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Evaluation of Chinese Cloth Suppliers using Dynamic Grey Relational Analysis

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Abstract: The clothing industry is one of the world's most important and innovative industries. Furthermore, it is a major industry in developing economies such as China and India. With the global economic turmoil and environmental problems expanding, it is extremely important to choose suppliers who offer the highest level of customer satisfaction while taking environmental concerns into account. The study aims to evaluate wholesale clothing suppliers of a Chinese import/export company using the Dynamic Grey Relational Analysis (DGRA) model. The results are validated through comparative analyses with the Ordinal Priority Approach (OPA) and TOPSIS models. The results show that the DGRA is a reliable approach to supplier selection in apparel industry.

Keywords: Apparel industry; grey relational analysis; grey system; grey model; supplier selection.

1. Introduction

Supply chain disruptions continue to affect most industries, even nearly three years after the initial challenges of the COVID-19 pandemic. One industry that has been particularly affected is apparel. Buyers are finding fewer choices at physical stores while delivery times for online purchases are getting longer. Meanwhile, suppliers and retailers are also struggle to keep inventory levels high, sometimes not receiving major designs until much later in the season than expected (Dashoush, 2021). One way to deal with these problem sis revisiting the existing supplier selection practices and sourcing strategies. Literature has long acknowledged the importance of performance aspects and evaluation in supply chain management (Estampe *et al.*, 2013; Melnyk *et al.*, 2014). Thus, selecting the appropriate suppliers is critical to the procurement procedure and it is a significant opportunity for businesses to lower costs across their entire supply chain. The rise of new challenges (e.g. political conflicts, wars, and epidemics) has all disrupted supply chains (SCs) in incredible ways, demanding better decisions from businesses throughout all industries. On the other hand, Supply chains were indeed advancing as new issues and opportunities arose (Cebekhulu & Ozor, 2022). In essence, adaptability and flexibility are essential for surviving in the market.

In today's competitive environment, effective and efficient supply chains are becoming increasingly important for gaining a competitive advantage. In this regard, "Sustainable Development" has gained more prominence internationally in previous decades. The World Commission on Environment and Development (WCED, 1987) simply defined "Sustainable

Development" as "having effective for satisfying the needs of today's individuals without having a major impact on the resources required for the next generation". To reach this, the notion of Green Supply Chain Management (GSCM) was first reported in the literature in the nineties, when the rivalry was on the rise (Zhu & Sarkis, 2006). GSCM is described as adopting sustainable or incorporating environmental concerns into supply chain activities starting from product layout and ending with product recyclability, and it has the potency to lessen the environmental impact of industrial production while sustaining high quality, actual cost, durability, performance, and energy efficiency (Srivastava, 2007; Bah & Tulkinov, 2022).

Classically, the supplier selection has played an important role in supply chains, as it adds value to higher product quality and satisfaction of customers (Gonzalez *et al.* 2004). In traditional supply chains, the process of supplier selection has evolved into a vital part of Global Sustainable Supply Chain Management (GSCM). Furthermore, with emerging advancements, sustainability development, and GSCM, it has been more difficult and complicated. Therefore, establishing a model for deciding green suppliers is essential to guarantee supply chain sustainability (Amindoust *et al.*, 2012). Dheeraj and Vishal (1992) argued that GSCM equals Green manufacturing/materials management + Green purchasing + Green Distribution/marketing + Reverse logistics.

Green supplier selection, in contrast, is viewed as an interesting example of sustainability principles in today's society. Green supplier evaluation is a significant step toward more sustainable network systems. It is critical for a sustainable supply chain to integrate environmental factors into traditional supplier evaluation methods and procedures (Rostamzadeh *et al.*, 2015; Darnall *et al.*, 2008). As new insights into the interactions between business and the environment emerge, there is a growing focus on how to incorporate sustainability performance into business processes and a broader supply chain (Davis-Sramek *et al.*, 2020; Srivastava, 2007). In literature several methods have been used to solve supplier selection problems. An overview of them is presented in Table 1, while the last row shows the contribution of the current study.

The current study used the Dynamic Grey Relational Analysis (DGRA) to evaluate cloths suppliers against multiple criteria. In section 2 criteria are defined. Section 3 discusses the methodology, including data collection strategies, criteria weighting and the DGRA model. Section 4 contains the results and discussion. The comparative analyses with the Ordinal Priority Approach (OPA), and the Technique for Order Preference by Similarity to an Ideal Solution (TOPSIS) model is also presented. In the final section, some concluding remarks are made.

