptual model to study the digital procurement capabilities. The study found positive relationships between digital procurement capabilities and supply chain management, and it presented that the digital procurement capabilities can even affect the relationship between external data analytics capabilities and supply chain performance [36]. Guida (2023) introduced a mixed-methodology exploratory study of artificial intelligent based on previous research and he found that the digital maturity of firms is at an early stage and the artificial intelligent is untapped [37].

3. Dynamic MDP Model

With the deepening understanding of supply chain management, procurement has become an important entry point for enterprises to reduce costs and improve efficiency. Similarly, using digital technology to optimize the supply chain management of the smart elderly care industry and alleviate the imbalance between supply and demand is also an important entry point to promote the digitalization of the smart elderly care. In order to develop an effective and economical product sourcing strategy, it is necessary to understand the current and expected demand levels of downstream members, as well as to consider the current price quoted by suppliers, expected prices, inventory costs and other factors, and finally make a decision on when to purchase from whom. Theoretically, production can be organized in a just-in-time manner to achieve zero inventory. Because just-in-time purchasing contracts are designed to negotiate, it is assumed that both parties make decisions based on complete information. In reality, however, JIT cannot be realized in non-core companies in the supply chain due to incomplete information sharing and other disturbances. Usually, these firms are willing to maintain a certain level of inventory based on their knowledge of demand trends, which is sufficient to balance fluctuations in the demand market while minimizing inventory costs. Therefore, it is necessary to study the decision of when to purchase from whom and how much to purchase. From the dynamic point of view, the future change in purchasing decisions mainly depends on the state of the current period, but has no obvious or direct relationship with the state of the previous periods; that is, the change has the characteristics of randomness and "no posteriority", which is in line with the requirements of the Markov decision process. Therefore, this paper uses a Markov process to predict the optimal decision at each decision point of the enterprise, hoping to provide useful decision support for the enterprise to solve the problem of when and who to purchase from under the cost constraint, and for the purchasing department to develop a long-term purchasing strategy.

3.1. Theory Background

3.1.1. Markov Decision Process

Markov theory is a mathematical theory of stochastic processes and probability theory that can be used to describe how a system can maintain stability in a constantly changing environment. In this state, a system may change from one state to another, which may or may not be identical. Moreover, Markov theory helps to determine the probability of transition between states and can be used to represent the probability of certain processes. It was originally proposed by the British economist Abraham Markov as a probabilistic model for describing the probability of possible transfers of states of a process and has subsequently been applied to other fields such as biology, mathematics, linguistics, game theory, and computer science, among many others [38–40].

A Markov decision process (MDP), also known as discrete stochastic dynamic programming, is often used to solve discrete sequential decision problems. Markovian decision processes have Markovianity, i.e., the state of the next moment is related to the state of this moment only and is independent of the state of all other moments. Markovianity can be described by a set of state transfer probability formulas:

$$P_{ss'} = P\left[S_{t+1} = s' \middle| S_t = s\right] \quad (1)$$

A Markov decision process usually consists of four elements: state, action, transfer probability, and payoff function. Markov decision models are generally represented by a quadruple $[S, A, T, R]$:

S denotes the set of states and the set of states in which the decision is taken at the moment of decision and after the decision.

A denotes the set of actions and the set of decisions taken, which can be executed by the decision subject to change the existing state of the system.

T denotes the state transfer function, which is the probability that the system will transfer to another state after executing any one action or decision.

R denotes the payoff function, which reflects the immediate reward obtained after taking a decision.

The transfer probability and the payoff function are related to the state and the decision taken in a state. For the decision maker, at each decision moment, it needs to take an action from the set of optional actions according to the state of the system at that moment, so as to obtain a certain reward, and after taking an action the system will move to another state at the next moment according to its mechanism under the decision of that action. Because the decision process is Markovian, the transfer probability and the reward obtained for the action taken at the current moment and the next state entered after the action is taken are only related to the current state and are not related to any historical states and actions before this state.

3.1.2. SERVQUAL Model

The SERVQUAL model is a new service quality evaluation system proposed by American marketing scholars A. Parasuraman, Zeithaml and Berry in the service industry based on Total Quality Management (TQM) theory in the late 1980s [41]. Its theoretical core is the "service quality gap model", that is, service quality depends on the degree of difference between the service level perceived by users and the service level expected by users (therefore also known as the "expectation-perception" model). The key to providing quality service is to exceed the expectations of users. The model is: Servqual score = Actual perception score—Expectation score. Additionally, the SERVQUAL model divides service quality into five dimensions: physical facilities, reliability, responsiveness, assurance, and emotional engagement, and each dimension is subdivided into 22 indexes.

The SERVQUAL model is widely used to evaluate service quality and there are many studies which have used the extended SERVQUAL model to evaluate service quality in different fields. For instance, Stefano (2015) compared the conception service value and the expected service value of hotel customers and proposed a fuzzy SERVQUAL and fuzzy AHP to evaluate the service quality of a large hotel [42]. Enoch (2018) used SERVQUAL to analyze the core public bus transport users' service quality expectations and perceptions and users' perception's effect on the satisfaction with public bus transport services in Kumasi [43]. Dinçer (2019) introduced a balanced scorecard based on the SERVQUAL model to select competitors in the banking sector, which can help to show the most relevant factor in the balanced scorecard according to the correlation coefficient and solve the fuzzy information **[44]**. Tumsekcali (2021) used the extended SERVQUAL model with two criteria related to Industry 4.0 to evaluate the service quality of public transport systems based on the perspective that the increase in service quality can help solve problems such as traffic congestion [45]. This paper will combine the SERVQUAL model and ANP method to construct the index assessment system for elderly care service supplier.

3.2. Decision Process

Based on the support of Blockchain, this e-procurement system demonstrates the decision-making procedure of how to select the appropriate supplier that brings the highest long-term gains to demand enterprise in elderly supply chains in the case that multiple suppliers give different quotations to one demand enterprise at the same time. Here it does not consider the relationship between previous suppliers and demand enterprises, but only pays attention to the best interests of demand enterprises. The structure of the e-procurement system is as depicted in Figure 1.

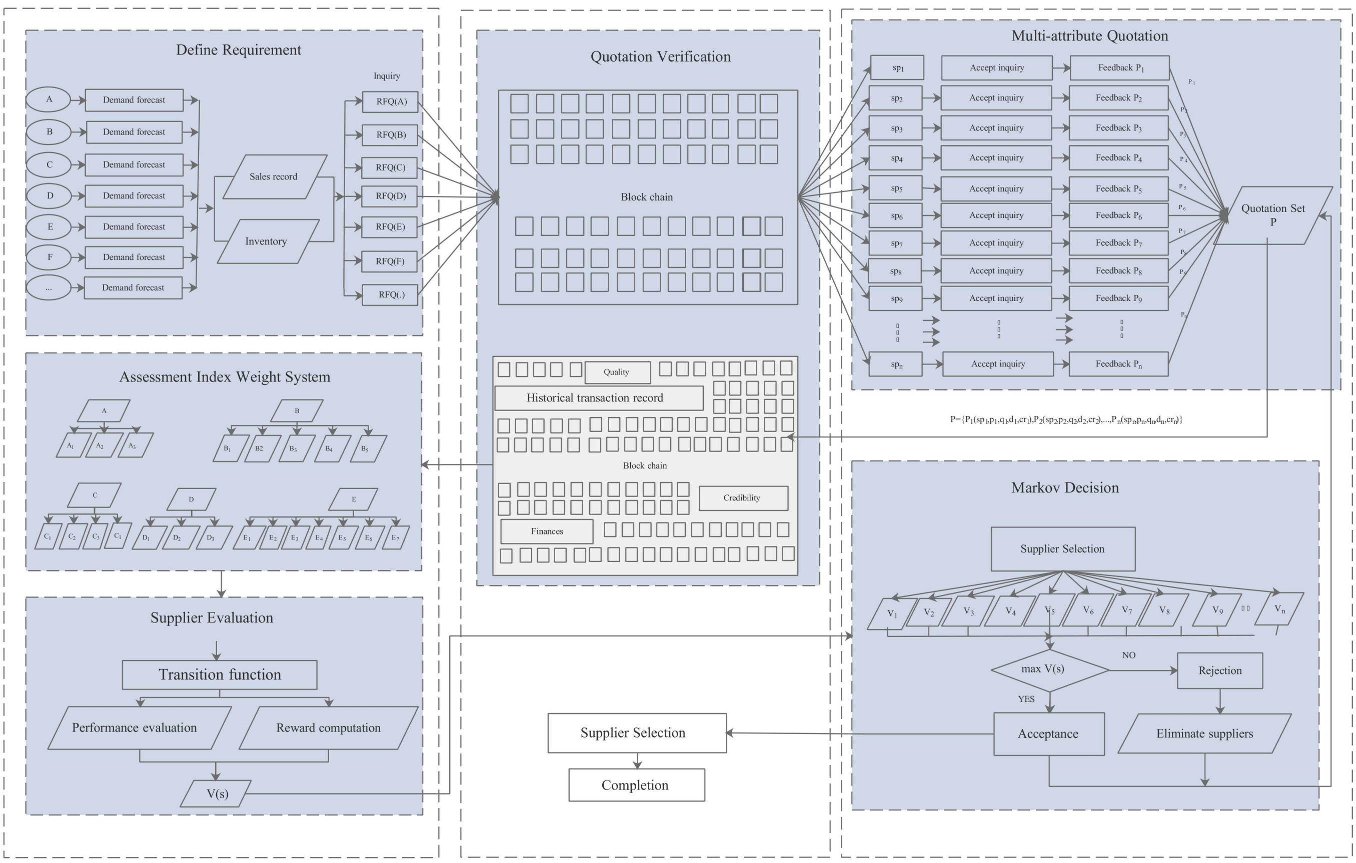


Figure 1. The framework of the e-procurement system.

The e-procurement system includes six modules, and the three for demand enterprise are *Define Requirement*, *Assessment Index Weight System*, and *Supplier Evaluation*. In addition, the two for suppliers are *Multi-attribute Quotation* and *Markov Decision*. Module *Quotation Verification* is used to verify suppliers' information utilizing Blockchain. The process begins in the *Define Requirement* module, where an elderly product-manufacturing enterprise puts forth a request for quotes.

(1) In the *Define Requirement* module, demand enterprises post their requests for quotes, and detail their demands. Additionally, the request and its specified demands are recorded in the trading platform.
(2) In the *Multi-attribute Quotation* module, suppliers (sp_i) respond to demand enterprises with their own quotations that includes Product information (A_i), Supplier service level (B_j), Supplier credibility (C_k) and Development potential of suppliers (D_l), as well as Technical indicators (E_g), i, j, k, l, g = 1, 2, 3, ...n.
(3) Following the receipt of quotations from suppliers, demand enterprises can use the Blockchain's *Quotation Verification* module to confirm some of the quotes' veracity. An assessment system is built using ANP and the comprehensive priorities of each index are obtained in the *Assessment Index Weight System* module.
(4) Then in the *Supplier Evaluation* module, demand enterprises will evaluate suppliers' competitiveness by assessing the four categories' indexes. Then the transition matrix is obtained through transition function (Pr_i).
(5) In the *Markov Decision* module, the inventory cost function (U) and the purchase cost function (B) are used to calculate the immediate reward ®. The supplier who can deliver the greatest long-term advantages (maximum value) is chosen by comparing the value of V, which is determined by adding up the immediate reward (s).
(6) The immediate reward (R) is obtained by the inventory cost function (U) and purchase cost function (B) in the *Markov Decision* module. In addition, the value function $V(s)$ is obtained by accumulating the immediate reward, and the supplier that can bring the maximum long-term gains (maximum value) is selected by comparing the value of $V(s)$.

3.3. An Improved MDP Model

The procurement decision depends on the state of the current period and has no direct bearing on the states of earlier periods; in other words, it is random and has "no after effect", which is in accordance with MDP requirements. Based on this and previous research [46,47], this paper resolves the problem by an improved MDP model and uses a dynamic programming algorithm to calculate the optimal decision path of the entire periods. s refers to the state of the current period, which represents the initial state in the MDP. I, Q, C, t, and k are variables in the transaction. I denotes the set of orders that should be delivered in the tth period, Q refers to the set of supplier quotations in the current state that demand enterprises may choose from, C refers to other cost-excluding product costs in the current period and k is demand enterprises' original inventory level. As soon as a transaction is complete, state s is transferred to the next state s', and receives I', Q', t', and k'.

3.3.1. State

Each initial state in the MDP is defined as a quintuple $s = (I, Q, C, t, k)$. After taking action *Accept*, the initial state transfers to the next state $s' = (I', Q', C', t', k')$ with the transition probability Pr_i. The variables in the new state are calculated as follows, $I' = I \backslash I_{old} \cup I_{new}$. $I_{old} = \{(q, t) | (q, t) \in I)$ is the set of orders that should be delivered in the period tth. $I_{new} = \{(q, t) \mid Action = Accept\}$ is the set of new orders after one quotation is accepted. $Q' = Q \backslash Q_{old} \cup Q_{new}$. $Q_{old} = \{(sp_i, A_i, B_j, C_k, D_l, E_g) | (sp_i, A_i, B_j, C_k, D_l, E_g) \in Q\}$ is the original set of quotations in the t^{th} period. The new set of quotations in the next period is $Q_{new} = \{(sp_i, A_i, B_j, C_k, D_l, E_g) | Action = Accept\}$, and the cost (apart from the product cost) in each period is the same. $K' = k + q_i - x_t$, x_t represents the quantity of products sold in the tth period.

3.3.2. Action

There are three actions of demand enterprises; namely, posting an inquiry, accepting a quotation from a supplier, and rejecting a quotation. Before posting an inquiry, demand enterprises will forecast the product demand through their own historical sales, then determine the future sales volume according to the demand function, and finally submit an inquiry. The set of effective actions is defined as A_S, $a \in A_s$.

(1) *Action* = *Request*: the action that demand enterprises post an inquiry. The inquiry shall describe the indexes that demand enterprises' need, including Product information (A_i), Supplier service level (B_j), Supplier credibility (C_k) and Development potential of suppliers (D_l), Technical indicators (E_g). i, j, k, l, g = 1, 2, 3, . . . , n. Define {*RFQ* (sp_i, A_i, B_j,C_k, D_l, E_g) | $sp_i \in SP$, (sp_i, A_i, B_j,C_k, D_l, E_g) $\in P$} as the set of inquiry actions, in Product information, price and quantity of product have a limit, $p_{min} \leq p \leq p_{max}$, $q_{min} \leq q \leq q_{max}$.
(2) *Action* = *Accept:* the action that demand enterprises accept supplier sp_i's quotation. The result of action *Accept* is that the initial state s = (I, Q, C, t, k) transfers to the next state s'= (I', Q', C', t', k') with probability Pr_i. Define {*Acc* (sp_i, A_i, B_j, ,C_k, D_l, E_g) | $sp_i \in SP$, (sp_i, A_i, B_j,C_k, D_l, E_g) $\in P$} as the set of suppliers' quotations available for selection.
(3) *Action* = *Reject*: the action that the demand enterprise rejects supplier sp_i's quotation. The rejected supplier can modify its quotation according to the new project's indexes of the demand enterprise in the next period and compete with others in the next period. Define {*Rej* (sp_i, A_i, B_j,C_k, D_l, E_g) | $sp_i \in SP$, (sp_i, A_i, B_j,C_k, D_l, E_g)$\in P$} as the set of the rejected suppliers.

3.3.3. Reward Function Establishment

So far domestic enterprises are still unable to achieve zero inventory control, hence, inventory cost is still an essential part of daily expenditure and an important pointcut to reduce cost. Therefore, in this model, the inventory cost and the purchase cost of demand enterprises are both included in the calculation of the reward function $R(s_t,a)$ in each period. The inventory cost function $U(s_t,a)$ represents the total inventory cost spent in each period, and the purchase cost function $B(s_t,a)$ represents the total purchase expenditure in each period. The reward function $R(s_t,a)$ represents the immediate reward after taking an action in each period.

The specific formula of the reward function is as follows:

$$R(s_t, a) = p' x_t - B(s_t, a) - U(s_t, a), \tag{2}$$

where

$$B(s_t, a) = p_i q_i + C, \tag{3}$$

$$U(s_t, a) = (k + p_i - x_t) \times h, \tag{4}$$

p' means sold prices of products.

3.3.4. Index Weight Assessment System

To enhance the transition function's accuracy, an index weight assessment system is established. The Analytic Hierarchy Process (AHP), Analytic Network Process (ANP), Fuzzy Comprehensive Evaluation, Data Envelopment Analysis (DEA), TOPSIS and other techniques are currently used to evaluate and select optimal suppliers. Among these, AHP may fully rely on the judgment of professionals while ANP builds connections among each precise index in the network layer, which makes it more objective. Further, ANP pays closer attention to the interaction among various elements and determines how each index affects another. Additionally, in the ANP, the calculated weight of each index also takes into account the influence of all of the principles, which is closer to the actual situation.

Thus, in this paper, we use ANP to evaluate the indexes of suppliers' quotations and select the optimal supplier for elderly demand enterprises. The process of ANP is as follows:

(1) Select indexes in the principle layer and network layer. Set up indexes in the principle layer and network layer based on the literature and cases.

(2) Build index assessment system and note intricate interaction and influence between each index. The indexes in the principle layer are $M_1, M_2, \ldots, M_n$, the indexes in the network layer are $N_1, N_2, N_3, \ldots, N_n$.

(3) The relative importance of each principle and index in the network layer is scored by experts on a scale of 1 to 9. Additionally, build a judgment matrix for the network and principle layers in Super Decision. Obtain the judgment matrix of principle layer A and judgement matrix of network layer $\overline{A}$.

(4) The judgment matrix A of the principle layer is normalized as B = $\begin{bmatrix} b_{11} & b_{12} & \cdots & b_{1n-1} & b_{1n} \\ b_{21} & b_{22} & \cdots & b_{2n-1} & b_{2n} \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ b_{n-11} & b_{n-12} & \cdots & b_{n-1n-1} & b_{n-1n} \\ b_{n1} & b_{n2} & \cdots & b_{nn-1} & b_{nn} \end{bmatrix}$, the judgment matrix $\overline{A}$ of network layer is normalized as O = $\begin{bmatrix} o_{11} & o_{12} & \cdots & o_{1m-1} & o_{1m} \\ o_{21} & o_{22} & \cdots & o_{2m-1} & o_{2m} \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ o_{m-11} & o_{m-12} & \cdots & o_{m-1m-1} & o_{m-1m} \\ o_{m1} & o_{m2} & \cdots & o_{mm-1} & o_{mm} \end{bmatrix}$. hence, obtain the Unweighted Super Matrix.

(5) The weighted hypermatrix H is obtained by multiplying matrix B and O. Using Super Decision, the weighted super matrix can also be obtained.

(6) Calculate the Limit Super Matrix of the Weighted Super Matrix H, or use Super Decision to analyze the Limit Matrix, and obtain the comprehensive ranking of the weight of each index.

To calculate the weight of each index, 60 questionnaires were issued to management departments. Based on the 23 common indexes proposed by Dickson [48], and individual indexes of elder goods proposed by Weber (1991) [49] and Xu (2013) [50], this research built a new comprehensive index assessment system using the ANP method and the questionnaire results. The index system is composed of 5 principles and 22 indexes. There are 7 individual indexes designed for smart elderly products evaluation and 15 common indexes for traditional products evaluation in this system, where 7 individual indexes are introduced to improve the assessment system's suitability for senior customers. The specific indexes are listed in Table 1:

Table 1. Assessment Indexes of Supplier.

Category	Principle Layer	Network Layer
Common index	Product information A	Price A_1
		Quantity A_2
		Product qualification rate A_3
	Supplier service level B	Order completion rate B_1
		On time delivery B_2
		Volume flexibility B_3
		Delivery flexibility B_4
		Customer complaint handling satisfaction rate B_5
	Supplier credibility C	Position in the industry C_1
		Recommendation rate C_2
		Performance of the contract C_3
	Development potential of suppliers D	Asset liability ratio D_1
		Profit growth rate D_2
		New product development rate D_3
		Cooperation income D_4

Table 1. *Cont.*

Category	Principle Layer	Network Layer
Individual index	Technical indicators E	Security E_1 Legibility E_2 Operability E_3 Anti-broken E_4 Comfort E_5 Toxicity E_6 Mechanical movement hazard E_7

3.3.5. State Transition Function

The state transition function is the probability of a supplier to be selected by demand enterprise in one period. It is represented as Pr_i (s' | s, a). In this paper, the state transition function is divided into two parts. The first is the evaluation of the supplier; the second is the demand of the demand enterprise. The evaluation function of the supplier is expressed as $\overline{Pr_i}(Q_{new})$, which refers to the probability of selecting supplier sp_i's quotation from the set of acceptable quotations Q_{new}.

The demand of the demand enterprise is expressed as the demand function df (t, x), which refers to the probability of selling x u products in the tth period. The calculation of the customer's average demand is:

$$\overline{\mathrm{d}} = \sum_{\mathrm{t}\,=1}^{\mathrm{M}} \frac{\mathrm{d_t}}{\mathrm{M}}, \tag{5}$$

The state transition function Pr_i (s' | s, a) is:

$$Pr_i\ \left(s'\ |s,\ a\right)\ \overline{Pr_i}(Q_{new})\times df(t\ x), \tag{6}$$

where $\overline{Pr_i}(Q_{new})$ is the weighted average of the transition probability of each supplier:

$$\overline{Pr_i}(Q_{new}) = \frac{Pr_i(Q_{new})}{\sum_{n=1}^{n=i} Pr_i(Q_{new})}, \tag{7}$$

$$Pr_i\ (Q_{new}) = \frac{\sum_{i=1}^{i} A_i \times \psi_{A_I}\ + \sum_{j=1}^{j} B_j \times \psi_{B_j +} \sum_{k=1}^{k} C_k \times \psi_{C_k} + \sum_{l=1}^{l} D_l \times \psi_{D_l} + \sum_{j=1}^{j} E_g \times \psi_{E_g}}{i+j+k+l+g}, \tag{8}$$

ψ_{A_I}, ψ_{B_j}, ψ_{C_k}, ψ_{D_l}, ψ_{E_g}($1 \leq i \leq 3$, $1 \leq \mathrm{j} \leq 5$, $1 \leq \mathrm{k} \leq 3$, $1 \leq \mathrm{l} \leq 4$, $1 \leq \mathrm{g} \leq 7$) refer to the relative weight of indexes in four categories, where $\sum_{i=1}^{i} \psi_{A_i} + \sum_{j=1}^{j} \psi_{B_j} + \sum_{k=1}^{k} \psi_{C_k} + \sum_{l=1}^{l} \times \psi_{D_l} + \sum_{j=1}^{j} E_g \times \psi_{E_g} = 1$.

Price function, quantity demand function, volume flexibility and delivery flexibility are presented as pf, qf, f_q and f_d.

$$pf = 0.5 + \frac{p - p_i}{p}, \tag{9}$$

The quantity demand function qf (sp_i, p_i, q_i,d_i, cr_i) is defined as:

$$qf = 1 - \frac{|q_i - q|}{q}, \tag{10}$$

Volume flexibility f_q refers to the range of the quantity of products that suppliers can produce under normal production conditions.

$$f_q\ = \varnothing[\frac{\mathrm{qMAX}\ -\ \mathrm{d}}{\mathrm{S_d}}]\ -\ \varnothing[\frac{\mathrm{qMIN}\ -\ \overline{\mathrm{d}}}{\mathrm{S_d}}], \tag{11}$$

Delivery flexibility mainly reflects the supplier's ability to respond to the change in the orders' delivery date. The current time is set to $\overline{\overline{t}}$, for job *i*th, the earliest completion time is E_i, and the latest is L_i. Then the relaxation period for job is:

$$TST_i = \sum_{i=1}^{i} \left(L_i - \overline{\overline{t}}\right), \tag{12}$$

The minimum delivery time is:

$$T_E = \sum_{i=1}^{i} \left(E_i - \overline{\overline{t}}\right), \tag{13}$$

Then delivery flexibility is calculated as:

$$f_d = \frac{\sum_{i=1}^{i} (L_i - E_i)}{\sum_{i=1}^{i} \left(E_i - \overline{\overline{t}}\right)}, \tag{14}$$

The customer complaint handling satisfaction rate is calculated as:

$$\text{The customer complaint handling satisfaction rate} = \frac{\text{Number of complaints satisfactorily resolved}}{\text{number of coplaints}}, \tag{15}$$

Based on the aforementioned transition function, we obtain the state transition matrix which shows in Figure 2:

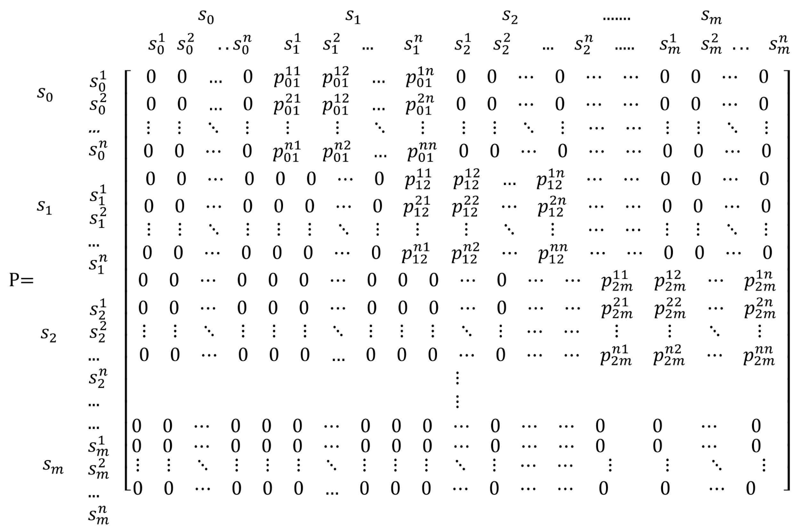


Figure 2. State transition matrix.

It assumes that demand enterprises have sufficient funds to pay for suppliers' products to fully account for the impact of the supplier's assessment on the final decision and eliminate the impact of the demand enterprise's own factors. In other words, the probability of being able to supply products in number y after demand enterprises purchase x units from supplier *spi* in the *t*th period is 1. Due to the decentralized nature of Blockchain, demand enterprises can carry out a secondary confirmation of the supplier's credibility directly without other media by using the password of semi-public information provided by the supplier. Meanwhile, due to the anti-falsification and non-tampering properties of Blockchain, the authenticity of the historical sales data and credibility of the suppliers on the chain can be guaranteed.

3.3.6. Value Function

The value function $V(s)$, which represents the long-term gains of demand enterprises, has an optimal value when it receives the maximum long-term gains. In MDP, $V(s)$ is the sum of the expected reward in this period and the expected discounted reward in the subsequent infinite periods when adopts policy π in state s. Under policy π, the value function $V\ (s)$ in state s is obtained as displayed below:

$$\begin{aligned} V^{\pi}(s) &= E_{\pi}\left[R_0 + \gamma R_1 + \gamma^2 R_2 + \gamma^3 R_3 + \ldots \middle| s_0 = s\right] \\ &= E_{\pi}\left[R_0 + \gamma[\gamma R_1 + \gamma^2 R_2 + \gamma^3 R_3 + \ldots]\middle| s_0 = s\right] \\ &= E_{\pi}[R(s'|s,a) + \gamma V^{\pi}(s')|s_0 = s], \end{aligned} \tag{16}$$

As demonstrated in Equation (15), E is the expectation of the value function in state s. To take the influence of other factors outside the inventory into account, and to prevent cycling with the same result indefinitely, discount factor gamma γ is considered to make the value function convergent.

According to the Bellman equation, the optimal value of the function in state s is:

$$V^*(s)\ \ max_{a\in A} \sum\nolimits_{s\in S'} Pr_i(s'|s,a)[R(s_t,a) + \gamma V^*(s')], \tag{17}$$

where

$$Q\ (s,\ s)\ \ max_{a\in A} \sum\nolimits_{s\in S'} Pr_i(s'|s,a)[R(s_t,a) + \gamma V^*(s')], \tag{18}$$

$$V^*(s) = \ \mathrm{max}_{\mathrm{a}\in \mathrm{A}} Q(s,a), \tag{19}$$

Then the optimal strategy obtained from $V(s)$ is:

$$\pi(s) = \mathrm{arg}max_{a\in A}\ Q(s,a)\ , \tag{20}$$

where the strategy π is the optimal strategy in the whole period.

4. An Illustrative Example

4.1. Industry Background

This section selects a large elderly household goods manufacturer in Hefei, Anhui province, as an example. Assuming that the manufacturer will conduct purchases for ten periods, and in each period, there will be 50 suppliers to feedback quotations after the demand enterprise making an inquiry. Then the demand enterprise selects a supplier that can enable it to realize the greatest long-term profit. The following are the requests for the manufacturer's four sales areas as shown in Table 2. In area I, III and IV, the sales volume is growing linearly and has not yet stabilized. Hence the model chooses the data from area II as the example. According to the historical data of area *II*, the probability distribution of demand for a certain product is obtained as Equation (21).

Table 2. Demands in four sales areas.

Period	Area I	Area II	Area III	Area IV
1	2850	2830	1609	897
2	2949	2858	1872	1185
3	3473	2732	1914	1344
4	3712	3012	2050	1413
5	4183	2953	2027	1515
6	4821	2856	2440	1485
7	4813	2713	2605	1660
8	5757	3024	2444	1625
9	5670	2970	2767	1765
10	6763	2863	2756	1807

$$df(t,x) = \begin{cases} 0.2, & 2700 < x < 2800 \\ 0.4, & 2800 < x < 2900 \\ 0.2, & 2900 < x < 3000, \\ 0.2, & 3000 < x < 3100 \end{cases} \quad (21)$$

Enterprise A proposes the inquiry RFQ, k = 800, h = 15, C = 2.

4.2. Index Weight Assessment

The e-procurement system will set up an index weight assessment system and determine the weight of indexes concurrently with posting an inquiry. This paper uses the 1–9 scale method proposed by Saaty to contrast the importance of each index under each principle and calculate the relative weight of each index by constructing a super matrix in the ANP. The weights of indexes in each principle layer and network layer are obtained through the software Super Decision. The judgment matrix of the Principle layer and Network layer, and the priorities of each index are given as Tables 3–9.

Table 3. Influence judgment matrix of Goal layer, Principle layer and Network layer.

		Affected Factors																					
			A				**B**				**C**			**D**						**E**			
		A_1	**A_2**	**A_3**	**B_1**	**B_2**	**B_3**	**B_4**	**B_5**	**C_1**	**C_2**	**C_3**	**D_1**	**D_2**	**D_3**	**D_4**	**E_1**	**E_2**	**E_3**	**E_4**	**E_5**	**E_6**	**E_7**
Influence Factors: A	A_1		√							√	√		√	√	√	√	√	√	√	√	√	√	√
	A_2	√		√	√		√			√	√	√	√	√	√	√							
	A_3	√			√	√	√	√		√	√	√	√	√	√	√	√	√	√	√	√	√	√
B	B_1								√	√	√	√	√	√	√	√							
	B_2				√			√	√	√	√	√	√	√	√	√							
	B_3				√	√		√	√	√	√	√	√	√	√	√							
	B_4				√	√			√	√	√	√	√	√	√	√							
	B_5				√					√	√	√	√	√	√	√							
C	C_1										√		√	√	√	√							
	C_2									√			√	√	√	√							
	C_3				√					√	√		√	√	√	√							
D	D_1	√								√	√				√								
	D_2									√	√		√		√								
	D_3									√	√		√	√		√							
	D_4									√	√		√		√								
E	E_1	√		√						√	√		√	√		√			√	√		√	√
	E_2	√		√						√	√		√	√		√			√		√		
	E_3	√		√						√	√		√	√		√					√		
	E_4	√		√						√	√		√	√		√	√						
	E_5	√		√						√	√		√	√		√		√	√				
	E_6	√		√						√	√		√	√		√	√				√		
	E_7	√		√						√	√		√	√		√	√		√				

Table 4. Judgement matrix of Principle Layer.

	A	B	C	D	E
A	1	3	2	1/3	1/2
B	1/3	1	1/2	1/3	1/2
C	1/2	2	1	1/2	1/2
D	3	3	2	1	1/2
E	2	2	2	2	1

Table 5. Judgement matrix under Principal A.

	A_1	A_2	A_3
A_1	1	1/2	2
A_2	2	1	2
A_3	1/2	1/2	1

Table 6. Judgement matrix under Principal B.

	B_1	B_2	B_3	B_4	B_5
B_1	1	2	2	3	2
B_2	1/2	1	1/2	2	2
B_3	1/2	2	1	2	3
B_4	1/3	1/2	1/2	1	2
B_5	1/2	1/2	1/3	1/2	1

Table 7. Judgement matrix under Principal C.

C	C_1	C_2	C_3
C_1	1	2	2
C_2	1/2	1	2
C_3	1/2	1/2	1

Table 8. Judgement matrix under Principal D.

	E_1	E_2	E_3	E_4	E_5	E_6	E_7
E_1	1	4	3	4	4	2	2
E_2	1/4	1	1/2	2	2	1/3	1/3
E_3	1/3	2	1	3	2	1/3	1/3
E_4	1/4	1/2	1/3	1	2	1/3	1/3
E_5	1/4	1/2	1/2	1/2	1	1/4	1/3
E_6	1/2	3	3	3	4	1	1/2
E_7	1/2	3	3	3	3	2	1

Table 9. Weight of indexes in Principle Layer and Goal Layer.

		Index	**Weight in Principle Layer**	**Weight in Goal Layer**
Supplier assessment	A	A_1	0.4286	0.0773
		A_2	0.4286	0.0773
		A_3	0.1429	0.0258
	B	B_1	0.2215	0.0194
		B_2	0.1751	0.0154
		B_3	0.2649	0.0233
		B_4	0.1724	0.0151
		B_5	0.1661	0.0146
	C	C_1	0.4425	0.0580
		C_2	0.2788	0.0366
		C_3	0.2788	0.0366
	D	D_1	0.1705	0.0484
		D_2	0.1483	0.0421
		D_3	0.4459	0.1266
		D_4	0.2354	0.0668
	E	E_1	0.2888	0.0915
		E_2	0.0686	0.0217
		E_3	0.1984	0.0628
		E_4	0.0217	0.0069
		E_5	0.2058	0.0652
		E_6	0.0499	0.0158
		E_7	0.1669	0.0528

Based on the influence judgment matrix, we obtain the judgment matrices under each principle.

According to the judgment matrix of each category in Tables 4–8, it can obtain the unweighted Super matrix, the weighted Super matrix and limit matrix. The result shows that the priorities of indexes in the Goal Layer and Principle layer are as Table 9:

4.3. Supplier Background

Using MATLAB to generate 50 suppliers randomly in a certain range to feedback 50 sets of quotations. SP = $\{sp_1, sp_2, sp_3, sp_4, sp_5, \ldots, sp_{50}\}$ is the set of suppliers. p_{min} = 80, p_{max} = 120; q_{min} = 2800, q_{max} =3200. Table 10 shows part of the normalized quotation in the first period. (See complete quotations in ten periods in Tables A1–A10 in Appendix A).

Table 10. The normalized quotation of the first ten suppliers in the first period.

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
1	0.65	0.93	0.81	0.89	0.92	0.66	0.65	0.97	12	0.63	4	0.51	0.11	0.08	2	0.97	0.77	0.92	0.87	0.94	0.81	0.97
2	0.55	0.97	0.90	0.86	0.94	0.59	0.71	0.93	13	0.67	6	0.34	0.10	0.08	4	0.76	0.95	0.79	0.81	0.91	0.85	0.80
3	0.55	0.97	0.93	0.86	1.00	0.51	0.71	0.97	17	0.60	3	0.32	0.09	0.12	4	0.96	0.77	0.90	0.88	0.79	0.83	0.86
4	0.68	0.97	0.81	0.91	0.95	0.88	0.86	0.94	11	0.70	5	0.45	0.13	0.15	5	0.86	0.85	0.95	0.76	0.88	0.95	0.89
5	0.69	0.93	0.84	0.96	0.99	0.57	0.71	0.98	3	0.52	5	0.36	0.14	0.09	5	0.91	0.93	0.85	0.79	0.92	0.95	0.87
6	0.59	0.97	0.91	0.97	0.94	0.77	0.65	0.99	16	0.62	5	0.55	0.14	0.13	3	0.89	0.80	0.95	0.91	0.88	0.94	0.94
7	0.46	1	0.89	0.94	0.94	0.8	0.83	0.92	18	0.62	5	0.51	0.13	0.12	3	0.78	0.88	0.88	0.76	0.87	0.90	0.93
8	0.64	1	0.83	0.99	0.96	0.78	0.63	0.91	21	0.69	4	0.50	0.14	0.10	4	0.93	0.90	0.91	0.77	0.82	0.77	0.82
9	0.56	0.97	0.86	0.96	0.90	0.62	0.73	0.98	29	0.74	3	0.35	0.13	0.09	2	0.75	0.82	0.89	0.98	0.86	0.98	0.92
10	0.66	0.93	0.85	0.86	0.94	0.72	0.74	0.93	14	0.61	5	0.39	0.14	0.11	3	0.77	0.76	0.97	0.77	0.87	0.84	0.90

4.4. Dynamic Programming Solution

According to the Bellman equation, we obtained:

$$\begin{bmatrix} v_{(1)} \\ \vdots \\ v_{(n)} \end{bmatrix} = \begin{bmatrix} R_1 \\ \vdots \\ R_2 \end{bmatrix} + \gamma \begin{bmatrix} P_{11} & \cdots & P_{1n} \\ \vdots & \ddots & \vdots \\ P_{11} & \cdots & P_{nn} \end{bmatrix} \begin{bmatrix} v_{(1')} \\ \vdots \\ v_{(n')} \end{bmatrix}, \quad (22)$$

This paper uses the inverse order method in finite time to obtain the results. The initial value of V (s) is set to 100, and the discount factor γ = 0.99, n = 20. We obtained the selection strategy in 1–10 periods is $sp_{41} \rightarrow sp_2 \rightarrow sp_{48} \rightarrow sp_{11} \rightarrow sp_{24} \rightarrow sp_{18} \rightarrow sp_2 \rightarrow sp_{32} \rightarrow sp_{15} \rightarrow sp_{27}$, and the maximum value of each period is described in Table 11, which estimates that when suppliers in 10 periods are totally different, the intelligent e-procurement system can accurately choose the unique supplier that bring the highest benefits for demanders in each period, the Max $V(s)$ of each period is shown in Figure 3.

Table 11. Max $V(s)$ in 10 periods.

$\mathbf{sp_i}$	**Max V(s)**	$\mathbf{sp_i}$	**Max V(s)**	$\mathbf{sp_i}$	**Max V(s)**	$\mathbf{sp_i}$	**Max V(s)**	$\mathbf{sp_i}$	**Max V(s)**
1	1,026,660.176	11	1,008,398.099	21	1,018,886.528	31	1,025,485.608	41	1,032,695.889
2	1,013,663.388	12	1,005,884.239	22	1,007,179.369	32	1,004,258.437	42	1,027,615.128
3	1,005,700.487	13	1,011,794.981	23	1,012,516.268	33	1,005,641.908	43	1,032,177.736
4	1,001,476.132	14	1,026,103.254	24	1,029,977.87	34	1,013,114.365	44	1,023,154.974
5	1,031,942.569	15	1,026,123.407	25	1,003,423.713	35	1,012,242.002	45	1,005,360.903
6	1,023,045.263	16	1,003,957.14	26	1,026,793.294	36	1,022,011.736	46	1,031,336.807
7	1,022,597.412	17	1,029,412.422	27	1,002,035.81	37	1,005,053.515	47	1,029,853.854
8	1,028,141.094	18	1,010,292.366	28	1,031,242.842	38	1,007,941.423	48	1,027,944.932
9	1,025,181.462	19	1,032,682.362	29	1,020,334.825	39	1,006,577.407	49	1,018,235.519
10	1,017,913.304	20	1,006,251.675	30	1,029,452.032	40	1,004,977.015	50	1,018,483.135

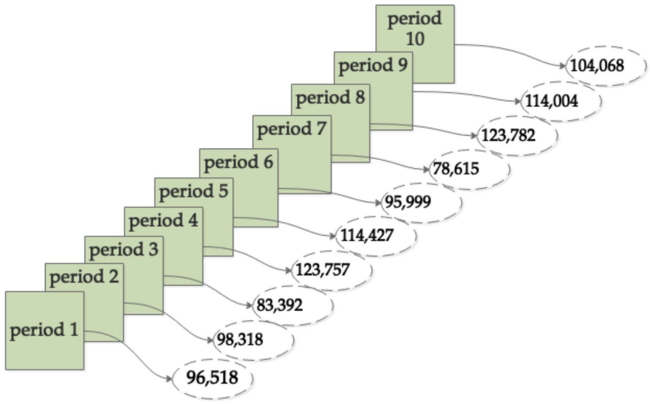


Figure 3. The Max $V(s)$ obtained by demander in 10 periods' purchasing. (Each circle represents the Max $V(s)$ in the corresponding period).

Here, we set suppliers in the other 9 periods which are consistent with suppliers in the first period. When suppliers in ten periods are the same, we obtained the final $V(s)$ brought by each supplier shown as Table 11, and the total maximum value of ten periods is also brought by sp_{41}, which is consistent with the result of the above. It demonstrates that the model can select a stable, suitable supplier when an elderly demand supplier receives different quotations from different suppliers in different periods. Hence, it reflects the accuracy of the model. Furthermore, an elderly demand supplier can put the normalized quotation in the long-term benefits calculation model to obtain a long-term optimal benefit when choosing a long-term stable supplier.

5. Data Discussion

Since the value function in the MDP model is obtained by using the inverse order method, it is unclear how the parameters in the quotation relate to the value function specifically. Therefore, it runs a simulation to determine the sensitivity to each parameter, treating each parameter as an independent variable and the value function as a dependent variable. It then compares and analyses the changes of the maximum value function and the characteristics of the optimal decision, to obtain a result that enables demand enterprises and suppliers to modify their actual trade strategy in accordance with the optimal strategy.

To increase the simulation accuracy, it extended the variation range of the simulation's independent variables. After obtaining an optimal strategy using this model, the optimal supplier was added as a control group and an additional 120 groups of suppliers were added as the test groups. To ensure the number of suppliers selected by the elderly demand enterprise in each period is the same, 120 suppliers are also added to provide quotations in the other nine periods, and in each period, the optimal choice is considered as a control group. In order to eliminate the impact of parameter changes in other periods on the final selection, the parameters in quotations from 120 new additional suppliers in the second through tenth periods are identical to the parameters of the optimal suppliers. We pick several key indexes from the 15 common indexes to conduct experiments in this chapter. For a traditional manufacturer, common indexes such as price, quantity, and delivery time serve as the primary criteria when choosing a supplier. The crucial indexes, however, for an elderly manufacturer are the technical indications of each individual index that make products more suitable for the elderly. As a result, the experiments also pick the other 7 technical indicators, namely, security, legibility, operability, anti-broken performance, comfort, toxicity, and mechanical movement hazard.

5.1. Simulation of Common Indexes

Price and quantity are the most essential indexes for traditional supplier selection. It relates to the overall efficiency of enterprises. Hence, it conducts a simulation among price (A_1), quantity(A_2) and the optimal value ($V_{(S)}$) of the enterprise. The optimal decision in the first periods is the 15th supplier, therefore, consider the 15th supplier as the control group, and 120 suppliers are added as test groups. A_1 was randomly generated in the range (p_{min}, p_{max}) and A_2 was randomly generated in the range of (q_{min}, q_{max}) with other parameters unchanged. The result shows that the new optimal decision of the first period is both to choose the first supplier in the test groups, and the optimal decisions of other periods also remain unchanged. The scatter diagram of A_1, A_2 and value function we obtained is as Tables 12 and 13.

Table 12. ANOVA and Coefficients of p and V(s).

ANOVA [a]					
	Sum of squares	df	Mean Square	F	Sig.
Regression	6.603×10^{10}	1	6.603×10^{10}	3,897,593.20	0.001 [b]
Residual	1,998,933.42	118	16,940.114		
Total	6.603×10^{10}	119			
Coefficients [a]					
	B	Std.Error	Standardized Coefficients Beta	t	Sig.
(Constant)	339,935.937	141.911		2395.423	0.001
p	−2800.433	1.418	−1.000	−1974.232	0.000

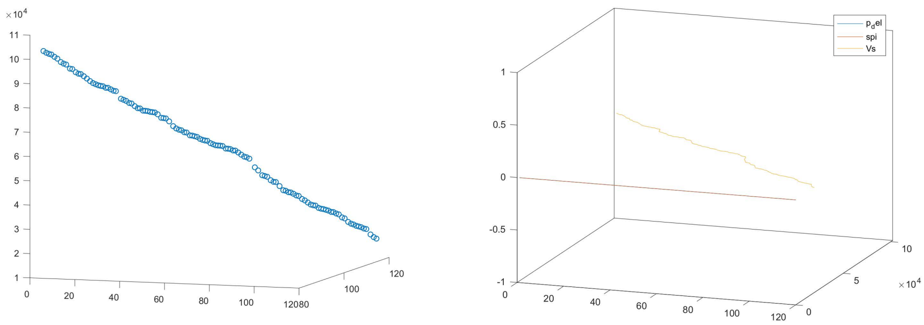
Table 13. ANOVA and Coefficients of q and V(s).

ANOVA [a]					
	Sum of squares	df	Mean Square	F	Sig.
Regression	1.506×10^{10}	1	1.506×10^{10}	5.785×10^{11}	0.001 [b]
Residual	3.071	118	0.026		
Total	1.506×10^{10}	119			
Coefficients [a]					
	B	Std.Error	Standardized Coefficients Beta	t	Sig.
(Constant)	339,891.253	0.360		945,039.408	0.001
q	−92.000	0.000	−1.000	−760,589.94	0.000

As Tables 12 and 13 exhibit, both A_1 and A_2 have a linear relationship with $V(s)$, and the two are both negatively correlated with $V(s)$. When the optimal supplier is chosen, the demand enterprise will lose 339,900.454 units for every increase in price and 339,891.253 units for every increase in quantity. Once the demand enterprise purchases at a price higher than the optimal price by Δp, the revenue will decrease by $\Delta p \times 339{,}900.454$ units for each product. Similarly, purchasing Q products will result in $Q \times \Delta p \times 39{,}900.454$ units reduction. If the product's accessory increases the purchase price, the demand enterprise can make a further decision by weighing the additional benefits the attachment will provide with the loss the high price will cause.