Table 1. Literature on supplier selection in clothing/textile/apparel/garment industry

Year	Market/Country	Method for ranking suppliers	Literature
2007	Garment vendors in Turkey and Egypt	AHP	Koprulu and Albayrakoglu (2007)
2010	Apparel Industry	AHP	Chan and Chan (2010)
2009	Apparel manufacturing Firm	AHP	Marufuzzaman *et al.* (2009)
2011	Taiwanese textile industry	TOPSIS	Chen (2011)
2015	Indian textile and clothes company	TOPSIS	Jia *et al.* (2015)
	Textile company Istanbul, Turkey	Fuzzy AHP, linear goal programming	Sivrikaya *et al.* (2015)
	Textile industry between China & India	AHP and TOPSIS	Sasi and Digalwar (2015)
2019	High-functionality textile industry	AHP and Fuzzy AHP	Mondragon *et al.* (2019)
	Garment industry of Vietnam	TOPSIS	Wang *et al.* (2019)
2020	Textile company in Turkey	Intuitionistic fuzzy TOPSIS	Nakiboglu and Bulgurcu (2021)
2021	Apparel and textile in Vietnam	Fuzzy AHP and Fuzzy TOPSIS	Wang *et al.* (2021)
2022	Chinese cloths import/export industry	Dynamic GRA, OPA, and TOPSIS	The current study

2. Supplier selection criteria

Selecting relevant criteria to use in evaluating potential suppliers is crucial for the procurement manager. Based on the literature (Ulutaş *et al.* 2019), a list of important criteria was created to evaluate suppliers in the clothing industry (see, Table 2). The final set of criterion are detailed as follows:

2.1 Technological capability

The technological capability has been seen as a significant player in the economic progress of a nation since the advance of manufacture relies on the ability to launch new items and it is also an indication of whether the company can keep up with the changing in the market (for instance, high demand, green products, new design, resilient products, etc.). Given the capability of a firm to implement any applicable practical utility, including the capability to form innovative goods, operations, and high-tech knowledge in order to reach upper levels of operational effectiveness (Tsai, 2004). Literature (Reed & Walsh, 2002; Tsai, 2004; Ulutaş *et al.*, 2019) regarded technological capability to be critically important for supplier selection in the aerospace, electronics, and textile industries.

The technological ability of the manufacturer is vital in bringing innovation to clothing and the process of cloth manufacturing. Through decent technological capability, the manufacturers can create a smart business that gathers both efficiency and effectiveness. As a result, the business will only employ resources that are necessary for production, limiting risks and extravagance (Wang *et al.*, 2006; Bergek *et al.*, 2008; Song *et al.*, 2008; Santos-Vijande *et al.*, 2012; García *et al.*, 2012). In addition, there is a clear correlation between technological capability, and business performance for small and medium-sized enterprises (Salisu & Bakar, 2019). Moreover, the well-built technological capabilities of the company are a notable factor for innovation in the area of management (Ercan, 2019). Guerra and Camargo (2016) argued that excellent technological capabilities possibly would create competitive advantages in the international market for the firm. In spite of everything, business owners should spend both money and effort to strengthen their technological capacity in order to secure their future in the marketplace.

2.2 Cost

Cost is the most favored economic characteristic used in supplier selection, it signifies the value given to take possession of (goods, services, raw materials, etc.), achieve, produce, or sustain anything. The importance of cost is demonstrated by their inclusion in nearly every supplier selection research, and failure to perform well on these criteria (cost, quality, and delivery) influences deeply supplier selection (Javed *et al.*, 2022; Jia *et al.*, 2015).

The cost influences the consumer segments that opt to purchase the product, as well as impacts the customer's expectations. Ohno (1988) said the only thing we are doing is observing the timeline, then removing the non-value-added wastes, and as a result shortening that timeline production. Because in the end, the firm's objective is looking to increase its profits, and this requires an understanding from the suppliers of the best cost afforded by buyers and consumers. Companies

Table 2. Supplier selection criteria (Ulutaş *et al.* 2019)

Dimension	**Criteria**
Economic	Technological Capability Cost Defective rate Late Delivery rate Technical assistance
Environment	Pollution control Environmental management Green transportation Green warehousing

can also decrease the cost by adopting new managerial approaches like kaizen, six sigma, Kanban, etc. and the best example is Japanese firms.

2.3 Defective rate

The defective rate is expressed as the sum of defective products detected divided by the total of units tested. The term defect rate refers to the proportion of damaged parts in comparison to the number of units produced. It is an indication of the quality of the production. A high defect rate influences negatively production costs as well as might perhaps result in a process shortage. Moreover, it might increase the storage rate in manufacturing (Yang *et al.*, 2015). All waste sources must be identified and eliminated because defectives are a form of production waste (Ohno, 1988). Sarkar (2019) argued that to reduce defective items the entire manufacturing system must be checked and verified.

Tracking the defective rate allows businesses to assess the overall quality of each product and the manufacturing process. Recognizing the above assessment enables the firm to recognize where defects are happening and, potentially, assist in the development of solutions or service quality. This concept is applicable to a wide range of industries and businesses. A software developer, for example, may use defect rate to determine what percentage of their lines of code are incorrect, while a call center may calculate how many calls fail to meet quality standards. All produced items should be categorized into good and defective products because defective items have a negative impact on economic ordering quantity (EOQ) (Salameh & Jaber, 2000; Wahab & Jaber, 2010).

2.4 Late delivery rate

The late delivery rate refers to the ratio of seller-fulfilled orders that are ship confirmed after the estimated ship date divided by those fulfilled during the relevant timeframe. Delivery timeliness has huge importance in measuring the performance of suppliers (Simpson *et al.*, 2002). Additionally, delivery timeliness influences severely supplier selection (Javed *et al.*, 2022).