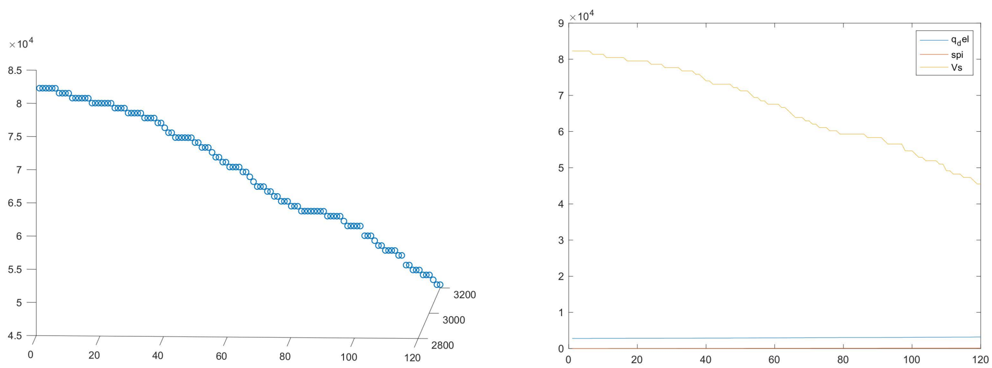
Essentially, the demand enterprise can use this outcome to bargain a fair price with the chosen supplier from the perspective of the product's quality, packaging, bonus items, and other conditions. In most cases, high-quality products can also bring higher stickiness and activity of users, hence, when faced with high-quality products, for instance, the demand enterprise may be willing to accept a higher price relative to the optimal decision within the acceptable revenue loss because the fast development in the economy has significantly altered people's expectations, and the elderly are no exception. In a way, the elderly now have better living conditions thanks to the rising economic standards, which raises the demand for elderly products, particularly intellectual ones. To better fit the physical and psychological features of the elderly, intellectual products for the elderly should improve their suitability for the elderly, including operability and convenience. For instance, an intelligent phone designed for the elderly has different requirements than one made for regular people. To boost its suitability for the elderly, the phone should have more concise functionalities and apps, larger fonts and screens, and louder volumes. According to Maslow's theory of the hierarchy of needs, individuals' demands are shifting from survival to a life pursuing high quality and spirit, and as a result, they place greater emphasis on enhancing their comfort and quality of life, so as the elderly. Therefore, when selecting products for the elderly, the first thing to focus on is the quality of the product and its suitability with the elderly. In the face of good quality and high adaptability with the elderly products, you can accept a higher price in exchange for the user stickiness and repurchase rate brought by the high quality.

As indicated by the 3D graph in Figures 4 and 5, the price and quantity increase monotonically while the value function decreases monotonically, supporting the validity of the regression analysis. In addition, as shown in Figures 4a and 5a, price and quantity caused the value function to fluctuate widely, which signifies that the price and quantity of products provided by suppliers have a significant impact on the long-term gains of the demand enterprise.



(**a**) (**b**)

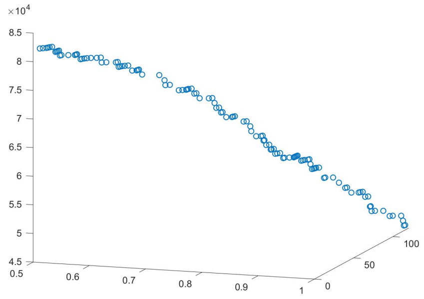
Figure 4. (**a**) Three-dimensional graph of value function of 120 suppliers under the variation of A_1; (**b**) Multiple-sequence diagrams of value functions of 120 suppliers under the variation of A_1.



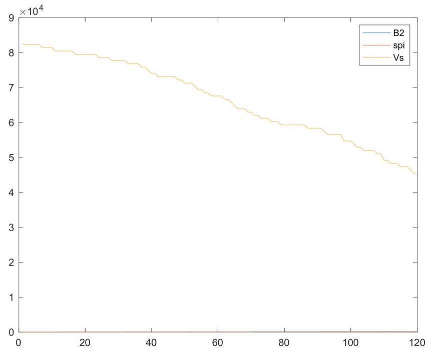
(**a**) (**b**)

Figure 5. (**a**) Three-dimensional graph of value function of 120 suppliers under A_2 variation; (**b**) Multiple-sequence diagrams of value functions of 120 suppliers under the variation of A_2.

On time delivery rate and the value function have a linear relationship as well, seen from Figure 6a,b. The demand enterprise will obtain more when the on time delivery rate is higher.



(**a**)



(**b**)

Figure 6. (**a**) Three-dimensional graph of value function of 120 suppliers under B_2 variation; (**b**) Multiple-sequence diagrams of value functions of 120 suppliers under B_2 variation.

But another crucial issue is what, in actuality, on-time delivery represents. Is it true that for demand enterprise, the sooner the supplier delivers the products to the demander, the more advantageous the demander is? Another simulation shows a surprising result, when the simulation specified the delivery time in days instead of rate. The result is as Figure 7:

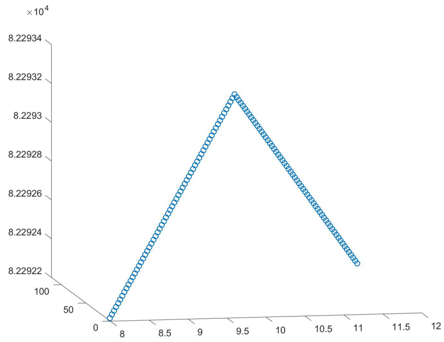


Figure 7. Three-dimensional graph of value function of 120 suppliers under d_i variation.

In the figure of delivery rate and value function, it can be found that the delivery date has a modest impact on the demand enterprise's long-term gains. However, it undoubtedly has an effect on the optimal decision. The outcome demonstrates that the supplier will be more competitive if its delivery date is closer to the delivery date demanded by the demand enterprise because the long-term gains will be greater. Therefore, the on time delivery rate refers to if the supplier's delivery time is close to the demanded time, in the case that it does not cause extra loss for the demander. Sometimes, suppliers deliver products much earlier than the appointed time, which hence causes a loss for the demander. This problem is caused by premature delivery, which results in product detention and raises the cost of inventory for the demand enterprise. On the other hand, late delivery of products will result in an inadequate supply of products for demand enterprises, which interrupts the normal processing, and the use and subsequent sales of products, lengthening the demand enterprises' period of capital return and resulting in the loss of profits.

In China, the elderly care patterns mainly include home elderly care, community elderly care, and institutional elderly care. As a result, a large number of purchases of smart elderly products in addition to the dealer is by elderly institutions or the community. Premature delivery of non-urgent elderly products, such as daily necessities, will result in insufficient storage space in the community and require additional renting of storage space, resulting in additional costs. This is because community elderly institutions are generally located in residential communities, which typically have less space to store goods.

Additionally, China currently encourages medical and nursing elderly care; consequently, the elderly care institutions are always equipped with a large amount of medical equipment. Additionally, the products must be provided on time or as soon as possible if the medical monitoring equipment for the elderly should be updated, necessitating institutions' immediate need to pick up medical equipment, physical health testing equipment, etc. At this time, the supplier who can deliver goods as quickly as possible will be more advantaged.

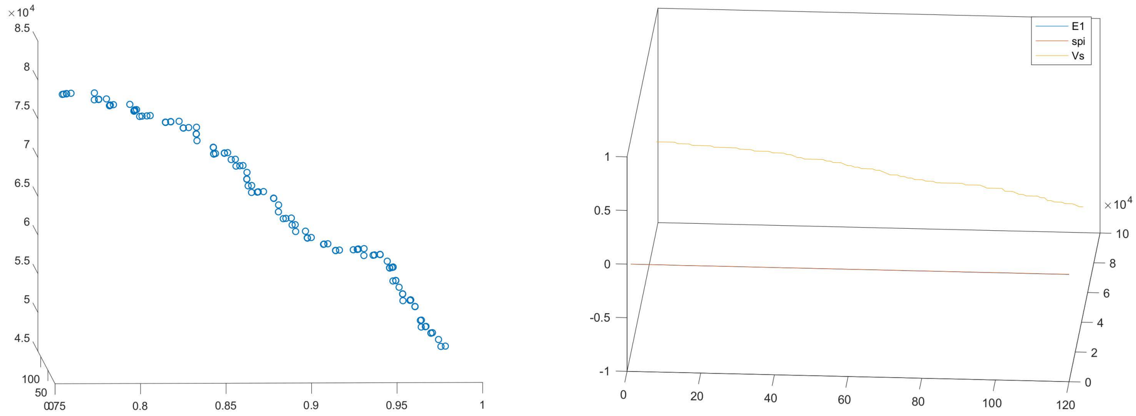
5.2. Simulation of Specific Indexes

As mentioned above, the elderly customers have more demands that are distinct from those of typical customers. When people enter an old stage, their body's functioning has significantly diminished. The degradation of hearing, vision, touch, and environment-related-reactions is particularly pronounced, and psychological needs are comparatively high. As a result, some technical evaluation indexes, such as security, legibility, operability, and comfort are more strictly required.

The safety of products for the elderly must be guaranteed first since they are unable to respond rapidly to situations and lack the capacity to handle accidents. Moreover, nowadays, the packaging and operation of products have become more complex with the development of technology, which make it harder for the elderly to operate. Therefore, the elderly manufacturer should notice that the package and operation of the products should be more concise, convenient, and text instructions should also be clearer and understandable for the elderly. Hence, in this chapter, a simulation was conducted on some main technical indexes; namely, security (E_1) and operability (E_3).

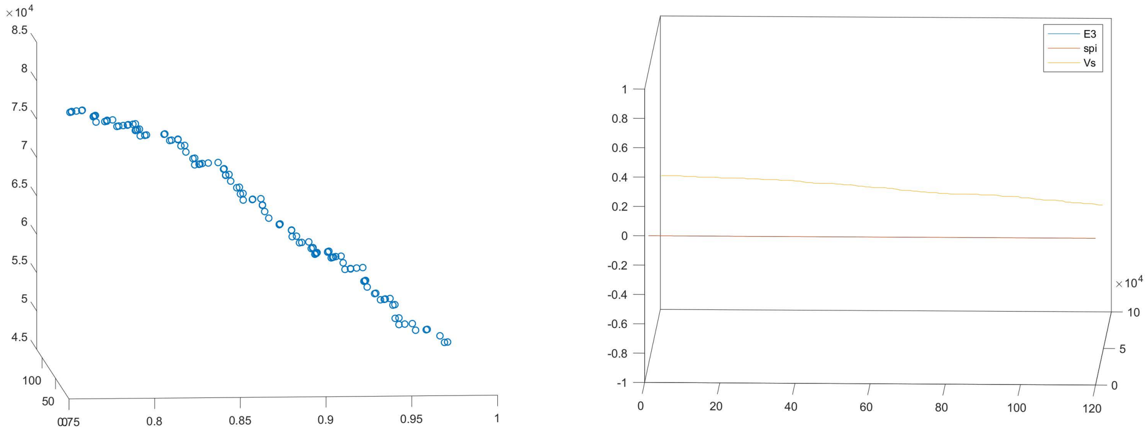
From Figures 8 and 9, it can be found that security (E_1) and operability (E_3) all have positive correlations with $V(s)$. For the elderly manufacturer, suppliers will be more competitive if their products are safer and more operable. It is the same as some other properties of products, such as legibility, comfort, toxicity, anti-broken performance, and mechanical movement hazard. Products provided by suppliers should be more legible, comfortable, and less toxic. In the face of accidents, it is required that the anti-broken performance of the product is better, so as to ensure the personal safety of the elderly and the people around them. In this sense, the functional attributes of elderly products are far more essential than the ordinary attributes, hence, the functional attributes are more competitive and can benefit the elderly demander more. If the elderly products, such as smartphones, smart rehabilitation devices, and physical health detectors, can be designed better to fit the physical state and needs of the elderly, they will be more competitive.

The acceleration of aging in China has led to a sharp increase in the number of elderly population pension products and services, which have lagged in development, and have hence become a more intractable problem. Moreover, it has become vital to figure out how to deal with the efficiency issue of China's pension service. The electronic selection system proposed in this paper can help pension service institutions assess the supply qualifications of various suppliers, thoroughly assess pension products and suppliers in terms of price, quantity, product attributes, and degree of age-appropriateness, and more quickly and accurately select suppliers that can bring maximum benefits for pension service institutions.



(**a**) (**b**)

Figure 8. (**a**) Three-dimensional graph of value function of 120 suppliers under $E_{1'}$s variation; (**b**) Multiple-sequence diagrams of value functions of 120 suppliers under $E_{1'}$s variation.



(**a**) (**b**)

Figure 9. (**a**) Three-dimensional graph of value function of 120 suppliers under $E_{3'}$s variation; (**b**) Multiple-sequence diagrams of value functions of 120 suppliers under $E_{3'}$s variation.

5.3. Result Analysis

To examine the relationship between the primary indexes in the supplier's quotation and the long-term gains of the elderly demand enterprises, a numerical simulation was conducted. According to the simulation results, the price and quantity both exhibit a clear negative correlation linear relationship with long-term gains, whereas the major indexes in the quotation are directly related to the long-term profits of the demand firms. However, the delivery time was different from the price and quantity. The advantageous thing is that suppliers can deliver products according to demand enterprises' needs. Being faster does not mean better. Products being delivered too early may cause a loss for demand enterprises due to overstocking. Furthermore, compared with the delivery date, the quantity and price of the products have a greater impact on long-term gains of demand enterprises than the delivery date, which causes long-term benefits to fluctuate more significantly. For demand enterprises, they can modify the unsatisfactory parameters in quotations in accordance with simulation findings and analysis based on the optimal decision. The actual delivery date of products is easily affected by force majeure. To avoid the effects on the normal use or sales of products, demand enterprises should reserve additional emergency products when predicting the demand. For suppliers, they can adjust the quantity and price in quotations according to the result to enhance their competitive advantage. If supplier's financial strength permits, it can adopt a cost-leading strategy, which takes the price as its main competitive advantage to win the competition. Supplier's enterprise credibility depends on supplier's historical transaction completion, which is verified by demand enterprises through the Blockchain, and suppliers cannot tamper with it. Therefore, the only way to improve their credibility is to ensure the stability of their own historical transaction logistics, on-time delivery rate and after-sales service, establish a good transaction record, and create a competitive advantage for future transactions. It was also discovered that technical factors such as security, legibility, operability, and toxicity have positive correlations with the elderly demand enterprises. In elderly supply chains, the requirements for products are different from traditional supply chain due to the weakened body and organ functions of the elderly. The old have both stricter physical and psychological requirements, such as louder, simpler to operate, and larger, clearer lettering on the products. Additionally, specific indexes are, in some ways, more significant than common indexes such as price, quantity, and delivery time. Hence, the supplier should pay more attention to these specific indicators and increase their competitiveness on these aspects.

This model works well for selecting manufacturers and suppliers for agile manufacturing and is particularly appropriate for large-scale and high-volume production enterprises, or manufacturing enterprises with many daily purchases. It can connect various kinds of enterprises through the distributed structure, dynamically select members in virtual manufacturing environments based on the principle of competition and cooperation, and form a task-oriented virtual company for rapid production cooperation. However, manufacturing enterprises with small-batch production and those which make customized products have relatively small demands for products. Thus, they have less frequent and smaller purchases in each period compared to the enterprise with mass production, so it is difficult to obtain the purchase advantage in price for them. Therefore, when using this model, it is suggested to appropriately extend the length of each procurement period and reduce the frequency of procurement.

6. Conclusions

At present, China's aging industry, which is relatively backward in development, has become more challenging with China's fast growing older population. The emergence of smart elderly care exactly gives the desperate situation some vitality. For the elderly care industry, there are currently significant issues with the supply and demand of domestic elderly products. For instance, the imbalance between supply and demand prevents the demander from locating a stable and reliable supplier who can provide high-quality products and long-term earnings, and the knowledge gap between them makes it impossible for them to swiftly compare their qualifications. To address this issue, a machine learning algorithm is added to the supply and demand of traditional pension services from the viewpoint of smart elderly care, to create a high-quality and high-efficiency smart elderly supply chain underlying the innovation and development of smart elderly care services and broaden the scope of the elderly research.

Hence, this paper looked at how to choose resource selection more effectively in the elderly manufacturing industry and how to select the optimal supplier for demand enterprises through an e-procurement system in the elderly supply chain. Further, it applied the theory of supply chains to the elderly supply chain according to the actual situation of the elderly products, making up for the fact that the previous research only examined supplier selection in traditional supply chains, which makes it an innovation for the study of elderly products. The main contribution of the model lies in the application of the modified MDP model and the index weight assessment system in the elderly care supply chain, which prompt the digitalization of elderly industry. The contribution of this paper to the improved model is as follows: (1) In the modified MDP model, it redefined state variables and added it to a new quintuple, increasing the dimension of constraint, effectively reducing the space of the solution. (2) A new state transition function and a new index assessment system are proposed, combining some specific indexes fitting to the elderly's demands to complete a real measurement of the elderly suppliers. (3) This model can go through every value of V(s) to find the global best solution, resolving the limitations of the PSO algorithm in that it can only find local best solutions and the blind search and time-consuming early stages of the ACO algorithm. (4) The e-procurement system takes Blockchain as an information identification platform, the decentralization and non-tampering of Blockchain make suppliers' information transparent and increase the reliability of decision-making.

This study has certain restrictions as well. The model proposed in this paper examines the uniliteral choice of one elderly demand enterprise to numerous suppliers. With the rising demands for elderly products, it needs swifter and more accurate selection systems to help demanders and suppliers choose each other. Hence, in later research, we will concentrate on the dynamic bidirectional selection model between elderly demand enterprises and suppliers.

Author Contributions: Conceptualization, S.Q. and M.Z.; methodology, S.Q.; software, S.Q.; validation, S.Q. and H.H.; formal analysis, S.Q.; investigation, S.Q.; resources, S.Q. and Y.W.; data curation, S.Q.; writing—original draft preparation, S.Q.; writing—review and editing, S.Q.; visualization, S.Q.; supervision, S.Q.; project administration, M.Z.; funding acquisition, M.Z. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Suppliers' feedback in the first period.

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
1	0.65	0.93	80.67%	89.22%	91.52%	0.66	0.65	97.32%	12	63.46%	4	51.29%	11.12%	8%	2	97.31%	76.73%	92.02%	87.35%	94.40%	81.13%	97.23%
2	0.55	0.97	89.64%	85.59%	94.47%	0.59	0.71	92.90%	13	66.65%	6	34.29%	10.08%	8%	4	76.28%	95.02%	79.20%	81.44%	90.81%	84.67%	80.06%
3	0.55	0.97	92.56%	85.89%	99.90%	0.51	0.71	96.66%	17	59.54%	3	31.52%	9.27%	12%	4	95.81%	76.54%	89.64%	87.91%	78.58%	83.26%	85.97%
4	0.68	0.97	81.18%	91.11%	94.58%	0.88	0.86	93.56%	11	69.67%	5	44.73%	13.20%	15%	5	86.45%	85.36%	94.78%	75.80%	87.83%	94.59%	89.11%
5	0.69	0.93	83.66%	96.11%	99.31%	0.57	0.71	97.69%	3	51.94%	5	35.54%	13.71%	9%	5	90.68%	93.45%	84.84%	79.31%	92.32%	95.37%	87.20%
6	0.59	0.97	90.55%	96.74%	94.17%	0.77	0.65	98.87%	16	62.19%	5	54.88%	13.76%	13%	3	89.46%	79.59%	94.77%	91.46%	87.93%	94.00%	94.05%
7	0.46	1.00	88.83%	94.49%	93.94%	0.80	0.83	92.20%	18	62.43%	5	51.25%	12.97%	12%	3	78.14%	87.61%	88.36%	75.81%	87.21%	90.41%	92.67%
8	0.64	1.00	82.56%	98.71%	95.55%	0.78	0.63	90.72%	21	68.58%	4	49.82%	13.63%	10%	4	93.39%	90.47%	90.83%	76.66%	82.02%	76.54%	81.61%
9	0.56	0.97	86.01%	95.52%	90.14%	0.62	0.73	97.79%	29	73.69%	3	35.03%	13.22%	9%	2	75.18%	82.39%	88.95%	97.89%	85.54%	97.64%	91.83%
10	0.66	0.93	84.56%	85.78%	93.91%	0.72	0.74	93.30%	14	60.58%	5	38.79%	13.69%	11%	3	76.91%	75.52%	96.58%	76.83%	86.95%	84.15%	90.13%
11	0.52	0.97	89.04%	89.38%	95.22%	0.52	0.65	94.90%	73	74.72%	5	42.73%	12.35%	8%	5	93.81%	82.84%	93.55%	84.67%	89.20%	86.35%	82.53%
12	0.65	0.97	84.19%	97.03%	91.27%	0.52	0.74	90.54%	50	68.80%	4	31.85%	13.49%	11%	5	93.06%	95.58%	87.67%	80.50%	94.06%	94.13%	85.69%
13	0.59	0.97	88.98%	92.83%	90.50%	0.65	0.64	95.07%	70	56.63%	5	39.02%	10.57%	11%	5	89.37%	75.87%	88.76%	96.92%	79.89%	93.21%	75.40%
14	0.54	1.00	88.42%	86.31%	97.63%	0.75	0.69	98.29%	74	55.58%	6	35.27%	11.10%	9%	2	76.77%	79.99%	79.34%	88.60%	81.94%	76.47%	90.53%
15	0.48	0.97	83.31%	94.49%	99.07%	0.89	0.78	90.57%	78	67.92%	3	41.75%	9.97%	10%	4	92.23%	93.38%	92.00%	82.38%	86.47%	83.62%	78.86%
16	0.46	0.93	91.78%	97.63%	91.09%	0.88	0.76	94.70%	48	59.31%	3	50.99%	10.92%	14%	4	88.84%	75.21%	80.42%	75.88%	86.13%	89.65%	75.82%
17	0.58	0.97	84.65%	87.16%	96.75%	0.58	0.67	94.96%	9	59.49%	3	42.66%	13.49%	13%	3	90.08%	92.95%	87.66%	97.33%	76.68%	79.67%	93.38%
18	0.69	1.00	92.40%	91.33%	93.32%	0.79	0.71	97.69%	5	72.99%	5	59.31%	11.00%	11%	5	78.06%	83.21%	80.48%	80.96%	88.67%	90.17%	77.20%
19	0.69	0.97	94.79%	91.84%	93.42%	0.58	0.76	96.67%	56	65.35%	4	40.29%	10.09%	14%	4	81.82%	86.46%	79.57%	92.07%	77.46%	86.32%	77.35%
20	0.65	0.97	91.51%	88.97%	97.87%	0.64	0.66	95.54%	53	67.92%	6	40.35%	10.23%	14%	3	75.42%	96.47%	85.54%	90.79%	92.29%	79.22%	96.69%
21	0.50	0.97	87.29%	93.05%	90.73%	0.61	0.84	91.28%	23	52.15%	4	58.19%	9.79%	9%	2	86.18%	96.03%	82.78%	93.42%	93.80%	80.16%	76.89%
22	0.65	1.00	93.16%	88.92%	92.30%	0.75	0.82	90.54%	77	54.32%	4	50.88%	10.33%	8%	2	78.86%	88.16%	94.19%	87.07%	77.23%	84.95%	87.13%
23	0.51	1.00	84.83%	96.26%	94.26%	0.73	0.80	99.00%	7	65.76%	5	35.86%	10.47%	8%	3	90.99%	75.72%	81.72%	92.79%	96.53%	88.48%	77.76%
24	0.66	0.97	91.27%	91.80%	92.00%	0.75	0.79	93.11%	10	73.70%	5	52.00%	11.08%	10%	3	88.18%	79.18%	82.41%	77.69%	78.71%	86.22%	79.76%
25	0.47	0.93	92.84%	91.85%	89.77%	0.58	0.63	93.90%	8	62.89%	5	38.71%	10.89%	13%	2	92.99%	90.35%	78.51%	87.10%	92.43%	84.44%	94.91%
26	0.64	0.97	83.37%	87.52%	96.95%	0.51	0.77	97.13%	34	50.95%	5	38.18%	10.59%	10%	4	93.11%	82.54%	89.83%	96.20%	92.19%	75.27%	92.70%
27	0.67	0.97	92.01%	92.92%	98.04%	0.55	0.63	90.48%	33	71.87%	3	39.25%	10.17%	14%	4	95.41%	81.50%	84.96%	80.51%	78.69%	90.28%	82.74%
28	0.65	0.93	92.67%	88.13%	98.45%	0.66	0.82	92.13%	75	51.46%	4	41.05%	12.23%	15%	2	87.38%	91.82%	87.06%	85.23%	86.40%	87.92%	96.42%
29	0.56	1.00	90.89%	96.46%	89.55%	0.55	0.67	95.48%	71	64.66%	6	30.06%	12.25%	13%	3	89.34%	83.04%	87.97%	87.31%	95.77%	78.04%	86.71%
30	0.60	0.93	85.15%	97.33%	98.27%	0.55	0.62	93.29%	16	70.09%	5	51.21%	9.69%	14%	3	86.35%	92.30%	78.98%	81.25%	94.20%	86.28%	78.51%
31	0.63	0.93	81.73%	87.16%	89.94%	0.77	0.79	98.68%	79	68.48%	4	31.50%	9.10%	14%	2	84.34%	90.25%	80.47%	97.09%	88.56%	89.40%	80.48%
32	0.50	1.00	95.48%	90.41%	92.16%	0.68	0.62	93.42%	6	68.20%	5	50.45%	12.74%	10%	4	92.31%	80.88%	79.87%	88.28%	87.22%	78.08%	90.06%
33	0.56	0.97	95.36%	91.19%	94.33%	0.86	0.66	97.84%	62	54.16%	4	52.54%	9.69%	9%	4	82.83%	76.55%	94.08%	97.37%	81.05%	80.33%	80.88%
34	0.58	0.97	90.08%	86.38%	94.43%	0.85	0.75	91.46%	2	73.10%	4	42.77%	13.97%	10%	3	90.35%	78.25%	80.78%	77.10%	87.69%	76.33%	82.91%

Table A1. *Cont.*

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
35	0.47	0.97	95.52%	89.56%	90.78%	0.76	0.81	97.42%	58	51.51%	4	51.34%	13.81%	13%	5	79.15%	90.43%	76.85%	92.79%	75.21%	78.27%	81.98%
36	0.65	0.97	82.36%	91.53%	93.51%	0.72	0.86	97.08%	12	53.85%	5	48.11%	13.46%	11%	2	78.87%	88.30%	82.37%	77.58%	75.53%	78.77%	94.98%
37	0.52	0.97	80.83%	96.23%	96.96%	0.88	0.63	97.89%	27	66.65%	6	41.60%	11.06%	14%	2	86.14%	77.55%	92.59%	90.02%	82.05%	80.35%	81.46%
38	0.52	1.00	87.03%	87.81%	95.94%	0.87	0.87	91.72%	27	72.39%	5	33.97%	13.73%	12%	2	87.37%	95.11%	95.49%	89.58%	80.52%	82.56%	95.61%
39	0.63	0.93	91.51%	93.22%	91.95%	0.83	0.87	96.82%	19	58.66%	4	50.42%	11.73%	14%	4	93.11%	85.92%	84.08%	80.66%	79.82%	91.36%	78.18%
40	0.57	0.93	94.65%	87.88%	99.52%	0.80	0.84	93.44%	29	51.45%	3	40.59%	13.21%	11%	3	86.71%	84.94%	88.46%	80.91%	91.08%	90.37%	84.45%
41	0.71	0.93	80.67%	90.31%	93.48%	0.82	0.85	91.69%	18	67.45%	5	47.04%	9.31%	13%	4	91.24%	81.85%	95.42%	91.69%	82.74%	93.91%	80.82%
42	0.71	0.97	93.26%	87.46%	95.31%	0.65	0.58	96.96%	15	53.19%	6	36.69%	9.47%	12%	3	84.08%	94.05%	78.89%	93.29%	87.71%	89.48%	84.70%
43	0.58	0.97	92.08%	85.64%	90.99%	0.78	0.65	97.98%	57	71.42%	6	45.95%	11.29%	8%	3	85.25%	84.09%	88.24%	87.11%	95.06%	80.92%	85.66%
44	0.52	0.93	86.84%	93.88%	90.23%	0.60	0.65	97.81%	24	52.20%	4	41.38%	9.59%	9%	3	97.54%	86.72%	79.75%	81.48%	82.79%	87.40%	96.36%
45	0.47	1.00	87.00%	98.20%	91.17%	0.56	0.87	97.14%	26	57.05%	6	30.17%	13.31%	13%	4	96.14%	90.27%	79.83%	94.34%	82.87%	84.43%	90.63%
46	0.69	1.00	88.24%	89.79%	92.35%	0.57	0.85	96.55%	28	60.12%	6	36.03%	12.53%	10%	4	75.06%	75.74%	76.16%	77.58%	76.85%	96.23%	79.77%
47	0.57	0.97	85.18%	88.46%	90.51%	0.59	0.68	96.40%	47	61.01%	5	44.02%	12.19%	10%	3	94.04%	80.59%	88.28%	83.89%	94.12%	88.19%	89.02%
48	0.60	0.97	91.22%	97.35%	90.37%	0.57	0.61	96.23%	32	65.45%	4	54.47%	11.85%	9%	5	79.97%	83.38%	87.00%	94.63%	94.14%	80.08%	78.95%
49	0.73	0.97	80.41%	95.09%	94.12%	0.65	0.83	96.01%	43	59.24%	3	59.90%	10.30%	12%	5	82.89%	78.77%	78.27%	87.93%	95.62%	82.18%	77.74%
50	0.64	0.97	93.12%	96.64%	89.73%	0.88	0.65	90.52%	40	71.15%	5	42.42%	13.19%	14%	4	80.45%	94.14%	77.56%	95.43%	89.15%	77.21%	78.03%

Table A2. Suppliers' feedback in the second period.

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
1	0.47	0.97	84.97%	96.51%	93.48%	0.76	0.89	98.80%	51	58.97%	4	54.66%	9.33%	10.33%	4	82.24%	85.98%	77.30%	86.34%	96.90%	81.89%	97.53%
2	0.70	0.93	94.11%	92.93%	94.24%	0.6	0.83	98.18%	8	52.64%	4	41.58%	13.74%	14.59%	4	87.69%	95.41%	77.29%	75.41%	84.30%	79.80%	80.10%
3	0.46	0.93	90.41%	97.68%	96.49%	0.56	0.9	97.92%	48	61.07%	4	34.28%	11.49%	8.52%	2	95.27%	90.97%	91.63%	93.57%	88.53%	97.74%	95.74%
4	0.51	0.97	84.07%	93.42%	97.67%	0.9	0.66	95.11%	45	65.12%	4	35.44%	11.55%	8.42%	4	79.82%	79.91%	89.46%	91.98%	86.57%	97.52%	85.88%
5	0.46	1.00	87.95%	97.73%	95.47%	0.82	0.68	98.92%	41	73.46%	5	45.61%	9.23%	13.08%	3	88.16%	84.50%	93.53%	77.19%	82.47%	92.05%	85.50%
6	0.51	0.97	91.13%	86.51%	94.67%	0.82	0.77	93.67%	54	69.91%	4	48.77%	9.95%	11.65%	4	78.16%	92.87%	79.43%	87.71%	88.92%	93.57%	91.71%
7	0.65	0.97	90.04%	90.91%	97.37%	0.83	0.62	95.34%	57	55.97%	4	51.39%	12.78%	11.55%	3	84.05%	75.87%	80.15%	81.26%	95.71%	84.86%	82.64%
8	0.48	0.97	82.31%	98.70%	98.00%	0.88	0.55	98.29%	33	52.11%	5	49.22%	11.75%	14.64%	5	89.75%	77.41%	75.57%	75.22%	81.37%	88.31%	86.10%
9	0.69	0.97	85.13%	98.53%	91.77%	0.57	0.81	97.98%	60	61.04%	4	34.38%	11.13%	8.63%	3	77.50%	87.57%	97.21%	87.30%	91.25%	93.65%	96.62%
10	0.48	0.93	88.23%	92.31%	91.47%	0.78	0.67	97.00%	39	54.24%	5	43.14%	10.36%	9.84%	4	81.83%	91.43%	79.06%	95.01%	75.09%	80.03%	77.31%
11	0.63	0.93	94.10%	85.29%	98.50%	0.56	0.81	95.44%	53	51.64%	6	47.01%	11.35%	13.43%	4	83.07%	95.43%	95.75%	91.17%	93.98%	94.02%	83.77%
12	0.72	0.97	95.03%	95.59%	93.00%	0.65	0.71	95.40%	38	71.42%	3	43.20%	9.34%	10.73%	3	76.40%	86.21%	84.35%	77.49%	90.72%	86.83%	86.13%
13	0.70	0.93	80.71%	89.98%	97.12%	0.83	0.81	95.02%	58	57.30%	6	33.05%	9.29%	13.96%	3	77.82%	76.67%	78.01%	79.64%	76.90%	84.02%	97.17%
14	0.54	0.97	89.87%	91.73%	98.46%	0.54	0.7	97.89%	11	72.49%	5	40.32%	12.83%	10.08%	5	96.52%	95.37%	96.77%	77.16%	87.49%	88.82%	94.08%
15	0.72	0.93	87.22%	89.46%	99.95%	0.59	0.55	91.71%	5	57.86%	5	51.55%	9.60%	13.08%	4	95.86%	92.71%	82.40%	82.85%	77.96%	75.72%	76.75%

Table A2. *Cont.*

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
16	0.56	0.93	86.20%	89.78%	93.15%	0.85	0.78	97.78%	32	55.99%	3	53.02%	13.27%	8.97%	4	79.05%	85.39%	89.66%	78.96%	88.60%	82.03%	96.19%
17	0.63	0.97	94.29%	98.00%	97.58%	0.69	0.75	97.70%	9	62.63%	4	53.45%	9.90%	11.10%	4	90.13%	87.49%	96.33%	80.82%	82.69%	76.39%	79.64%
18	0.65	0.93	95.45%	92.14%	97.30%	0.87	0.6	96.11%	49	63.33%	4	32.62%	11.49%	14.46%	2	81.40%	87.62%	76.35%	77.89%	81.34%	77.89%	83.71%
19	0.53	0.97	92.56%	98.90%	93.00%	0.81	0.55	97.73%	36	52.24%	4	59.89%	9.73%	9.85%	3	82.63%	92.81%	76.41%	93.17%	94.60%	94.28%	87.25%
20	0.48	1.00	87.71%	90.70%	97.66%	0.53	0.63	92.47%	4	73.34%	5	46.38%	11.23%	14.77%	3	96.47%	75.96%	96.01%	81.60%	92.90%	93.24%	77.33%
21	0.47	0.97	91.18%	98.49%	91.41%	0.62	0.76	93.98%	14	72.82%	4	44.37%	9.23%	13.26%	2	84.01%	78.23%	80.01%	92.51%	89.92%	79.13%	92.89%
22	0.73	0.97	84.20%	92.75%	94.21%	0.59	0.68	98.19%	8	60.66%	6	43.54%	13.97%	14.26%	2	96.75%	80.91%	81.03%	83.87%	95.21%	82.03%	79.12%
23	0.70	0.97	83.78%	92.51%	99.20%	0.61	0.71	92.16%	58	68.18%	6	55.27%	10.50%	13.52%	3	85.97%	91.10%	85.45%	77.47%	85.71%	75.92%	94.00%
24	0.65	0.97	95.23%	96.08%	94.90%	0.66	0.77	98.61%	10	56.64%	5	31.00%	10.51%	10.51%	3	96.28%	94.45%	89.45%	85.23%	86.07%	82.62%	80.92%
25	0.69	0.93	90.45%	85.91%	91.19%	0.59	0.59	91.87%	31	64.32%	3	47.77%	12.58%	11.96%	3	94.90%	94.42%	88.88%	96.56%	85.63%	87.38%	85.44%
26	0.63	0.97	82.45%	90.07%	91.03%	0.72	0.61	90.71%	17	64.89%	6	40.27%	9.25%	14.85%	2	81.59%	80.07%	93.44%	79.40%	83.27%	88.41%	82.91%
27	0.63	1.00	80.99%	94.26%	93.06%	0.88	0.66	91.15%	11	63.00%	5	30.27%	9.39%	14.01%	3	78.85%	82.60%	94.44%	90.86%	77.60%	78.23%	91.83%
28	0.47	0.97	84.60%	97.73%	93.40%	0.62	0.66	91.37%	48	64.00%	5	36.41%	11.51%	9.37%	4	87.85%	75.95%	78.08%	89.21%	97.23%	90.78%	76.29%
29	0.53	1.00	87.98%	92.90%	94.76%	0.68	0.88	91.73%	52	67.91%	6	52.00%	13.96%	12.72%	4	90.60%	82.72%	79.26%	76.30%	84.65%	89.78%	84.77%
30	0.56	0.97	95.23%	96.35%	98.32%	0.58	0.71	97.56%	38	69.20%	3	56.12%	9.87%	11.35%	2	90.27%	76.03%	80.18%	97.68%	88.33%	75.47%	84.32%
31	0.55	1.00	89.79%	95.36%	97.46%	0.8	0.87	97.29%	26	72.92%	6	49.34%	9.89%	8.59%	4	81.70%	82.79%	77.69%	79.67%	84.16%	76.44%	97.79%
32	0.62	0.97	80.18%	91.11%	91.07%	0.54	0.64	90.37%	23	52.49%	4	58.92%	12.75%	11.48%	5	81.16%	95.61%	89.64%	89.43%	75.85%	75.04%	86.06%
33	0.49	0.93	87.03%	90.59%	91.46%	0.5	0.62	98.78%	58	74.38%	6	33.64%	9.79%	11.45%	4	76.57%	97.33%	91.96%	86.80%	94.14%	80.20%	79.17%
34	0.48	0.93	90.36%	96.63%	99.26%	0.77	0.85	93.52%	15	74.93%	4	59.67%	12.45%	12.69%	3	83.06%	91.48%	90.49%	83.10%	80.68%	85.04%	94.21%
35	0.53	0.93	87.07%	95.69%	94.48%	0.88	0.57	96.61%	32	67.16%	3	55.60%	12.78%	13.70%	2	80.88%	78.26%	87.12%	80.98%	86.44%	92.21%	78.99%
36	0.62	1.00	86.55%	90.83%	96.74%	0.75	0.83	93.85%	12	62.75%	4	56.08%	11.69%	11.37%	2	77.39%	79.19%	91.46%	94.74%	87.92%	82.82%	91.86%
37	0.53	0.93	90.40%	98.75%	96.41%	0.8	0.64	93.64%	3	56.91%	5	55.08%	10.72%	14.34%	2	93.97%	85.61%	88.34%	85.60%	75.30%	75.60%	90.28%
38	0.59	0.97	85.22%	92.08%	97.86%	0.52	0.88	92.63%	47	65.27%	4	48.07%	9.12%	10.51%	5	88.38%	82.45%	91.03%	77.02%	75.26%	83.47%	84.45%
39	0.52	0.93	81.83%	93.17%	95.77%	0.52	0.77	98.99%	41	53.59%	4	36.66%	9.91%	13.10%	4	82.16%	77.08%	77.86%	77.44%	90.44%	95.05%	84.69%
40	0.61	0.97	91.29%	91.39%	92.03%	0.68	0.65	95.60%	30	64.38%	3	60.00%	11.32%	8.39%	2	90.61%	86.40%	79.03%	81.57%	97.28%	87.22%	84.90%
41	0.72	0.93	87.95%	86.16%	93.44%	0.83	0.73	95.01%	35	68.64%	5	46.31%	11.63%	11.69%	5	92.25%	97.36%	88.63%	85.57%	95.15%	96.95%	94.27%
42	0.72	1.00	82.97%	85.19%	95.33%	0.77	0.88	96.41%	22	64.97%	4	39.97%	9.66%	13.27%	4	87.21%	80.41%	77.05%	97.53%	87.14%	93.92%	80.64%
43	0.68	0.97	85.48%	85.11%	95.10%	0.89	0.66	93.52%	7	53.40%	6	51.00%	9.69%	10.52%	3	90.02%	82.46%	82.18%	81.87%	77.24%	97.49%	79.38%
44	0.62	0.93	84.14%	86.49%	96.40%	0.84	0.76	90.92%	23	65.99%	3	42.88%	11.60%	11.24%	3	79.02%	86.35%	95.52%	88.16%	91.20%	86.81%	95.40%
45	0.68	0.93	93.27%	93.31%	90.90%	0.55	0.8	97.93%	19	59.04%	5	37.07%	13.90%	11.14%	2	84.63%	93.39%	96.66%	86.85%	97.45%	89.63%	81.01%
46	0.61	1.00	80.93%	87.08%	93.58%	0.89	0.82	96.92%	42	63.47%	4	33.38%	11.33%	10.41%	4	79.36%	86.78%	94.65%	79.84%	78.20%	78.60%	97.74%
47	0.61	0.97	87.90%	93.76%	98.97%	0.72	0.75	92.50%	19	68.80%	5	45.48%	10.14%	13.42%	3	82.33%	76.35%	90.00%	76.31%	84.58%	77.92%	76.80%
48	0.53	0.93	83.75%	89.84%	99.10%	0.54	0.8	95.97%	51	73.10%	5	54.62%	11.64%	9.18%	4	83.05%	82.01%	86.03%	92.40%	75.42%	75.48%	91.53%
49	0.65	0.97	82.03%	89.64%	98.23%	0.68	0.57	94.95%	38	54.91%	4	37.24%	13.77%	9.19%	4	82.10%	80.65%	78.77%	92.66%	81.29%	75.13%	87.61%
50	0.46	0.97	89.04%	94.46%	90.14%	0.54	0.55	92.23%	34	57.29%	3	39.34%	10.59%	11.91%	4	97.26%	98.00%	78.22%	96.93%	83.01%	80.58%	91.42%

Table A3. Suppliers' feedback in the second period.

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
1	0.53	1.00	87.98%	95.56%	99.84%	0.64	0.56	92.46%	30	52.01%	5	54.14%	9.60%	10.15%	5	81.63%	76.43%	88.36%	95.75%	93.14%	84.77%	80.99%
2	0.49	0.93	86.13%	87.22%	91.19%	0.71	0.79	90.87%	39	64.29%	3	44.98%	11.54%	13.49%	4	92.46%	90.84%	88.79%	80.89%	96.19%	87.26%	84.57%
3	0.69	0.93	95.34%	88.91%	95.85%	0.8	0.77	93.42%	23	63.68%	3	34.79%	10.07%	12.61%	3	75.66%	84.88%	91.56%	94.13%	84.30%	96.44%	94.52%
4	0.66	0.97	93.40%	93.82%	92.65%	0.61	0.6	98.06%	24	59.00%	5	58.18%	9.16%	13.55%	5	87.84%	86.06%	94.68%	92.07%	86.42%	77.13%	81.86%
5	0.45	0.93	95.00%	98.32%	99.22%	0.72	0.85	94.33%	26	69.77%	5	53.60%	12.18%	9.50%	3	84.78%	90.34%	97.57%	86.48%	81.70%	79.79%	82.13%
6	0.65	1.00	83.06%	90.96%	94.26%	0.6	0.66	91.22%	15	55.38%	5	35.19%	13.81%	12.57%	3	83.85%	84.10%	97.55%	78.81%	82.23%	95.24%	97.17%
7	0.50	1.00	95.56%	88.34%	90.87%	0.77	0.62	96.87%	7	72.96%	5	56.95%	9.94%	10.91%	3	80.39%	82.71%	77.40%	80.63%	89.20%	77.17%	88.56%
8	0.61	1.00	90.88%	86.53%	95.62%	0.7	0.87	96.87%	27	58.61%	3	45.74%	13.65%	8.02%	2	89.14%	91.08%	93.32%	95.01%	82.56%	95.15%	81.44%
9	0.55	0.93	87.95%	93.49%	92.37%	0.7	0.76	90.27%	44	66.23%	5	55.23%	10.05%	13.77%	3	78.13%	79.42%	89.20%	82.55%	97.31%	87.49%	93.39%
10	0.63	0.93	93.69%	92.03%	92.36%	0.82	0.59	95.26%	38	67.02%	6	56.80%	12.36%	10.80%	2	84.45%	80.71%	83.29%	84.04%	75.69%	97.70%	77.41%
11	0.71	0.97	83.32%	86.76%	95.48%	0.65	0.86	92.78%	22	56.75%	5	59.35%	9.24%	12.81%	4	91.75%	90.26%	93.07%	83.96%	92.40%	96.11%	81.89%
12	0.50	1.00	90.46%	90.55%	94.07%	0.82	0.7	97.52%	2	65.78%	6	39.33%	10.54%	14.02%	4	94.86%	83.36%	92.02%	90.26%	87.69%	96.87%	77.26%
13	0.70	0.93	87.27%	89.75%	90.44%	0.57	0.79	94.13%	60	71.47%	5	59.06%	11.60%	11.54%	5	88.35%	92.43%	86.67%	81.96%	91.62%	80.11%	97.10%
14	0.58	0.97	90.26%	97.88%	92.53%	0.69	0.74	91.59%	43	63.30%	4	48.83%	12.73%	12.38%	2	80.59%	87.07%	81.53%	84.87%	76.53%	87.61%	78.63%
15	0.65	0.97	85.12%	95.88%	92.26%	0.74	0.8	90.94%	19	74.12%	4	52.85%	10.26%	10.51%	2	81.98%	89.10%	96.83%	79.33%	88.23%	80.63%	78.93%
16	0.66	0.93	87.83%	94.42%	97.25%	0.85	0.66	91.72%	38	53.74%	5	32.63%	12.29%	10.92%	5	75.65%	89.20%	94.16%	86.07%	75.07%	83.00%	94.02%
17	0.63	0.93	89.18%	86.85%	91.85%	0.72	0.82	98.56%	35	57.47%	6	56.99%	12.04%	13.42%	5	94.86%	96.15%	78.48%	79.91%	95.47%	94.20%	91.06%
18	0.54	0.93	96.00%	89.56%	94.72%	0.83	0.73	91.23%	31	52.94%	5	50.91%	11.21%	12.59%	5	84.43%	76.43%	90.62%	93.58%	93.83%	96.14%	95.25%
19	0.72	0.97	80.51%	93.27%	90.88%	0.65	0.71	94.36%	52	57.60%	4	58.47%	11.07%	10.02%	2	92.68%	94.49%	97.96%	81.45%	79.76%	78.30%	96.96%
20	0.57	1.00	95.49%	86.83%	95.64%	0.87	0.75	92.82%	24	59.73%	4	37.13%	11.71%	9.32%	5	85.59%	82.92%	77.31%	82.14%	97.14%	81.89%	87.82%
21	0.66	0.97	81.44%	97.94%	92.84%	0.59	0.62	94.04%	14	50.28%	5	58.91%	9.07%	9.22%	4	96.73%	86.26%	97.67%	88.92%	76.79%	81.73%	83.62%
22	0.54	0.93	83.91%	96.92%	97.90%	0.89	0.6	90.71%	40	51.89%	3	48.98%	10.53%	11.88%	3	76.55%	89.46%	97.92%	91.42%	78.91%	81.44%	96.60%
23	0.46	0.93	94.90%	91.19%	92.10%	0.55	0.79	93.50%	13	50.56%	4	54.46%	12.52%	9.25%	4	93.56%	78.82%	95.81%	80.47%	81.88%	84.85%	96.66%
24	0.65	0.97	83.70%	89.29%	96.99%	0.55	0.75	94.21%	32	63.20%	5	48.58%	13.62%	10.55%	4	90.66%	90.95%	81.02%	76.65%	97.10%	92.07%	82.13%
25	0.67	0.93	92.05%	91.79%	97.58%	0.64	0.75	92.31%	47	51.38%	5	32.45%	12.70%	10.76%	4	96.05%	94.10%	88.20%	82.00%	93.05%	78.66%	97.75%
26	0.59	0.97	92.21%	94.55%	92.81%	0.64	0.74	95.82%	43	51.23%	4	48.04%	12.70%	12.08%	4	77.94%	91.61%	85.08%	76.41%	96.82%	91.38%	76.78%
27	0.48	0.97	94.47%	93.03%	92.79%	0.86	0.79	95.14%	48	70.93%	5	43.16%	11.02%	12.26%	4	77.11%	90.21%	83.69%	88.77%	79.69%	79.90%	95.91%
28	0.52	0.93	88.97%	91.50%	93.30%	0.71	0.77	96.76%	56	64.15%	5	32.04%	10.01%	9.56%	2	87.64%	76.47%	76.61%	81.56%	96.51%	96.36%	76.77%
29	0.70	0.93	84.07%	90.54%	98.85%	0.57	0.79	97.21%	15	73.70%	3	57.39%	12.49%	14.37%	4	76.08%	84.09%	78.38%	84.43%	75.27%	92.45%	79.72%
30	0.71	0.97	92.62%	90.31%	92.10%	0.78	0.72	96.71%	37	59.29%	5	36.88%	12.13%	14.88%	4	85.33%	77.60%	93.72%	81.40%	94.10%	95.77%	89.95%
31	0.59	0.93	95.48%	91.41%	90.98%	0.87	0.71	95.65%	30	60.58%	5	41.42%	13.66%	14.96%	5	97.74%	82.15%	76.06%	79.98%	94.10%	96.08%	97.82%
32	0.52	0.97	81.68%	90.38%	94.53%	0.77	0.82	97.42%	43	54.02%	4	52.90%	12.95%	14.55%	5	91.58%	95.16%	89.04%	87.26%	87.02%	84.38%	90.14%
33	0.48	0.97	86.87%	93.98%	92.52%	0.87	0.76	91.31%	40	56.81%	4	58.31%	9.36%	9.04%	2	78.88%	80.43%	94.82%	86.36%	90.74%	86.93%	77.30%
34	0.66	0.93	83.14%	96.78%	90.89%	0.59	0.7	98.78%	24	65.10%	6	51.69%	10.21%	14.21%	5	87.00%	97.76%	79.08%	84.01%	89.92%	97.67%	87.90%
35	0.63	0.93	87.14%	87.46%	96.43%	0.52	0.67	98.98%	8	61.69%	5	55.22%	9.59%	11.90%	4	96.78%	75.84%	88.14%	83.12%	84.93%	86.53%	75.23%
36	0.65	0.97	82.81%	86.98%	97.16%	0.72	0.85	97.49%	27	73.38%	5	50.56%	12.07%	9.11%	4	80.23%	85.14%	78.14%	85.40%	84.11%	94.94%	75.51%
37	0.65	0.97	92.48%	98.99%	98.54%	0.76	0.63	94.79%	13	71.46%	4	53.27%	9.04%	9.39%	4	85.49%	88.01%	75.34%	95.94%	97.74%	83.22%	91.39%

Table A3. *Cont.*

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
38	0.52	1.00	81.68%	95.02%	92.01%	0.71	0.87	96.92%	54	52.93%	3	44.13%	13.22%	8.03%	3	90.55%	79.37%	78.26%	86.55%	96.97%	93.69%	77.39%
39	0.55	0.97	91.70%	94.46%	95.16%	0.79	0.79	98.77%	40	52.44%	5	52.02%	13.05%	10.19%	5	92.56%	93.37%	83.88%	95.63%	81.10%	90.14%	86.37%
40	0.53	0.97	89.28%	89.77%	95.88%	0.71	0.75	91.87%	47	73.12%	4	52.87%	10.27%	9.45%	2	76.86%	88.48%	83.30%	92.03%	84.47%	85.94%	86.87%
41	0.72	1.00	92.78%	85.35%	93.35%	0.82	0.57	93.55%	52	74.97%	4	54.59%	9.23%	12.24%	3	76.36%	87.78%	78.75%	79.54%	96.87%	90.38%	94.70%
42	0.61	0.93	82.47%	95.15%	90.46%	0.71	0.65	92.35%	46	57.32%	4	59.00%	10.46%	11.10%	3	84.91%	81.60%	95.99%	80.68%	82.39%	94.93%	79.61%
43	0.63	0.97	84.13%	95.30%	97.69%	0.5	0.82	92.18%	37	59.09%	4	52.09%	11.25%	11.20%	5	81.94%	87.06%	91.79%	96.97%	97.88%	90.96%	78.33%
44	0.69	0.93	84.33%	98.42%	96.22%	0.55	0.58	97.26%	45	74.67%	5	33.18%	10.39%	14.68%	4	90.03%	87.35%	97.12%	89.03%	95.37%	86.15%	82.27%
45	0.69	0.93	85.45%	98.92%	93.18%	0.57	0.62	90.14%	54	56.80%	5	54.97%	12.93%	13.11%	4	75.28%	85.97%	93.22%	84.50%	96.08%	93.64%	92.15%
46	0.69	0.97	82.11%	90.96%	94.12%	0.79	0.56	90.15%	53	52.80%	4	53.12%	9.52%	11.66%	2	84.46%	79.33%	75.40%	82.08%	82.09%	91.30%	95.53%
47	0.57	0.97	85.47%	85.04%	96.51%	0.55	0.78	94.00%	38	63.58%	3	52.25%	11.68%	8.65%	3	92.63%	90.02%	89.85%	79.17%	87.50%	83.67%	77.04%
48	0.70	0.93	86.47%	87.99%	93.95%	0.63	0.59	92.80%	49	66.47%	4	48.04%	11.66%	13.56%	4	96.76%	75.55%	88.85%	76.16%	87.52%	80.86%	91.28%
49	0.66	0.93	92.58%	85.62%	91.69%	0.52	0.55	93.54%	60	70.98%	4	42.40%	11.31%	11.93%	5	77.17%	76.06%	95.90%	94.87%	84.39%	92.52%	96.69%
50	0.53	0.97	89.46%	93.31%	90.85%	0.75	0.61	95.74%	6	72.45%	5	31.42%	13.29%	13.02%	2	91.37%	85.44%	93.61%	96.71%	86.80%	95.87%	95.31%

Table A4. Suppliers' feedback in the second period.

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
1	0.61	0.93	88.92%	91.16%	98.05%	0.76	0.89	98.75%	29	67.94%	3	32.22%	13.18%	9.35%	3	87.91%	78.81%	86.84%	81.20%	95.91%	94.99%	96.37%
2	0.65	0.93	92.32%	90.16%	98.24%	0.59	0.82	91.91%	13	56.26%	4	32.61%	9.47%	13.50%	4	81.03%	92.04%	76.48%	91.24%	96.38%	94.08%	90.21%
3	0.60	0.93	84.06%	87.05%	91.20%	0.62	0.64	92.35%	21	60.35%	4	41.73%	9.25%	12.14%	5	88.12%	85.93%	95.21%	93.57%	91.78%	87.26%	90.10%
4	0.48	0.93	83.23%	93.21%	92.58%	0.84	0.73	96.56%	41	56.84%	4	57.37%	12.79%	11.05%	3	80.08%	81.41%	92.79%	78.98%	75.23%	96.69%	92.67%
5	0.64	0.93	92.51%	98.53%	99.03%	0.57	0.88	90.22%	13	58.50%	5	35.64%	10.08%	10.75%	3	88.04%	90.00%	75.84%	85.39%	78.64%	97.90%	88.93%
6	0.61	0.97	80.89%	89.07%	91.38%	0.64	0.68	94.98%	19	74.00%	3	45.05%	9.74%	8.37%	4	96.42%	92.07%	92.87%	84.92%	83.66%	80.96%	80.24%
7	0.66	0.97	85.07%	92.18%	90.30%	0.86	0.6	92.35%	54	73.86%	4	58.79%	9.55%	13.00%	3	93.39%	84.83%	97.59%	85.76%	96.66%	84.09%	93.97%
8	0.62	0.97	94.24%	90.80%	92.37%	0.52	0.59	95.72%	58	60.67%	4	58.14%	12.93%	12.67%	3	78.48%	80.62%	76.20%	80.56%	75.01%	82.61%	94.22%
9	0.68	0.93	93.74%	93.80%	99.18%	0.87	0.88	90.54%	36	55.01%	4	51.06%	9.35%	10.22%	5	82.84%	83.25%	88.91%	83.97%	88.90%	96.82%	75.55%
10	0.54	0.97	88.23%	92.46%	99.15%	0.69	0.75	96.20%	5	67.46%	4	44.35%	9.92%	11.20%	5	76.87%	84.52%	93.14%	97.06%	81.44%	77.96%	82.88%
11	0.73	0.93	86.27%	97.29%	92.67%	0.5	0.55	91.73%	56	65.76%	5	59.04%	12.84%	12.77%	3	76.16%	91.87%	92.35%	96.84%	78.10%	94.91%	95.83%
12	0.72	1.00	85.95%	94.84%	92.96%	0.52	0.56	94.78%	26	64.60%	5	30.63%	9.52%	14.42%	5	96.67%	75.97%	77.47%	85.56%	82.21%	76.17%	76.80%
13	0.65	0.93	94.72%	86.27%	96.80%	0.67	0.79	96.19%	14	72.54%	6	51.12%	9.85%	8.54%	4	82.30%	88.52%	96.85%	76.31%	84.68%	85.88%	88.04%
14	0.57	0.97	84.26%	86.53%	97.59%	0.75	0.81	90.03%	40	66.30%	5	47.50%	9.98%	14.87%	3	84.09%	85.47%	94.03%	91.80%	88.25%	80.56%	97.26%
15	0.68	0.97	83.36%	88.73%	98.49%	0.61	0.8	97.01%	10	67.67%	4	39.66%	12.75%	14.06%	3	83.87%	86.17%	79.84%	96.68%	88.81%	84.01%	79.51%

Table A4. *Cont.*

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
16	0.67	0.93	93.67%	97.75%	96.99%	0.82	0.77	98.51%	20	52.93%	5	51.29%	9.44%	14.45%	4	87.42%	94.45%	83.16%	79.63%	96.30%	97.15%	75.90%
17	0.63	0.93	90.05%	91.55%	93.40%	0.83	0.75	90.58%	40	63.63%	3	40.51%	11.34%	12.92%	3	86.85%	84.19%	85.87%	75.46%	76.75%	96.74%	75.59%
18	0.71	0.93	81.54%	91.39%	99.23%	0.6	0.8	91.91%	24	52.78%	6	39.71%	11.16%	12.04%	3	79.76%	80.87%	93.96%	82.86%	79.29%	88.12%	92.89%
19	0.51	0.97	81.23%	97.89%	94.10%	0.84	0.59	95.37%	52	64.08%	5	47.01%	11.67%	9.92%	5	76.59%	83.33%	90.21%	84.00%	85.39%	78.47%	87.95%
20	0.56	0.97	95.54%	86.77%	92.91%	0.89	0.75	91.52%	3	51.80%	5	50.62%	11.83%	11.79%	4	78.58%	93.42%	84.54%	78.49%	77.90%	93.08%	93.89%
21	0.67	0.93	84.65%	89.65%	97.42%	0.8	0.7	98.42%	50	54.69%	4	42.31%	9.45%	11.08%	4	82.01%	80.90%	79.93%	81.55%	86.03%	95.47%	79.22%
22	0.56	0.97	93.04%	89.32%	97.54%	0.89	0.75	97.94%	6	53.36%	4	38.58%	9.98%	8.30%	2	86.87%	81.70%	82.49%	87.39%	87.59%	82.86%	81.73%
23	0.68	0.93	85.74%	86.72%	91.86%	0.56	0.58	94.99%	41	57.04%	4	30.17%	11.83%	12.70%	3	77.38%	86.59%	84.80%	95.69%	91.51%	84.17%	84.47%
24	0.65	0.97	94.64%	87.29%	91.89%	0.76	0.84	91.15%	54	62.95%	3	44.36%	9.39%	14.32%	4	78.94%	87.65%	77.62%	79.76%	84.45%	89.91%	77.84%
25	0.59	0.97	89.99%	93.50%	95.37%	0.67	0.69	96.21%	58	71.06%	4	40.51%	13.05%	10.98%	3	92.37%	95.74%	88.49%	88.52%	75.40%	92.10%	90.29%
26	0.72	0.93	89.90%	91.21%	91.34%	0.71	0.69	91.16%	57	62.68%	6	32.59%	13.18%	9.16%	2	93.93%	86.21%	84.50%	91.11%	81.05%	89.16%	89.95%
27	0.62	0.93	95.65%	94.87%	91.36%	0.83	0.83	93.53%	49	59.64%	4	38.85%	12.64%	14.11%	4	77.82%	84.39%	82.40%	97.71%	88.05%	84.05%	94.13%
28	0.66	1.00	95.43%	95.94%	95.94%	0.71	0.67	98.08%	43	63.16%	6	43.32%	9.29%	14.06%	2	92.31%	88.55%	88.85%	94.79%	87.26%	75.04%	86.70%
29	0.46	0.93	83.79%	89.17%	92.18%	0.76	0.81	92.24%	47	66.66%	6	47.98%	10.21%	12.02%	3	75.74%	78.33%	91.22%	84.08%	94.64%	92.54%	91.09%
30	0.46	0.97	85.61%	89.66%	98.34%	0.71	0.85	96.07%	20	55.48%	3	52.67%	12.51%	13.74%	4	78.57%	95.57%	96.61%	78.86%	95.16%	83.00%	92.51%
31	0.64	1.00	82.59%	85.30%	99.84%	0.83	0.66	96.00%	9	51.26%	5	48.23%	11.86%	13.14%	4	96.90%	77.29%	84.98%	88.35%	85.40%	77.23%	91.21%
32	0.72	0.93	84.84%	85.98%	99.61%	0.68	0.84	93.14%	30	56.28%	6	54.69%	9.11%	14.42%	3	83.24%	75.31%	83.27%	95.94%	90.61%	97.30%	87.59%
33	0.60	0.93	93.40%	94.30%	93.08%	0.61	0.9	94.86%	35	68.80%	5	45.05%	12.67%	8.87%	3	90.22%	86.94%	86.43%	97.69%	79.23%	84.35%	80.39%
34	0.46	0.97	88.10%	88.78%	97.84%	0.76	0.82	91.14%	13	70.41%	4	47.40%	13.56%	8.32%	3	88.67%	94.88%	86.23%	97.16%	80.47%	90.76%	84.02%
35	0.66	0.97	91.71%	93.12%	99.17%	0.5	0.71	94.11%	55	51.90%	4	43.90%	9.33%	13.89%	2	90.89%	90.54%	81.63%	79.54%	93.38%	79.20%	90.12%
36	0.61	0.93	90.10%	92.63%	91.92%	0.74	0.73	95.19%	25	68.20%	4	34.66%	9.42%	9.40%	3	89.68%	80.43%	88.66%	79.28%	96.02%	76.17%	88.35%
37	0.56	1.00	87.49%	94.81%	91.85%	0.7	0.64	95.85%	11	67.90%	3	58.24%	12.57%	10.11%	4	86.10%	79.48%	95.33%	88.69%	93.27%	91.21%	92.10%
38	0.55	1.00	93.72%	97.74%	94.28%	0.75	0.83	96.30%	13	54.06%	4	45.70%	9.21%	9.54%	3	85.25%	91.86%	79.58%	79.77%	87.56%	83.29%	93.54%
39	0.50	0.97	94.04%	85.21%	95.07%	0.67	0.69	91.05%	1	66.70%	4	35.46%	12.34%	8.67%	2	90.34%	95.09%	84.96%	96.57%	83.15%	90.57%	88.07%
40	0.66	0.93	91.36%	86.24%	94.64%	0.62	0.75	98.69%	12	54.93%	6	53.23%	10.27%	13.35%	3	79.41%	83.22%	95.92%	95.85%	79.20%	76.25%	78.87%
41	0.65	0.97	92.74%	89.87%	91.85%	0.69	0.88	94.15%	57	53.92%	5	43.63%	10.95%	13.51%	2	76.68%	87.20%	79.93%	92.67%	89.89%	75.65%	77.88%
42	0.69	1.00	82.72%	92.30%	91.74%	0.79	0.84	96.40%	51	57.03%	5	37.91%	9.10%	11.38%	5	87.80%	82.08%	81.88%	84.32%	92.72%	76.23%	85.26%
43	0.64	0.97	85.96%	87.35%	97.41%	0.72	0.61	92.54%	35	58.98%	5	48.19%	9.92%	14.45%	4	92.81%	89.29%	93.30%	77.78%	86.36%	78.25%	94.47%
44	0.46	1.00	94.96%	88.78%	94.88%	0.85	0.66	96.16%	36	58.42%	3	46.62%	13.52%	10.81%	3	79.19%	86.15%	95.13%	91.73%	90.56%	84.15%	80.48%
45	0.68	0.93	87.70%	90.24%	94.87%	0.76	0.68	90.11%	40	68.68%	5	34.44%	12.90%	14.63%	5	93.41%	91.69%	83.46%	80.68%	88.40%	90.96%	78.73%
46	0.50	0.97	86.56%	92.49%	92.08%	0.8	0.79	91.83%	28	57.68%	5	50.70%	13.06%	12.33%	5	91.41%	87.10%	89.69%	81.06%	75.93%	75.93%	80.44%
47	0.65	0.97	83.16%	97.34%	98.49%	0.78	0.8	97.67%	22	54.64%	6	46.38%	10.47%	13.43%	3	95.51%	87.41%	80.04%	75.44%	86.68%	93.52%	94.16%
48	0.61	0.93	92.23%	93.12%	99.52%	0.67	0.87	97.00%	37	69.93%	3	44.64%	10.10%	11.70%	2	78.36%	97.27%	90.28%	95.33%	81.95%	84.64%	76.76%
49	0.69	0.93	92.47%	85.71%	94.99%	0.87	0.86	91.55%	52	72.60%	5	55.76%	11.49%	14.39%	4	77.43%	93.46%	82.53%	86.25%	77.45%	87.76%	78.02%
50	0.49	0.93	90.07%	85.19%	92.48%	0.77	0.75	96.93%	20	56.50%	6	43.13%	12.65%	11.19%	4	84.01%	96.90%	92.07%	83.28%	77.97%	79.65%	95.81%

Table A5. Suppliers' feedback in the second period.

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
1	0.70	0.93	88.19%	93.21%	99.25%	0.84	0.76	91.51%	40	58.84%	6	49.58%	9.84%	14.01%	3	78.72%	94.20%	87.37%	97.87%	97.76%	92.06%	83.94%
2	0.70	1.00	94.40%	93.36%	97.84%	0.73	0.6	95.90%	41	61.52%	5	41.04%	10.83%	9.33%	3	90.77%	79.75%	93.00%	88.22%	89.09%	86.06%	95.25%
3	0.70	0.93	89.90%	93.98%	94.26%	0.85	0.85	93.91%	30	63.00%	5	31.66%	13.15%	8.79%	5	91.59%	82.35%	76.76%	85.03%	84.97%	95.22%	96.20%
4	0.58	0.97	86.79%	95.95%	94.32%	0.5	0.85	98.71%	8	72.50%	5	57.36%	13.34%	11.54%	3	93.28%	80.27%	91.22%	86.67%	88.91%	94.68%	91.40%
5	0.53	0.97	86.99%	85.24%	92.73%	0.79	0.58	93.42%	17	60.76%	5	38.55%	12.89%	11.78%	3	91.30%	85.10%	79.87%	96.28%	82.18%	86.22%	83.73%
6	0.54	0.93	83.76%	92.45%	91.41%	0.69	0.81	97.56%	49	53.26%	4	47.21%	10.66%	14.64%	5	97.49%	95.09%	78.61%	88.98%	90.43%	87.44%	88.53%
7	0.71	0.97	82.90%	94.86%	98.49%	0.54	0.77	98.69%	4	60.98%	4	46.55%	10.86%	10.04%	2	96.16%	80.10%	92.26%	90.15%	76.07%	93.36%	96.53%
8	0.59	0.93	86.91%	92.77%	97.90%	0.61	0.8	97.73%	1	70.88%	5	52.54%	12.89%	9.07%	3	84.02%	88.50%	96.13%	82.58%	91.95%	87.97%	86.43%
9	0.54	0.97	83.02%	95.19%	95.13%	0.9	0.64	93.83%	32	73.94%	4	40.06%	9.74%	10.08%	4	92.84%	96.46%	84.46%	94.10%	96.37%	88.59%	83.49%
10	0.62	1.00	82.55%	97.04%	90.31%	0.58	0.64	93.48%	53	71.14%	5	43.18%	13.61%	10.75%	5	79.99%	79.42%	92.85%	82.76%	78.95%	84.66%	77.48%
11	0.48	0.97	80.24%	95.00%	94.14%	0.8	0.81	98.51%	10	67.49%	5	30.92%	10.57%	14.89%	4	84.36%	86.99%	97.21%	76.45%	95.30%	77.33%	90.26%
12	0.48	0.93	94.19%	88.85%	91.15%	0.69	0.65	93.43%	5	70.11%	6	56.86%	10.38%	8.97%	3	77.21%	89.32%	95.49%	92.67%	82.23%	77.56%	85.93%
13	0.52	0.93	88.75%	98.82%	93.25%	0.67	0.75	95.94%	46	57.74%	5	57.82%	10.77%	14.47%	5	88.82%	75.95%	90.09%	87.05%	93.85%	84.07%	96.23%
14	0.50	0.93	94.29%	88.43%	94.12%	0.77	0.82	91.51%	47	69.77%	4	34.32%	13.31%	10.27%	4	77.98%	96.08%	82.83%	84.35%	85.88%	76.07%	86.14%
15	0.46	1.00	80.60%	96.70%	95.37%	0.61	0.72	98.89%	16	56.64%	4	40.65%	10.39%	8.21%	5	81.98%	84.10%	85.49%	90.62%	95.55%	89.68%	80.11%
16	0.58	0.97	85.16%	85.27%	91.28%	0.67	0.85	90.22%	28	52.15%	5	57.14%	12.05%	9.11%	3	84.10%	77.83%	88.03%	89.37%	88.92%	93.06%	85.44%
17	0.71	0.93	93.45%	88.33%	90.00%	0.81	0.87	96.58%	39	52.55%	4	57.60%	10.16%	12.95%	3	90.93%	81.12%	80.44%	76.44%	84.90%	87.93%	76.84%
18	0.46	0.93	83.93%	93.11%	95.79%	0.77	0.83	92.48%	39	71.61%	4	34.25%	12.82%	8.21%	3	82.09%	91.19%	85.94%	80.19%	80.09%	82.05%	83.30%
19	0.63	0.93	95.89%	95.74%	94.82%	0.71	0.89	95.63%	14	58.58%	4	52.47%	10.80%	10.12%	4	75.89%	97.83%	91.97%	76.86%	83.10%	82.82%	79.94%
20	0.69	0.97	92.87%	97.46%	95.84%	0.84	0.89	92.86%	18	64.83%	5	55.34%	9.14%	14.63%	2	86.37%	75.50%	93.49%	82.09%	76.51%	78.74%	88.50%
21	0.54	1.00	92.83%	85.58%	99.85%	0.86	0.75	93.13%	44	57.74%	4	34.14%	13.18%	11.78%	5	93.89%	94.48%	96.28%	96.10%	79.53%	81.15%	91.25%
22	0.68	1.00	87.68%	88.33%	95.27%	0.75	0.74	92.56%	58	67.01%	4	44.86%	12.52%	8.44%	2	78.29%	96.14%	88.39%	84.18%	92.54%	85.51%	85.97%
23	0.72	0.97	94.53%	98.79%	94.13%	0.5	0.84	95.45%	6	58.32%	5	35.19%	9.04%	9.48%	3	85.16%	85.51%	96.86%	81.85%	86.82%	81.07%	75.06%
24	0.72	0.93	81.64%	98.34%	97.69%	0.82	0.57	94.94%	60	66.97%	6	39.90%	10.72%	13.57%	5	88.97%	95.58%	88.20%	85.49%	78.95%	96.75%	81.12%
25	0.68	1.00	84.16%	87.18%	97.88%	0.53	0.79	90.40%	50	66.23%	6	44.40%	10.23%	14.50%	5	92.56%	86.48%	92.81%	84.82%	77.99%	90.99%	86.85%
26	0.71	1.00	80.30%	87.75%	95.36%	0.81	0.73	98.20%	12	68.65%	5	41.55%	10.23%	10.50%	2	87.24%	87.60%	90.65%	91.83%	97.75%	88.57%	78.32%
27	0.67	1.00	81.00%	94.92%	90.59%	0.82	0.74	95.75%	36	73.84%	5	34.34%	11.89%	8.05%	4	75.02%	76.28%	95.15%	95.48%	86.31%	87.43%	79.07%
28	0.54	0.93	84.48%	88.44%	91.54%	0.75	0.65	92.32%	11	50.30%	4	30.20%	10.01%	12.35%	5	76.44%	95.93%	95.85%	87.00%	89.02%	97.78%	90.27%
29	0.62	0.97	95.69%	94.88%	92.30%	0.89	0.68	91.89%	18	56.04%	3	51.36%	10.35%	14.27%	3	91.39%	83.64%	93.24%	81.36%	80.74%	85.86%	75.87%
30	0.64	0.97	89.10%	87.27%	98.84%	0.72	0.85	97.66%	54	64.08%	4	59.12%	10.18%	9.02%	2	87.87%	81.30%	75.04%	89.11%	91.87%	93.53%	95.23%
31	0.53	0.93	86.04%	90.93%	99.11%	0.65	0.59	97.36%	20	68.57%	4	49.74%	11.61%	13.29%	2	79.64%	82.71%	96.63%	85.96%	80.86%	86.53%	92.87%
32	0.61	1.00	88.03%	91.55%	96.44%	0.85	0.56	90.98%	1	69.00%	4	32.43%	13.45%	13.71%	4	87.90%	84.73%	90.09%	91.35%	86.33%	75.32%	83.60%
33	0.63	0.93	87.77%	94.74%	90.54%	0.84	0.88	97.65%	34	60.50%	4	34.03%	11.02%	14.32%	4	89.58%	81.96%	75.55%	96.91%	92.50%	81.61%	96.96%
34	0.63	0.93	89.37%	94.09%	93.14%	0.88	0.77	97.38%	59	65.09%	4	46.04%	11.69%	8.54%	3	86.56%	91.89%	96.05%	84.82%	77.09%	91.34%	85.18%
35	0.66	0.93	81.23%	90.53%	90.88%	0.72	0.69	96.46%	32	65.13%	6	53.83%	10.46%	13.15%	5	83.01%	90.53%	92.23%	96.76%	93.27%	83.87%	89.90%
36	0.57	0.97	93.45%	98.96%	95.33%	0.55	0.67	98.81%	19	50.18%	5	44.58%	10.01%	10.06%	3	83.85%	90.35%	82.11%	89.78%	94.63%	78.94%	75.24%

Table A5. *Cont.*

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
37	0.56	0.93	92.56%	98.39%	92.02%	0.73	0.61	96.74%	16	50.09%	4	57.30%	9.74%	12.47%	4	91.11%	95.52%	84.26%	93.52%	77.00%	90.35%	95.39%
38	0.72	0.97	83.77%	98.85%	91.83%	0.75	0.65	94.62%	13	56.19%	5	38.03%	12.49%	13.80%	4	88.93%	78.87%	76.46%	76.24%	87.39%	88.92%	87.14%
39	0.55	0.97	90.61%	92.09%	95.20%	0.84	0.75	98.89%	48	72.60%	6	59.24%	10.07%	13.41%	5	85.43%	78.38%	91.93%	85.14%	97.44%	91.73%	86.09%
40	0.54	0.97	92.01%	86.52%	95.22%	0.79	0.7	94.32%	10	62.04%	5	59.88%	11.18%	9.57%	4	84.16%	86.04%	97.52%	79.49%	78.66%	80.43%	94.70%
41	0.46	0.93	89.70%	95.00%	99.23%	0.62	0.84	97.97%	57	69.90%	5	33.34%	13.54%	8.88%	3	83.93%	84.33%	86.41%	87.50%	90.73%	81.11%	86.23%
42	0.71	1.00	92.04%	90.27%	94.44%	0.73	0.67	97.83%	40	70.04%	5	50.57%	9.06%	10.71%	4	80.91%	83.33%	87.39%	94.36%	76.06%	76.68%	82.94%
43	0.60	0.93	81.05%	91.34%	96.13%	0.9	0.82	95.47%	14	74.65%	5	48.72%	11.54%	9.00%	5	96.80%	76.25%	87.59%	94.19%	78.99%	83.85%	81.04%
44	0.52	0.97	90.30%	88.22%	94.22%	0.64	0.87	97.70%	11	61.05%	3	36.49%	10.43%	11.23%	4	76.97%	95.87%	85.61%	87.36%	92.55%	83.37%	88.87%
45	0.50	0.97	85.22%	85.66%	98.99%	0.58	0.83	97.28%	9	50.99%	5	44.66%	10.29%	8.14%	5	84.17%	85.05%	83.59%	80.18%	76.87%	89.97%	89.38%
46	0.55	0.97	89.35%	93.24%	97.55%	0.85	0.57	96.97%	9	54.45%	5	42.81%	12.41%	13.88%	3	82.51%	86.07%	97.93%	75.19%	77.44%	80.71%	83.14%
47	0.65	0.93	82.44%	89.44%	96.07%	0.53	0.63	94.09%	31	69.74%	4	41.22%	10.77%	8.79%	3	76.77%	88.64%	78.28%	97.34%	84.10%	97.77%	86.71%
48	0.63	1.00	80.27%	90.47%	94.46%	0.8	0.58	90.50%	59	72.93%	4	46.96%	9.47%	9.29%	3	89.27%	88.27%	84.03%	75.12%	96.22%	82.93%	85.12%
49	0.72	0.93	88.80%	94.53%	96.19%	0.73	0.6	96.84%	39	69.17%	4	35.11%	9.66%	11.78%	4	91.44%	76.08%	88.73%	79.54%	91.47%	87.32%	95.34%
50	0.52	0.93	84.07%	93.50%	95.75%	0.79	0.61	96.69%	33	58.55%	5	34.53%	11.73%	8.09%	4	82.75%	85.42%	83.40%	82.29%	82.96%	85.16%	89.56%

Table A6. Suppliers' feedback in the second period.

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
1	0.50	0.97	87.80%	95.47%	97.57%	0.71	0.88	92.69%	5	54.25%	3	48.42%	10.54%	14.17%	4	93.15%	84.11%	82.26%	91.46%	85.01%	89.87%	81.93%
2	0.47	0.97	91.65%	86.90%	93.22%	0.6	0.65	97.61%	15	57.20%	4	55.04%	12.14%	13.27%	4	83.13%	88.27%	89.07%	96.74%	80.88%	88.78%	80.44%
3	0.52	0.97	89.78%	89.46%	94.12%	0.55	0.78	97.99%	15	65.43%	5	42.22%	12.97%	13.18%	5	82.57%	93.08%	95.89%	85.55%	93.07%	86.40%	77.74%
4	0.50	0.93	89.61%	92.52%	91.08%	0.51	0.72	97.10%	6	58.52%	4	35.30%	13.39%	10.81%	3	83.90%	79.24%	77.13%	84.78%	88.55%	87.57%	78.55%
5	0.70	0.97	80.87%	97.07%	94.83%	0.9	0.6	93.55%	54	56.21%	5	59.99%	12.85%	12.97%	4	84.44%	94.50%	75.24%	84.87%	95.05%	96.36%	86.92%
6	0.70	1.00	80.02%	90.66%	91.31%	0.52	0.7	94.12%	37	72.60%	5	51.86%	12.07%	11.34%	4	88.47%	86.78%	91.76%	82.60%	90.80%	90.31%	85.07%
7	0.60	0.97	80.13%	90.26%	90.60%	0.53	0.58	97.76%	22	66.72%	3	37.51%	9.51%	14.96%	3	81.31%	88.24%	93.76%	90.89%	79.47%	78.05%	75.06%
8	0.57	0.97	89.87%	94.49%	96.92%	0.79	0.6	93.42%	15	54.96%	3	40.14%	11.07%	13.54%	4	79.14%	91.33%	92.98%	76.94%	77.09%	90.89%	82.48%
9	0.47	0.97	89.83%	89.22%	94.12%	0.62	0.82	93.00%	54	52.08%	5	47.32%	11.48%	8.27%	3	92.14%	87.33%	81.66%	76.33%	89.27%	78.37%	85.88%
10	0.62	0.97	80.44%	95.28%	92.08%	0.55	0.57	97.54%	25	54.38%	4	43.21%	11.08%	10.08%	3	88.75%	90.53%	96.94%	91.63%	94.14%	93.18%	80.86%
11	0.51	0.93	84.21%	98.57%	96.65%	0.7	0.6	91.37%	49	69.17%	4	46.64%	9.70%	14.88%	3	91.31%	81.36%	76.68%	96.93%	89.59%	84.92%	90.62%
12	0.71	0.93	92.41%	93.39%	97.86%	0.7	0.65	90.29%	15	63.99%	3	30.29%	13.54%	9.47%	3	79.39%	82.34%	85.79%	84.20%	94.76%	95.80%	88.72%
13	0.53	1.00	83.69%	94.06%	97.70%	0.81	0.75	91.25%	48	74.50%	4	56.34%	11.26%	14.84%	4	92.38%	76.25%	96.54%	87.49%	93.78%	91.58%	87.30%
14	0.61	1.00	85.91%	87.75%	92.33%	0.67	0.82	95.72%	7	51.22%	3	51.93%	13.48%	9.66%	3	88.39%	81.81%	95.69%	85.64%	93.26%	76.78%	82.46%

Table A6. *Cont.*

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
15	0.53	0.93	95.70%	93.54%	98.84%	0.7	0.56	94.20%	19	51.50%	6	58.27%	11.82%	14.08%	3	91.43%	78.02%	77.73%	79.77%	83.76%	87.11%	79.98%
16	0.69	0.93	92.60%	90.52%	91.81%	0.58	0.78	97.59%	60	60.55%	6	41.48%	10.22%	13.47%	3	91.76%	82.41%	93.18%	86.88%	87.48%	81.02%	95.60%
17	0.72	1.00	90.71%	85.06%	95.99%	0.76	0.66	90.06%	26	51.95%	5	37.43%	11.70%	8.34%	4	90.78%	76.33%	82.38%	95.63%	88.83%	92.70%	95.17%
18	0.72	0.97	93.67%	89.61%	97.48%	0.77	0.69	91.08%	51	68.03%	4	53.34%	11.43%	8.18%	5	96.47%	77.99%	97.88%	86.61%	88.29%	77.34%	79.01%
19	0.60	0.93	87.35%	98.47%	95.66%	0.82	0.6	96.95%	50	69.11%	3	52.30%	10.79%	14.54%	2	82.56%	88.37%	84.73%	76.03%	91.48%	86.52%	79.23%
20	0.71	1.00	89.06%	89.09%	90.73%	0.54	0.61	92.66%	4	56.19%	4	56.04%	12.88%	9.47%	4	93.66%	92.39%	93.82%	89.61%	77.88%	77.13%	97.13%
21	0.70	0.97	87.66%	96.28%	95.36%	0.66	0.68	91.35%	34	52.97%	3	33.61%	11.24%	14.69%	3	80.72%	80.27%	79.15%	78.62%	79.03%	87.75%	81.84%
22	0.62	1.00	88.68%	88.34%	98.45%	0.69	0.8	97.04%	9	53.30%	6	37.50%	11.77%	12.46%	3	91.77%	82.45%	89.10%	90.26%	85.67%	95.01%	89.22%
23	0.47	1.00	92.13%	93.60%	90.52%	0.65	0.77	97.01%	27	59.65%	6	38.15%	11.94%	14.59%	4	92.66%	94.84%	83.51%	82.57%	87.25%	96.05%	75.26%
24	0.58	0.97	81.14%	87.57%	90.77%	0.68	0.66	93.08%	37	68.43%	5	45.88%	11.96%	12.35%	2	86.70%	96.31%	81.62%	89.19%	89.74%	94.24%	86.51%
25	0.64	1.00	87.06%	89.45%	91.52%	0.5	0.85	91.23%	45	61.08%	5	41.25%	10.65%	12.41%	4	92.21%	88.11%	94.34%	82.50%	85.70%	85.51%	87.41%
26	0.51	0.97	85.65%	93.53%	94.36%	0.69	0.73	96.26%	40	58.45%	4	41.40%	12.45%	9.92%	3	77.10%	90.42%	80.48%	81.67%	96.47%	80.58%	92.83%
27	0.50	0.97	80.17%	92.82%	92.54%	0.53	0.62	92.47%	21	54.63%	5	50.11%	10.30%	13.08%	4	95.22%	75.73%	96.18%	75.16%	82.54%	97.75%	90.96%
28	0.56	0.93	89.79%	92.60%	95.69%	0.53	0.82	95.18%	4	73.41%	5	38.37%	11.33%	10.36%	2	77.07%	93.68%	92.28%	86.04%	95.34%	87.68%	85.54%
29	0.57	0.93	94.68%	86.63%	98.08%	0.76	0.84	96.74%	55	51.75%	5	55.98%	9.60%	14.67%	3	85.23%	94.17%	75.83%	97.14%	82.95%	80.07%	86.66%
30	0.63	0.97	83.56%	95.90%	94.99%	0.68	0.7	92.80%	7	67.86%	5	48.72%	10.63%	9.39%	4	76.50%	85.01%	75.29%	87.43%	91.50%	84.52%	93.12%
31	0.60	0.97	82.23%	90.16%	100.00%	0.55	0.64	98.65%	42	74.37%	4	43.69%	9.90%	9.28%	3	95.80%	81.53%	89.38%	93.63%	95.66%	90.20%	88.10%
32	0.72	1.00	87.82%	88.38%	91.19%	0.79	0.82	96.60%	3	62.06%	4	36.47%	12.96%	12.26%	2	83.08%	91.21%	75.71%	79.08%	82.82%	92.37%	87.21%
33	0.52	1.00	89.37%	85.92%	96.46%	0.84	0.71	94.81%	51	57.22%	4	43.10%	10.89%	12.52%	4	75.31%	81.94%	92.38%	94.80%	91.56%	93.53%	82.89%
34	0.50	0.93	92.08%	86.02%	97.59%	0.77	0.84	95.98%	43	64.18%	5	49.05%	9.02%	14.16%	3	79.97%	93.97%	79.58%	80.75%	75.78%	88.74%	88.91%
35	0.66	1.00	95.45%	88.96%	94.86%	0.81	0.8	97.15%	43	66.71%	5	30.31%	11.17%	12.36%	3	81.27%	88.98%	92.21%	82.44%	84.21%	83.98%	97.20%
36	0.55	0.97	83.93%	93.90%	99.80%	0.79	0.74	96.45%	31	52.05%	5	51.23%	10.90%	12.55%	2	97.09%	84.06%	81.86%	89.54%	92.37%	91.08%	82.21%
37	0.48	0.97	87.06%	94.81%	96.58%	0.65	0.7	95.46%	39	72.57%	5	38.83%	9.43%	9.32%	4	93.11%	85.08%	96.80%	96.34%	96.38%	94.17%	84.76%
38	0.60	0.93	87.67%	93.41%	99.31%	0.55	0.88	93.81%	24	59.63%	5	57.62%	9.69%	14.47%	5	90.12%	76.71%	76.12%	75.46%	91.05%	75.29%	79.02%
39	0.63	0.97	87.85%	87.41%	98.54%	0.71	0.57	98.85%	37	70.80%	5	39.76%	13.25%	10.04%	4	76.24%	80.01%	95.01%	96.71%	81.54%	85.56%	78.82%
40	0.48	0.97	84.35%	93.16%	90.02%	0.88	0.68	91.25%	38	60.68%	5	41.74%	13.99%	11.70%	3	93.80%	82.50%	81.22%	97.89%	85.47%	83.27%	95.92%
41	0.70	0.97	80.43%	95.65%	94.53%	0.8	0.76	90.31%	5	59.33%	5	45.25%	12.38%	13.57%	3	87.52%	79.95%	84.82%	79.92%	78.21%	76.37%	76.51%
42	0.65	1.00	94.09%	94.50%	91.19%	0.72	0.78	90.47%	10	55.59%	5	53.98%	13.33%	9.33%	4	97.57%	93.19%	88.88%	93.48%	95.52%	76.79%	86.65%
43	0.57	1.00	86.58%	90.86%	94.14%	0.89	0.63	94.10%	24	55.88%	3	30.51%	11.43%	10.70%	4	93.89%	90.60%	93.15%	96.90%	83.68%	82.16%	88.99%
44	0.56	0.93	91.89%	93.82%	99.11%	0.62	0.82	98.03%	16	65.46%	6	53.18%	9.34%	10.47%	3	81.68%	78.92%	80.69%	90.69%	79.28%	81.86%	95.75%
45	0.51	0.93	92.10%	97.41%	93.34%	0.66	0.68	92.00%	34	63.07%	6	48.84%	12.75%	12.85%	3	81.03%	88.06%	93.09%	95.35%	77.51%	88.29%	79.06%
46	0.71	0.93	94.40%	95.41%	93.13%	0.59	0.88	98.54%	15	56.70%	6	49.06%	9.59%	12.20%	2	83.49%	77.37%	80.80%	89.98%	96.76%	79.52%	90.77%
47	0.57	1.00	94.95%	93.49%	95.43%	0.79	0.74	98.78%	39	72.00%	6	44.95%	12.42%	9.80%	4	93.37%	88.92%	97.42%	80.50%	83.87%	97.19%	84.53%
48	0.71	0.97	82.72%	90.72%	95.69%	0.88	0.82	94.51%	48	66.55%	4	53.70%	12.20%	11.31%	2	88.76%	81.71%	78.55%	97.25%	77.21%	82.26%	97.62%
49	0.47	0.97	87.18%	96.94%	99.96%	0.71	0.64	95.29%	36	66.62%	5	54.89%	13.27%	11.42%	3	91.57%	80.89%	86.52%	89.03%	93.76%	82.08%	86.22%
50	0.48	0.93	83.34%	96.31%	90.52%	0.8	0.67	91.19%	21	67.89%	5	45.05%	12.26%	10.08%	3	76.48%	89.94%	90.69%	95.95%	90.47%	92.97%	86.99%

Table A7. Suppliers' feedback in the second period.

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
1	0.52	1.00	87.72%	97.84%	99.67%	0.56	0.71	91.86%	17	54.73%	3	45.48%	13.54%	12.81%	4	88.92%	89.69%	97.92%	77.11%	88.15%	83.22%	90.33%
2	0.73	0.97	86.15%	85.25%	95.06%	0.69	0.82	94.62%	4	68.80%	4	32.14%	13.53%	12.94%	4	88.53%	91.59%	90.85%	94.24%	95.92%	76.88%	85.41%
3	0.54	0.93	82.64%	85.49%	96.45%	0.6	0.66	95.76%	50	51.23%	4	53.89%	11.44%	11.15%	3	88.14%	94.94%	85.79%	84.34%	80.32%	97.26%	75.43%
4	0.72	1.00	95.38%	96.13%	96.31%	0.76	0.6	96.87%	58	54.70%	4	43.14%	12.67%	14.95%	2	83.35%	83.32%	84.91%	78.42%	97.46%	94.02%	83.63%
5	0.72	0.97	84.50%	97.06%	97.07%	0.6	0.78	93.05%	31	64.24%	4	46.42%	12.89%	11.82%	4	95.43%	81.25%	85.77%	80.16%	75.33%	80.88%	79.65%
6	0.66	1.00	85.69%	95.38%	91.43%	0.57	0.59	92.28%	31	52.73%	3	56.88%	9.44%	11.67%	4	75.26%	87.46%	93.51%	78.77%	80.20%	75.00%	78.19%
7	0.55	0.93	94.30%	87.72%	92.69%	0.77	0.7	92.57%	34	63.79%	6	46.60%	12.77%	14.99%	4	80.75%	83.21%	82.34%	81.54%	92.76%	92.20%	78.62%
8	0.61	1.00	87.43%	85.66%	99.89%	0.61	0.8	92.93%	1	66.60%	5	49.66%	11.67%	14.67%	3	94.19%	97.17%	89.10%	88.00%	91.81%	80.66%	96.65%
9	0.54	0.93	85.96%	98.04%	97.00%	0.53	0.59	94.87%	34	72.25%	4	51.27%	11.64%	11.67%	5	86.68%	96.21%	87.45%	94.58%	82.31%	89.48%	80.68%
10	0.59	0.93	81.24%	87.75%	91.18%	0.83	0.83	95.60%	8	60.81%	5	32.15%	11.01%	10.50%	5	80.02%	85.39%	82.38%	97.36%	79.94%	96.79%	83.46%
11	0.53	0.93	82.42%	94.78%	98.38%	0.53	0.57	93.36%	29	74.87%	6	30.08%	14.00%	9.69%	2	95.95%	85.02%	81.13%	92.54%	82.84%	89.99%	78.29%
12	0.57	0.93	87.04%	94.86%	90.37%	0.63	0.89	91.77%	33	54.18%	4	31.47%	13.15%	14.40%	4	84.79%	78.23%	97.88%	83.79%	75.48%	93.27%	96.99%
13	0.59	0.97	94.90%	95.41%	92.33%	0.66	0.68	91.79%	15	51.47%	3	43.51%	13.83%	11.13%	4	95.75%	84.01%	75.67%	75.32%	92.97%	81.58%	87.13%
14	0.57	0.97	84.88%	89.94%	98.09%	0.79	0.57	97.57%	35	64.03%	3	59.44%	11.35%	9.55%	4	81.63%	80.96%	79.22%	91.76%	77.78%	82.85%	86.88%
15	0.57	1.00	91.03%	86.71%	93.00%	0.68	0.68	91.44%	53	71.57%	4	43.98%	13.14%	14.77%	2	87.81%	82.81%	84.17%	85.25%	83.98%	85.99%	80.84%
16	0.58	0.93	81.46%	98.45%	96.77%	0.51	0.57	93.88%	4	61.08%	4	55.36%	10.08%	13.42%	2	79.49%	77.13%	80.96%	97.03%	80.73%	84.68%	89.39%
17	0.51	0.93	89.06%	98.60%	96.55%	0.57	0.8	92.04%	29	65.79%	6	58.04%	11.06%	12.91%	3	81.03%	92.09%	94.24%	96.24%	82.14%	96.17%	87.75%
18	0.70	0.97	93.77%	88.80%	95.48%	0.66	0.73	94.03%	36	60.28%	6	52.60%	11.03%	12.52%	2	87.35%	78.50%	94.18%	84.05%	87.04%	88.33%	77.50%
19	0.63	0.93	89.26%	97.86%	92.46%	0.61	0.71	96.37%	10	65.91%	5	34.48%	12.97%	11.19%	4	91.94%	79.99%	96.39%	88.97%	84.00%	82.75%	95.09%
20	0.59	0.93	92.59%	93.44%	95.84%	0.53	0.77	90.11%	33	70.68%	5	36.02%	9.61%	12.31%	3	92.93%	97.84%	90.74%	89.44%	76.39%	96.20%	83.95%
21	0.51	0.93	85.15%	97.33%	99.68%	0.73	0.75	94.60%	33	53.15%	6	32.42%	9.50%	10.53%	4	96.04%	75.91%	84.89%	94.86%	95.82%	84.19%	96.67%
22	0.60	0.97	85.81%	88.13%	98.55%	0.59	0.68	94.96%	60	53.19%	4	58.22%	12.08%	9.48%	2	93.28%	75.56%	95.38%	94.17%	89.28%	89.40%	92.90%
23	0.65	0.97	80.82%	89.27%	96.77%	0.89	0.81	90.16%	32	51.73%	6	40.76%	9.28%	14.96%	5	81.12%	97.41%	79.93%	87.31%	89.76%	77.57%	95.11%
24	0.71	1.00	88.17%	91.42%	95.80%	0.59	0.63	97.29%	31	61.46%	6	39.12%	9.32%	9.44%	5	88.19%	96.50%	90.72%	95.64%	83.65%	80.98%	95.29%
25	0.53	0.93	90.60%	86.58%	94.43%	0.65	0.78	94.83%	2	69.29%	5	49.09%	12.67%	14.86%	3	92.26%	97.30%	96.02%	83.98%	96.22%	93.89%	93.46%
26	0.71	0.97	88.19%	89.16%	96.15%	0.86	0.9	96.32%	15	55.45%	5	46.58%	13.06%	10.85%	4	81.79%	94.33%	92.31%	78.14%	82.48%	76.63%	87.44%
27	0.58	1.00	81.41%	98.02%	91.57%	0.72	0.89	90.37%	10	69.55%	5	55.55%	10.49%	11.38%	3	86.42%	76.75%	87.87%	76.36%	75.32%	77.45%	80.64%
28	0.55	0.97	83.24%	97.09%	97.56%	0.59	0.76	91.51%	31	66.73%	6	35.35%	13.74%	14.97%	4	76.16%	97.21%	88.45%	87.95%	91.64%	91.50%	81.18%
29	0.60	1.00	95.06%	93.47%	99.26%	0.79	0.83	94.05%	19	57.22%	4	50.38%	9.18%	9.32%	2	90.80%	91.72%	79.56%	93.43%	81.29%	78.56%	82.34%
30	0.65	0.97	90.34%	91.55%	91.61%	0.63	0.63	92.04%	30	51.83%	5	53.78%	13.60%	10.82%	3	80.85%	76.02%	86.96%	86.78%	88.48%	88.01%	76.67%
31	0.71	0.93	80.36%	94.22%	91.08%	0.52	0.86	94.06%	36	57.16%	3	46.34%	9.60%	14.19%	5	88.04%	91.34%	75.77%	80.00%	95.30%	84.24%	79.99%
32	0.60	1.00	84.13%	93.32%	96.24%	0.72	0.63	98.13%	20	67.31%	6	59.03%	10.09%	12.62%	2	91.01%	80.65%	79.54%	95.69%	89.19%	81.23%	76.89%
33	0.47	0.93	82.48%	91.15%	97.75%	0.63	0.73	98.24%	11	71.71%	5	57.48%	13.23%	8.62%	2	86.48%	86.93%	92.44%	93.48%	88.05%	95.40%	87.66%
34	0.68	0.93	82.22%	96.00%	90.23%	0.62	0.86	92.45%	34	62.66%	4	43.60%	11.61%	9.35%	4	97.39%	79.47%	84.61%	81.91%	78.46%	85.12%	79.93%
35	0.62	1.00	80.23%	90.20%	95.10%	0.58	0.8	92.74%	40	67.17%	4	34.47%	13.86%	14.84%	3	79.23%	90.08%	97.80%	96.03%	76.16%	84.02%	86.38%
36	0.51	0.93	95.80%	90.14%	97.26%	0.73	0.63	94.38%	32	69.48%	3	58.68%	13.39%	9.62%	2	82.97%	85.22%	83.59%	95.03%	91.89%	91.28%	76.54%

Table A7. *Cont.*

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
37	0.71	0.93	80.03%	96.96%	90.23%	0.58	0.56	98.00%	26	57.81%	4	45.86%	10.11%	9.05%	3	91.40%	77.40%	85.91%	91.66%	89.90%	87.51%	75.03%
38	0.69	0.97	82.90%	91.35%	93.13%	0.71	0.84	97.14%	25	51.15%	5	39.76%	9.59%	10.23%	3	83.83%	94.23%	77.84%	92.55%	80.76%	80.91%	94.20%
39	0.61	0.97	87.80%	93.33%	98.29%	0.5	0.72	91.03%	38	52.47%	3	51.44%	12.16%	14.34%	4	87.70%	77.04%	83.15%	77.35%	84.66%	79.52%	92.30%
40	0.59	1.00	84.77%	93.99%	99.82%	0.6	0.7	95.70%	57	58.28%	4	35.31%	9.05%	10.87%	4	80.54%	93.33%	76.39%	77.90%	79.30%	87.43%	88.77%
41	0.67	0.93	83.76%	90.23%	99.24%	0.55	0.67	97.79%	47	54.41%	6	56.70%	10.02%	12.38%	2	88.00%	96.09%	93.99%	86.69%	79.90%	96.56%	80.86%
42	0.51	0.97	87.86%	88.97%	92.14%	0.75	0.74	91.31%	28	68.52%	4	34.16%	13.33%	9.42%	3	88.25%	85.70%	86.14%	86.11%	77.22%	77.92%	84.14%
43	0.63	1.00	86.46%	97.47%	91.63%	0.89	0.72	91.38%	2	59.12%	6	47.43%	13.48%	8.85%	4	81.69%	79.92%	86.09%	95.06%	77.92%	93.43%	94.38%
44	0.56	1.00	84.59%	89.29%	94.70%	0.89	0.57	95.45%	25	69.28%	3	30.88%	9.45%	11.18%	5	91.49%	77.30%	77.32%	97.37%	86.44%	76.12%	93.35%
45	0.47	0.93	85.01%	86.14%	91.03%	0.6	0.56	97.16%	26	72.94%	4	53.94%	11.20%	9.93%	2	82.25%	83.10%	83.84%	87.93%	81.15%	90.44%	76.20%
46	0.53	1.00	85.39%	91.76%	97.93%	0.65	0.6	93.53%	51	56.32%	6	58.96%	11.51%	8.31%	4	80.90%	80.11%	95.82%	92.69%	78.33%	96.10%	76.20%
47	0.60	0.93	85.77%	87.32%	92.90%	0.87	0.61	90.55%	22	69.47%	6	30.48%	10.95%	9.06%	3	97.11%	96.73%	85.55%	84.13%	76.38%	84.45%	92.96%
48	0.57	0.97	88.98%	91.60%	90.23%	0.63	0.65	90.21%	43	74.61%	6	42.46%	10.36%	11.24%	4	83.59%	83.16%	95.06%	78.44%	85.56%	96.03%	96.21%
49	0.66	0.93	95.90%	96.56%	90.80%	0.63	0.83	91.52%	56	68.53%	5	44.97%	12.24%	8.75%	4	97.22%	75.97%	81.06%	78.24%	93.36%	76.77%	84.59%
50	0.64	0.97	92.45%	87.93%	91.87%	0.86	0.6	98.63%	44	56.07%	3	42.01%	9.11%	8.55%	3	78.84%	82.56%	92.89%	92.36%	89.85%	90.40%	81.02%

Table A8. Suppliers' feedback in the second period.

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
1	0.58	0.93	94.04%	95.07%	90.26%	0.75	0.69	94.20%	49	51.37%	5	51.54%	9.30%	13.24%	4	97.97%	86.90%	92.91%	79.98%	84.57%	85.99%	94.79%
2	0.55	1.00	86.60%	88.69%	96.20%	0.66	0.63	95.43%	20	63.59%	5	42.58%	10.67%	10.36%	2	76.91%	88.86%	88.91%	97.66%	84.07%	94.10%	94.52%
3	0.62	0.93	91.34%	93.93%	94.01%	0.6	0.75	96.19%	4	64.75%	4	34.81%	11.64%	8.08%	4	95.68%	86.30%	88.65%	77.98%	84.16%	96.63%	89.21%
4	0.61	0.97	91.72%	92.08%	98.58%	0.86	0.6	98.81%	46	68.60%	3	30.88%	11.11%	9.96%	5	97.40%	77.75%	95.47%	97.85%	79.10%	87.63%	84.78%
5	0.46	1.00	89.50%	98.83%	95.36%	0.71	0.78	90.73%	38	66.58%	4	51.06%	9.90%	9.26%	3	79.46%	93.99%	79.85%	83.31%	80.45%	77.70%	96.67%
6	0.46	0.97	92.06%	97.25%	93.80%	0.81	0.66	90.54%	11	61.33%	4	40.27%	9.65%	14.01%	4	75.28%	80.46%	95.43%	97.09%	79.96%	78.49%	87.74%
7	0.62	0.93	95.94%	90.75%	96.65%	0.9	0.71	91.32%	30	53.32%	6	53.23%	12.39%	9.81%	4	89.31%	76.37%	81.25%	89.06%	79.19%	79.84%	94.89%
8	0.46	0.97	85.60%	94.59%	99.44%	0.71	0.72	94.55%	4	58.54%	6	39.06%	9.71%	14.00%	2	92.04%	80.96%	85.16%	79.46%	96.89%	80.28%	89.40%
9	0.52	0.93	90.31%	86.84%	99.33%	0.64	0.67	91.04%	37	57.42%	4	32.94%	13.80%	9.39%	3	84.23%	96.07%	90.02%	76.91%	89.51%	92.67%	90.42%
10	0.66	0.93	87.86%	88.16%	95.14%	0.89	0.61	95.96%	37	57.73%	3	44.85%	9.98%	12.46%	2	91.67%	76.84%	87.00%	83.92%	88.61%	78.15%	86.74%
11	0.69	0.93	91.09%	97.10%	96.94%	0.86	0.84	93.46%	52	72.64%	5	31.20%	9.40%	12.21%	5	93.11%	78.89%	79.09%	84.74%	79.52%	88.45%	76.31%
12	0.68	1.00	86.60%	89.73%	94.91%	0.56	0.7	96.05%	60	53.44%	3	58.88%	9.51%	14.19%	5	81.56%	83.72%	82.62%	79.04%	82.94%	81.63%	78.81%
13	0.47	0.97	82.66%	93.82%	95.81%	0.51	0.56	91.17%	11	66.30%	5	33.59%	12.64%	11.82%	3	92.28%	84.01%	96.27%	85.73%	84.31%	89.17%	79.99%
14	0.53	0.93	90.12%	98.87%	91.55%	0.51	0.6	93.27%	41	69.34%	3	39.58%	9.56%	13.34%	4	97.79%	78.88%	76.12%	81.18%	80.80%	94.30%	82.27%
15	0.49	1.00	80.62%	95.84%	97.76%	0.71	0.63	92.46%	27	58.47%	4	43.88%	12.38%	9.69%	4	91.54%	76.82%	93.72%	95.94%	77.55%	85.36%	76.72%

Table A8. *Cont.*

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
16	0.52	0.97	82.78%	97.58%	99.38%	0.86	0.56	94.28%	29	58.07%	4	32.98%	11.12%	8.98%	3	77.20%	88.61%	80.62%	82.72%	78.40%	96.06%	91.34%
17	0.51	1.00	83.50%	87.50%	91.42%	0.53	0.78	92.05%	32	62.12%	5	51.82%	13.97%	11.28%	3	85.33%	81.13%	89.13%	88.49%	89.89%	92.38%	91.40%
18	0.69	0.93	81.68%	87.90%	96.27%	0.86	0.88	95.42%	31	53.01%	6	55.55%	9.11%	13.40%	3	81.13%	94.00%	88.39%	92.34%	77.71%	84.55%	85.77%
19	0.72	1.00	93.10%	89.87%	99.08%	0.74	0.7	98.75%	28	50.32%	4	50.84%	10.46%	13.19%	4	90.04%	80.32%	97.15%	92.22%	77.33%	97.21%	77.32%
20	0.53	0.97	91.85%	98.50%	94.62%	0.78	0.87	95.95%	49	57.36%	5	50.73%	10.93%	11.45%	5	80.56%	88.71%	75.82%	94.40%	79.32%	77.01%	92.14%
21	0.69	0.93	92.43%	97.59%	94.24%	0.67	0.73	97.90%	14	68.73%	4	58.81%	12.53%	9.25%	4	87.50%	96.19%	78.81%	76.97%	90.14%	94.57%	77.33%
22	0.61	0.97	84.19%	93.81%	90.80%	0.81	0.89	94.74%	28	53.08%	4	53.08%	9.73%	14.97%	3	76.67%	92.02%	80.00%	80.49%	78.49%	93.14%	82.08%
23	0.63	0.97	82.76%	95.06%	91.45%	0.82	0.87	91.87%	34	61.78%	4	54.55%	13.82%	10.11%	4	87.93%	88.23%	95.78%	92.13%	83.91%	89.42%	84.34%
24	0.64	1.00	81.86%	95.00%	92.92%	0.54	0.71	94.04%	56	71.99%	5	49.83%	10.57%	12.28%	3	96.24%	90.31%	90.66%	91.65%	78.26%	90.60%	82.12%
25	0.51	0.97	95.03%	95.58%	92.47%	0.65	0.77	94.15%	33	68.43%	5	38.70%	9.92%	8.22%	3	93.54%	85.25%	78.08%	85.02%	95.95%	96.44%	84.96%
26	0.71	0.97	94.42%	87.78%	99.24%	0.79	0.65	93.75%	37	73.88%	4	50.30%	10.14%	8.62%	3	95.46%	89.11%	85.14%	90.44%	83.13%	93.74%	92.50%
27	0.71	0.93	86.05%	97.74%	94.43%	0.81	0.83	98.97%	8	62.62%	4	56.19%	13.88%	8.36%	4	87.61%	84.18%	94.48%	89.74%	87.81%	94.82%	83.16%
28	0.51	1.00	93.62%	90.85%	94.01%	0.83	0.8	96.43%	58	54.56%	4	34.73%	12.93%	12.18%	3	83.75%	78.26%	84.88%	97.13%	89.09%	79.68%	80.03%
29	0.70	1.00	88.35%	93.19%	90.36%	0.6	0.73	96.00%	25	53.41%	3	41.62%	9.92%	13.40%	4	95.54%	79.52%	92.96%	87.72%	80.33%	93.04%	82.64%
30	0.56	0.93	88.81%	97.76%	99.42%	0.81	0.55	92.06%	43	59.86%	5	32.10%	10.00%	8.56%	4	82.75%	86.56%	82.19%	75.26%	86.32%	83.79%	79.99%
31	0.52	1.00	91.21%	87.54%	97.39%	0.52	0.64	94.49%	56	59.76%	3	41.09%	13.13%	13.12%	4	76.64%	79.51%	90.04%	97.07%	83.78%	92.25%	94.05%
32	0.72	0.93	80.87%	98.55%	93.61%	0.67	0.82	92.75%	26	61.37%	4	44.13%	11.05%	12.73%	4	78.31%	77.02%	78.67%	82.27%	94.88%	87.50%	85.58%
33	0.65	0.97	92.27%	92.83%	99.12%	0.65	0.58	97.28%	31	56.01%	5	45.51%	12.69%	12.99%	4	84.65%	76.65%	96.74%	79.41%	80.48%	76.73%	84.16%
34	0.56	1.00	93.92%	95.84%	97.59%	0.59	0.86	98.05%	23	72.25%	6	37.11%	11.90%	12.89%	4	79.00%	94.42%	84.28%	78.36%	81.48%	84.58%	80.06%
35	0.47	0.93	91.92%	97.08%	99.56%	0.61	0.8	97.22%	53	58.98%	5	50.67%	12.22%	11.77%	2	97.93%	85.10%	96.88%	94.28%	80.66%	91.87%	85.75%
36	0.64	0.93	91.71%	88.76%	90.42%	0.81	0.56	90.01%	3	63.12%	6	53.59%	11.24%	10.02%	4	83.55%	79.87%	87.77%	78.39%	83.83%	77.03%	89.46%
37	0.60	0.93	80.06%	97.14%	99.26%	0.88	0.78	94.25%	40	66.14%	4	44.40%	10.79%	11.54%	3	96.63%	97.94%	93.64%	95.91%	75.50%	75.85%	90.76%
38	0.62	1.00	95.01%	91.64%	95.22%	0.66	0.81	93.75%	11	56.14%	5	39.74%	9.35%	10.49%	4	75.00%	79.41%	90.90%	93.11%	80.96%	78.98%	88.94%
39	0.47	1.00	85.53%	87.25%	93.37%	0.52	0.69	94.09%	30	55.88%	3	37.50%	10.16%	14.51%	4	93.41%	87.59%	78.47%	84.19%	93.42%	84.39%	79.97%
40	0.61	0.93	83.92%	93.01%	96.51%	0.74	0.64	91.34%	48	53.43%	6	58.16%	12.44%	13.09%	4	93.61%	85.08%	75.04%	75.07%	77.56%	96.20%	79.45%
41	0.69	0.97	90.26%	90.28%	91.02%	0.6	0.83	97.08%	45	66.68%	5	39.46%	10.96%	10.67%	3	90.49%	81.19%	93.69%	83.18%	91.85%	81.44%	87.46%
42	0.53	1.00	84.90%	90.52%	98.43%	0.9	0.65	90.30%	39	50.01%	6	31.78%	13.15%	10.80%	3	80.06%	89.17%	91.71%	77.18%	76.16%	88.15%	86.15%
43	0.51	0.93	87.82%	93.72%	91.85%	0.65	0.81	95.28%	25	64.96%	6	48.37%	13.04%	11.56%	3	92.29%	76.65%	94.86%	92.34%	75.96%	79.95%	78.71%
44	0.65	0.97	80.32%	94.68%	93.31%	0.82	0.9	95.32%	46	57.37%	5	51.20%	11.51%	12.73%	4	93.17%	85.39%	82.61%	75.19%	91.45%	76.20%	87.75%
45	0.60	1.00	81.30%	96.86%	97.85%	0.71	0.83	92.66%	57	53.73%	4	55.35%	9.81%	8.50%	4	84.99%	84.88%	82.77%	89.07%	92.93%	85.13%	78.81%
46	0.68	0.93	94.96%	89.73%	97.78%	0.72	0.59	97.97%	55	65.43%	5	59.39%	13.00%	9.56%	4	77.97%	91.53%	87.62%	92.50%	87.62%	75.52%	85.37%
47	0.60	0.93	82.51%	95.27%	98.97%	0.85	0.65	93.28%	31	68.76%	5	58.07%	12.58%	9.82%	3	84.69%	97.72%	96.88%	75.80%	95.44%	92.63%	96.41%
48	0.66	0.97	83.79%	90.00%	93.16%	0.59	0.63	95.94%	10	54.83%	3	45.53%	10.84%	9.06%	3	93.27%	78.68%	83.51%	92.88%	92.50%	89.48%	96.05%
49	0.53	1.00	81.76%	90.93%	93.47%	0.82	0.84	91.47%	45	69.11%	4	42.43%	13.16%	8.19%	2	89.05%	84.46%	76.89%	94.06%	77.44%	85.38%	79.02%
50	0.51	0.93	92.16%	90.34%	98.82%	0.7	0.7	95.73%	25	69.46%	6	54.60%	13.48%	12.38%	2	94.59%	87.67%	87.46%	96.93%	79.37%	96.35%	92.43%

Table A9. Suppliers' feedback in the second period.

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
1	0.62	0.93	93.58%	97.06%	95.87%	0.9	0.57	94.66%	7	60.37%	5	56.05%	12.90%	9.12%	2	96.85%	91.55%	97.61%	87.25%	92.28%	94.75%	97.62%
2	0.70	0.97	85.32%	97.75%	94.67%	0.72	0.59	90.74%	36	62.21%	4	32.38%	12.86%	11.18%	2	75.72%	78.34%	97.73%	91.17%	77.90%	83.93%	87.51%
3	0.60	0.93	89.70%	87.54%	91.72%	0.77	0.6	93.24%	35	54.54%	3	53.99%	11.60%	13.95%	3	94.16%	86.47%	75.77%	91.05%	77.74%	89.47%	93.27%
4	0.51	1.00	89.17%	87.48%	94.30%	0.86	0.87	94.11%	45	62.40%	4	51.50%	10.57%	12.20%	5	91.77%	85.16%	83.80%	79.43%	91.92%	80.05%	91.60%
5	0.50	0.97	86.19%	97.51%	93.72%	0.75	0.69	90.13%	37	55.43%	4	49.99%	9.86%	11.71%	5	97.00%	88.48%	84.21%	83.31%	97.34%	89.00%	91.15%
6	0.53	0.97	89.98%	98.90%	96.63%	0.61	0.89	91.86%	13	66.32%	5	54.00%	13.49%	11.64%	4	94.60%	94.21%	94.22%	93.88%	75.75%	92.63%	95.04%
7	0.65	0.93	83.95%	96.82%	96.30%	0.78	0.81	98.70%	24	54.57%	6	39.90%	12.25%	12.68%	5	80.70%	87.73%	96.97%	95.03%	97.33%	85.70%	92.20%
8	0.63	0.93	83.41%	90.28%	92.15%	0.72	0.7	94.35%	3	66.05%	6	46.80%	13.43%	13.65%	4	78.67%	77.51%	86.51%	95.79%	92.04%	91.19%	86.16%
9	0.52	0.93	89.35%	92.61%	97.84%	0.5	0.62	95.96%	9	67.69%	5	59.45%	10.76%	14.38%	2	92.41%	77.06%	79.29%	78.20%	94.18%	82.39%	93.16%
10	0.60	0.93	82.12%	94.43%	90.39%	0.75	0.7	91.58%	37	67.15%	4	50.04%	11.95%	13.47%	4	82.04%	76.15%	94.09%	88.29%	83.61%	96.36%	97.95%
11	0.54	0.93	94.84%	94.33%	95.44%	0.62	0.75	91.98%	49	72.28%	4	49.43%	13.32%	10.40%	3	95.71%	80.19%	76.26%	89.17%	86.73%	93.19%	84.22%
12	0.61	1.00	90.22%	98.86%	90.62%	0.66	0.79	97.87%	6	65.53%	4	44.74%	10.42%	11.35%	4	81.57%	90.07%	90.95%	82.64%	86.84%	84.20%	91.55%
13	0.51	0.93	88.15%	92.14%	95.06%	0.51	0.78	95.51%	48	64.86%	4	53.07%	10.29%	13.94%	4	75.56%	91.78%	90.55%	90.75%	76.53%	95.41%	88.59%
14	0.54	0.93	92.75%	86.94%	98.01%	0.9	0.55	96.31%	22	71.85%	3	58.02%	11.19%	11.30%	4	92.47%	87.50%	86.57%	94.91%	92.75%	86.50%	87.19%
15	0.71	0.93	95.48%	87.63%	90.26%	0.83	0.79	95.88%	14	55.04%	5	49.74%	10.64%	12.32%	5	95.42%	88.74%	86.34%	81.71%	76.33%	86.89%	95.37%
16	0.59	0.93	93.24%	95.78%	92.73%	0.68	0.73	95.69%	48	54.33%	4	58.10%	13.97%	8.18%	3	92.67%	94.07%	94.95%	78.46%	95.53%	76.76%	84.00%
17	0.50	0.97	91.43%	91.17%	91.73%	0.58	0.83	95.77%	10	73.16%	5	33.02%	11.12%	11.17%	3	92.03%	90.87%	92.11%	94.26%	79.60%	77.99%	82.33%
18	0.69	0.93	88.13%	96.05%	95.19%	0.83	0.77	91.55%	37	57.36%	4	42.88%	9.79%	14.94%	3	97.83%	94.63%	92.11%	75.87%	84.10%	90.94%	88.48%
19	0.52	0.93	84.04%	95.95%	90.02%	0.63	0.88	98.16%	26	51.30%	4	33.98%	11.28%	12.02%	2	76.80%	85.53%	85.49%	94.45%	87.78%	75.54%	81.53%
20	0.51	0.97	80.31%	95.21%	92.23%	0.57	0.88	98.17%	38	57.52%	5	39.25%	13.83%	13.42%	3	93.19%	86.18%	89.22%	85.47%	94.72%	80.69%	95.65%
21	0.47	0.93	94.86%	96.56%	98.60%	0.57	0.69	93.15%	4	69.25%	4	40.87%	10.21%	10.60%	4	80.41%	85.90%	77.48%	96.83%	93.13%	77.00%	77.26%
22	0.50	0.93	93.74%	93.94%	91.41%	0.82	0.58	98.56%	41	68.17%	5	57.85%	13.29%	13.12%	3	91.10%	93.91%	81.37%	79.95%	95.01%	90.52%	79.01%
23	0.72	0.93	82.35%	91.16%	93.00%	0.57	0.76	92.39%	41	60.93%	3	53.83%	10.59%	9.36%	2	95.76%	80.06%	88.94%	79.36%	88.12%	85.56%	82.84%
24	0.67	0.93	80.52%	87.99%	90.02%	0.58	0.84	98.09%	7	55.00%	5	34.39%	10.17%	11.08%	4	86.33%	83.82%	89.78%	90.09%	86.07%	79.19%	96.09%
25	0.64	0.93	95.78%	94.09%	96.31%	0.89	0.81	95.14%	10	67.09%	5	40.03%	11.50%	13.92%	5	84.67%	89.15%	89.14%	83.28%	97.39%	90.98%	86.19%
26	0.46	0.93	92.24%	89.68%	94.71%	0.55	0.84	97.43%	33	66.41%	5	59.65%	11.32%	10.58%	4	76.09%	84.09%	86.90%	83.98%	93.88%	81.53%	91.78%
27	0.48	0.93	92.24%	94.48%	93.10%	0.76	0.73	91.27%	48	62.21%	5	52.66%	12.81%	9.69%	4	96.41%	91.75%	88.36%	82.65%	77.70%	78.47%	87.80%
28	0.69	1.00	91.88%	85.64%	90.18%	0.62	0.66	90.85%	44	67.67%	5	36.03%	10.74%	11.03%	4	88.00%	90.20%	76.47%	91.95%	93.95%	96.66%	83.11%
29	0.54	0.93	95.22%	96.21%	98.22%	0.54	0.8	90.08%	18	55.50%	4	48.66%	13.72%	14.33%	3	85.48%	92.94%	96.24%	97.86%	84.20%	82.00%	80.21%
30	0.65	0.97	82.50%	97.20%	95.27%	0.79	0.81	93.48%	44	55.94%	6	56.48%	13.39%	14.81%	3	85.77%	91.24%	88.89%	81.99%	79.48%	81.78%	95.98%
31	0.69	1.00	91.73%	87.24%	99.59%	0.77	0.88	91.83%	1	66.77%	6	59.20%	12.07%	10.80%	2	76.80%	96.35%	91.93%	96.33%	82.00%	86.02%	91.83%
32	0.69	1.00	93.66%	94.17%	91.07%	0.8	0.62	91.54%	57	68.35%	5	58.48%	12.68%	11.40%	4	84.03%	90.03%	87.69%	82.43%	88.49%	80.93%	76.48%
33	0.58	0.97	88.05%	89.25%	96.61%	0.73	0.55	90.14%	45	53.03%	3	32.21%	12.73%	13.21%	4	95.77%	85.69%	92.54%	91.15%	83.38%	82.29%	78.87%
34	0.68	0.93	86.76%	85.79%	94.14%	0.5	0.88	97.00%	45	56.53%	6	49.87%	10.02%	9.07%	3	84.53%	97.74%	81.75%	83.96%	76.79%	85.14%	87.23%
35	0.53	1.00	84.88%	88.78%	92.65%	0.79	0.6	92.02%	16	53.71%	5	33.20%	9.58%	11.50%	3	94.80%	97.05%	78.29%	94.14%	80.76%	96.72%	78.32%
36	0.71	1.00	91.56%	87.26%	96.92%	0.67	0.62	91.14%	9	73.63%	4	52.06%	9.33%	12.75%	5	92.41%	84.46%	85.08%	92.59%	82.60%	80.53%	93.66%

Table A9. *Cont.*

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
37	0.72	0.93	85.23%	95.42%	93.20%	0.9	0.84	96.84%	26	70.20%	4	52.66%	13.57%	13.26%	2	95.52%	76.00%	76.81%	88.30%	83.00%	89.10%	89.14%
38	0.47	1.00	88.30%	98.43%	96.07%	0.56	0.59	98.28%	6	70.56%	5	48.44%	11.31%	12.40%	5	90.20%	97.92%	81.01%	96.38%	87.81%	84.99%	77.97%
39	0.53	0.97	82.08%	95.98%	92.77%	0.86	0.61	93.38%	50	53.60%	4	57.53%	11.82%	13.34%	5	84.54%	91.93%	79.16%	88.10%	86.15%	88.79%	87.78%
40	0.49	0.97	93.33%	89.61%	98.24%	0.78	0.56	98.34%	15	74.53%	6	46.76%	12.92%	10.73%	3	88.46%	88.23%	84.17%	78.14%	82.01%	76.87%	85.87%
41	0.50	0.97	81.51%	95.29%	99.35%	0.64	0.85	94.79%	53	60.13%	4	40.19%	9.69%	13.46%	4	93.32%	92.85%	82.61%	97.65%	80.80%	97.59%	85.13%
42	0.63	0.93	92.66%	94.34%	90.57%	0.88	0.67	91.40%	10	73.47%	3	53.99%	10.94%	13.01%	3	77.36%	89.73%	76.56%	85.87%	97.94%	79.36%	85.17%
43	0.56	0.93	88.08%	93.75%	96.72%	0.78	0.77	92.78%	17	50.15%	4	37.66%	9.11%	12.11%	3	75.32%	89.18%	90.82%	92.69%	87.72%	94.81%	97.57%
44	0.51	0.93	81.53%	87.65%	97.02%	0.87	0.8	97.97%	12	56.81%	6	51.67%	10.23%	14.28%	4	90.75%	93.49%	78.14%	97.84%	90.87%	93.01%	96.41%
45	0.71	0.97	90.25%	97.53%	95.14%	0.85	0.82	94.33%	10	68.76%	4	39.49%	13.64%	14.43%	4	88.00%	93.61%	76.43%	93.06%	89.33%	89.44%	82.38%
46	0.64	0.97	81.93%	86.55%	96.73%	0.72	0.61	97.08%	38	73.50%	5	38.44%	12.06%	8.47%	4	82.68%	84.09%	80.92%	84.74%	76.63%	94.89%	78.72%
47	0.58	0.97	82.48%	93.23%	93.59%	0.81	0.64	95.45%	20	51.52%	5	35.77%	13.35%	8.92%	2	92.26%	89.54%	91.87%	92.63%	86.33%	82.54%	78.29%
48	0.51	0.97	87.90%	85.06%	99.11%	0.55	0.88	96.58%	47	59.96%	5	48.32%	11.47%	11.57%	4	92.59%	86.49%	76.60%	75.66%	80.02%	77.56%	90.92%
49	0.49	0.93	82.00%	88.76%	98.42%	0.89	0.78	92.53%	45	73.26%	5	48.71%	13.23%	14.76%	3	92.84%	93.27%	80.02%	76.07%	90.36%	92.86%	93.24%
50	0.47	1.00	85.80%	92.62%	97.03%	0.85	0.58	95.97%	51	71.04%	6	41.88%	11.19%	12.66%	3	84.29%	80.02%	76.01%	84.58%	82.68%	75.36%	93.33%

Table A10. Suppliers' feedback in the second period.

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
1	0.46	0.97	81.78%	88.43%	91.49%	0.64	0.57	95.41%	50	55.23%	4	31.56%	9.81%	11.09%	2	91.14%	82.82%	80.37%	77.68%	97.76%	78.46%	76.22%
2	0.50	1.00	81.70%	88.59%	94.64%	0.69	0.82	93.26%	55	73.26%	3	33.12%	11.91%	9.72%	4	97.91%	75.38%	87.12%	87.76%	76.60%	97.45%	81.61%
3	0.58	0.93	87.01%	87.45%	93.45%	0.77	0.81	96.49%	13	52.88%	5	33.95%	9.02%	12.25%	3	82.13%	92.78%	76.51%	92.87%	77.48%	97.37%	77.71%
4	0.51	1.00	91.41%	85.36%	93.75%	0.53	0.62	93.97%	46	69.80%	4	36.33%	9.90%	8.64%	4	90.27%	95.40%	96.87%	75.20%	84.66%	95.70%	82.39%
5	0.66	0.93	92.95%	92.72%	96.11%	0.8	0.64	97.70%	41	59.25%	5	38.99%	13.30%	10.43%	3	94.40%	90.71%	80.52%	91.70%	76.78%	81.47%	90.93%
6	0.51	1.00	82.53%	98.77%	96.88%	0.61	0.82	97.82%	25	74.34%	6	47.85%	12.63%	9.69%	3	77.52%	82.38%	79.72%	77.34%	96.50%	77.74%	87.50%
7	0.72	0.97	84.23%	87.11%	98.49%	0.89	0.61	94.26%	3	53.33%	5	52.70%	9.05%	8.06%	3	78.57%	75.38%	81.77%	80.73%	79.97%	94.83%	84.38%
8	0.68	0.93	87.23%	91.52%	92.43%	0.73	0.7	92.34%	6	59.11%	3	50.20%	10.70%	14.45%	2	88.27%	82.31%	86.98%	95.18%	77.56%	83.00%	87.04%
9	0.48	0.93	80.98%	94.27%	99.98%	0.73	0.65	94.99%	1	68.95%	5	57.82%	13.46%	12.84%	3	91.73%	96.39%	94.07%	81.04%	75.42%	92.41%	84.54%
10	0.59	0.93	91.98%	86.05%	98.99%	0.65	0.73	90.78%	21	71.12%	3	41.56%	9.81%	9.17%	4	77.99%	82.76%	83.33%	92.08%	83.63%	97.34%	96.09%
11	0.68	0.97	85.60%	95.32%	98.15%	0.57	0.87	94.87%	14	58.00%	6	50.66%	10.36%	9.03%	3	89.79%	83.14%	79.18%	95.34%	95.48%	78.84%	91.65%
12	0.54	0.93	84.31%	89.50%	91.46%	0.89	0.77	93.95%	54	57.25%	5	34.97%	13.76%	9.16%	3	89.15%	75.20%	84.09%	84.80%	93.88%	75.38%	78.38%
13	0.52	0.97	83.23%	87.97%	97.28%	0.82	0.84	96.16%	16	60.89%	3	43.04%	10.93%	12.09%	3	89.42%	89.98%	83.21%	96.45%	87.32%	84.49%	88.80%
14	0.65	0.93	82.77%	93.92%	92.85%	0.86	0.77	92.31%	32	58.74%	3	45.37%	11.56%	10.86%	4	78.54%	84.45%	93.41%	76.87%	79.60%	86.79%	92.13%
15	0.58	1.00	95.16%	85.33%	93.14%	0.73	0.68	97.15%	19	73.43%	4	40.66%	12.28%	14.29%	4	88.78%	91.90%	90.20%	77.38%	80.82%	96.17%	83.30%

Table A10. *Cont.*

	A_1	A_2	A_3	B_1	B_2	B_3	B_4	B_5	C_1	C_2	C_3	D_1	D_2	D_3	D_4	E_1	E_2	E_3	E_4	E_5	E_6	E_7
16	0.50	1.00	87.36%	85.50%	96.74%	0.71	0.67	98.21%	31	54.65%	5	45.71%	13.30%	8.21%	3	91.56%	75.96%	97.56%	97.97%	90.89%	92.72%	90.97%
17	0.51	0.93	80.25%	91.04%	93.40%	0.6	0.81	97.17%	54	62.53%	4	36.16%	9.92%	14.09%	3	97.58%	88.03%	77.20%	83.64%	87.63%	85.78%	87.02%
18	0.70	1.00	81.63%	96.72%	93.66%	0.88	0.66	94.65%	13	67.79%	5	40.14%	10.63%	12.02%	4	92.31%	90.73%	88.44%	95.54%	87.43%	92.01%	88.08%
19	0.60	1.00	84.33%	95.49%	91.94%	0.64	0.84	94.60%	56	62.04%	6	32.43%	11.31%	9.92%	2	81.48%	85.68%	79.83%	94.26%	94.08%	93.96%	77.67%
20	0.67	0.97	94.55%	89.75%	97.23%	0.77	0.74	91.10%	5	52.55%	6	32.05%	11.41%	9.12%	3	75.38%	89.21%	84.36%	89.86%	90.95%	78.30%	90.18%
21	0.63	0.97	84.61%	94.38%	96.45%	0.82	0.69	94.64%	19	58.65%	3	43.58%	12.50%	12.98%	3	92.70%	90.95%	85.50%	87.22%	96.13%	82.44%	85.21%
22	0.56	0.97	86.80%	95.19%	96.12%	0.79	0.86	93.88%	20	50.92%	4	42.57%	12.61%	11.37%	3	94.86%	77.73%	95.07%	80.47%	82.53%	75.44%	83.75%
23	0.62	1.00	83.15%	87.35%	95.31%	0.75	0.63	98.12%	41	70.10%	5	54.96%	11.85%	8.18%	5	79.61%	82.06%	89.01%	81.10%	75.10%	76.20%	78.61%
24	0.50	1.00	81.86%	91.96%	97.03%	0.54	0.65	91.86%	22	67.41%	6	51.62%	9.15%	14.00%	4	87.75%	93.99%	96.13%	97.10%	75.98%	78.60%	95.31%
25	0.59	0.93	92.63%	86.47%	94.17%	0.6	0.74	98.72%	29	55.69%	5	50.89%	12.40%	9.10%	4	86.56%	94.90%	89.24%	77.09%	75.23%	79.83%	91.07%
26	0.64	0.97	90.51%	91.30%	92.14%	0.54	0.65	97.05%	53	71.24%	4	44.73%	10.44%	8.79%	4	89.99%	76.52%	91.50%	96.28%	75.38%	81.93%	76.53%
27	0.72	0.93	89.38%	86.14%	95.95%	0.9	0.89	90.00%	46	52.85%	4	32.27%	10.08%	11.24%	4	92.94%	96.46%	84.91%	83.55%	81.10%	80.75%	97.94%
28	0.49	0.93	85.80%	91.77%	96.93%	0.86	0.87	96.27%	47	61.02%	4	41.09%	13.33%	13.97%	4	87.41%	93.11%	94.94%	79.11%	89.97%	83.06%	80.57%
29	0.51	0.97	93.51%	92.14%	92.39%	0.75	0.65	98.54%	17	72.98%	5	42.43%	12.64%	12.56%	4	82.26%	87.59%	97.63%	79.41%	79.10%	96.61%	84.59%
30	0.58	0.93	82.83%	96.40%	90.21%	0.59	0.83	92.58%	8	64.26%	6	54.50%	9.37%	11.46%	3	96.93%	87.85%	77.42%	87.41%	79.05%	75.07%	86.84%
31	0.63	0.93	84.38%	87.22%	90.75%	0.82	0.57	97.32%	39	54.01%	5	54.73%	9.69%	12.40%	3	82.76%	95.93%	85.65%	87.49%	93.83%	87.87%	83.59%
32	0.46	0.93	90.25%	85.11%	97.92%	0.82	0.58	90.24%	37	72.79%	4	44.16%	9.53%	8.06%	4	85.42%	85.37%	94.64%	96.73%	78.74%	75.96%	75.23%
33	0.54	0.93	87.71%	94.68%	92.81%	0.54	0.72	94.43%	33	57.53%	4	40.34%	13.92%	9.56%	3	86.16%	80.41%	77.22%	77.73%	77.67%	76.36%	79.52%
34	0.65	1.00	90.05%	88.71%	92.62%	0.87	0.74	90.97%	14	53.04%	4	50.49%	10.48%	8.43%	4	88.15%	94.39%	97.16%	78.06%	94.47%	89.21%	92.03%
35	0.66	0.97	93.62%	91.04%	99.58%	0.7	0.6	97.94%	1	52.84%	5	35.02%	12.56%	11.47%	3	87.11%	87.04%	83.69%	80.81%	81.63%	78.62%	82.14%
36	0.60	0.93	89.03%	97.75%	98.52%	0.5	0.68	91.07%	43	56.87%	5	47.81%	11.01%	11.96%	3	81.72%	83.91%	85.39%	97.58%	80.68%	77.90%	83.43%
37	0.59	0.93	88.84%	85.46%	98.87%	0.78	0.78	95.48%	24	61.51%	6	55.43%	12.41%	8.77%	2	78.93%	93.69%	79.49%	79.95%	85.15%	93.60%	95.17%
38	0.52	0.93	88.23%	87.33%	98.41%	0.53	0.78	95.70%	30	73.89%	5	45.47%	11.79%	14.29%	4	78.82%	87.67%	85.23%	95.13%	81.84%	93.41%	80.86%
39	0.52	0.93	85.03%	97.00%	91.99%	0.84	0.59	97.09%	16	69.54%	6	55.96%	12.37%	12.82%	5	88.25%	87.19%	81.34%	82.98%	95.62%	83.78%	80.10%
40	0.63	0.93	85.51%	91.16%	92.55%	0.79	0.79	95.96%	58	53.81%	4	51.39%	11.17%	11.75%	4	77.66%	89.43%	81.17%	82.78%	75.30%	76.69%	87.97%
41	0.50	0.97	82.60%	94.55%	97.18%	0.58	0.78	98.80%	4	72.01%	5	59.13%	13.26%	9.21%	2	90.92%	85.51%	80.21%	84.27%	83.28%	96.34%	89.53%
42	0.57	0.93	89.57%	98.80%	90.68%	0.85	0.85	90.92%	27	65.90%	4	33.89%	13.75%	9.17%	4	83.82%	96.44%	85.63%	93.78%	87.99%	86.85%	85.12%
43	0.51	1.00	82.57%	92.05%	92.50%	0.82	0.78	97.61%	41	72.16%	5	36.37%	11.65%	8.10%	4	93.69%	78.32%	78.66%	75.91%	97.76%	96.01%	78.69%
44	0.72	0.93	90.81%	87.90%	96.18%	0.7	0.81	95.49%	56	73.34%	4	43.27%	11.01%	9.58%	4	96.99%	90.99%	92.99%	86.60%	91.47%	76.71%	84.31%
45	0.54	0.93	90.87%	91.02%	99.59%	0.53	0.61	92.34%	55	69.01%	5	35.86%	13.74%	14.66%	5	89.86%	90.54%	90.92%	97.36%	92.99%	96.14%	88.19%
46	0.54	0.93	94.16%	92.90%	99.02%	0.63	0.86	96.08%	58	57.75%	3	38.07%	9.68%	14.18%	2	87.09%	85.67%	90.74%	88.85%	89.33%	85.20%	92.19%
47	0.62	0.93	92.06%	93.34%	91.85%	0.64	0.57	97.47%	44	64.06%	6	36.31%	9.40%	14.60%	3	78.39%	94.00%	78.98%	90.07%	84.36%	90.67%	87.39%
48	0.63	0.97	89.67%	89.73%	97.96%	0.8	0.88	94.53%	20	62.13%	6	31.70%	13.34%	9.99%	2	77.35%	96.11%	76.13%	90.18%	76.78%	95.07%	81.88%
49	0.61	0.97	94.32%	88.94%	90.86%	0.52	0.7	96.30%	45	66.85%	4	55.84%	10.15%	10.23%	4	79.55%	94.78%	83.09%	79.63%	78.53%	79.85%	91.52%
50	0.69	0.97	94.11%	95.35%	93.04%	0.57	0.56	94.61%	8	71.30%	4	49.23%	9.75%	13.35%	3	92.13%	91.76%	81.90%	84.75%	81.66%	86.25%	95.03%

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