Logistics and supply chain management can be time-consuming and overwhelming business endeavors. As a result, late delivery comes at a high cost to the business, as evidenced by lowering customer loyalty, higher customer acquisition costs, and declined customer lifetime value. Bushuev (2018) emphasized that higher levels of delivery uncertainty may make a buyer unwilling to agree to contract terms with the supplier. That is why the suppliers should indeed look for creative ways to provide higher levels of delivery service even with super low inventory levels.

2.5 Technical assistance

Technical assistance refers to a supplier's capacity to provide specialized assistance to the firm with a development necessity. Out of all the service components discussed in the study, technical assistance was an attribute that appeared on more than 20% of the assessments (Simpson *et al.*, 2002). The more the firm is advanced in technology capabilities the more technical assistance provides and verse versa.

Technical assistance was among the strategies used by companies to accomplish significant economic and environmental gains by collaborating with their supplier partners (Kim & Rhee, 2012). In today's digital age, businesses are defined by their technological capabilities. A firm can be brought to a halt without the assistance and knowledge of a tech team. In other words, technical support ensures that the firm's technology remains productive and therefore achieves maximum advantages (cost saving, enhanced performance, higher product quality, and service quality).

2.6 Pollution control

Organizations and governments all around the globe are attempting to lower their environmental impact by implementing a sustainable supply chain. Pollution control refers to any sort of practice adopted by the firm to minimize, mitigate, or avoid pollution at its source before it is created. Developing guidelines to help to prevent environmental harm (see Rabbani *et al.*, 2019;

Amindoust, 2018; Amindoust *et al.*, 2012). A successful pollution prevention initiative entails meeting a group of qualified individuals, reporting how the business processes actually work and then delving into where setbacks happen and how much it actually costs. Only then can workers and staff work harmoniously to minimize or avoid shortfalls that cost you money and have detrimental effects on the environment. Consequently, training could be more crucial in boosting a company's adoption of environmental policies (Efobi *et al.*, 2019).

The impact is apparent in the performance of small businesses, which gain social acceptance. The said acceptance level will boost sales volume and performance. In addition, by implementing pollution control, the company will avoid government financial penalties and harassment from public agencies responsible for enforcing environmental protection regulations, as well as other environmental organizations (Efobi *et al.*, 2019). Clearly, businesses that aim to flourish in the global market should not continue ignoring environmental problems.

2.7 Environmental Management

People are becoming more conscious of the deep ties that exist between the economy and the environment. As a result, several nations have enacted environmental legislation and regulations to regulate the use of potentially harmful goods, processes, and wastes (Lee *et al.*, 2009). The EU requires importers to adhere to environmental rules and acquire more environmentally friendly equipment (Lee *et al.*, 2009). Collaboration on environmental concerns with suppliers was connected to improvements in three conventional aspects of manufacturing performance - quality, delivery on time, and flexibility - as well as environmental performance (Vachon & Klassen, 2008). Moreover, the Supplier's environmental performance must be defined under four types of indicators (wastewater, air emissions, solid wastes, and energy consumption) (Noci, 1997). Handfield *et al.* (2002) argued that buyers requisite to buy products and services from suppliers who can provide them at the lowest possible cost and with the highest possible quality, and with the shortest delivery dates while also managing their activities related to environmental responsibility.

The economy's prosperity is highly reliant on the well-being of the environment and society (Mahmoudi *et al.*, 2021). As a result, managers and policymakers should indeed take into account the combination of environmental practices with economic objectives.

2.8 Green transportation

Sustainable logistics development prompts activities that achieve maximum economic and social benefits while limiting negative environmental impacts (Abbasi & Nilsson, 2016). Green transportation is defined as any method of transportation used by suppliers that are powered by [an alternative power source], [Alternative fuel]. The environmental impact can be direct, considering that the products purchased generate waste during storage, transportation, processing, usage, or disposal (Handfield *et al.*, 2002). According to Salimifard *et al.* (2012), the transportation industry is directly responsible for 23% of emissions of CO2. Moreover, a further 40% increase in CO2 emissions is predicted between 2007 and 2030, threatening global health (Rostamzadeh *et al.*, 2015). Therefore, serious efforts should be made to reduce or eliminate CO2 emissions through the adoption of green transportation.

Logistics includes transportation, which can be employed in a range of ways. The main modes of transportation are by road, rail, sea, and air (Gurel *et al.*, 2015). Govindan *et al.* (2019) emphasized that green and energy-efficient transportation practices could well assist in minimizing the negative influence on the environment while also enhancing the usage of resources efficiently, herewith improving the environmental image of both suppliers and customers. Additionally, the most frequent initiatives to boost the effectiveness and efficiency of internal logistical resources concerned the mode of transportation and the energy consumption of vehicles (Abbasi & Nilsson, 2016).

2.9 Green warehousing

Developing solutions to minimize energy consumption, employ sustainable energy sources and materials, and reduce non-recyclable trash generated during warehouse operations. In order to mend supply chain sustainability, Wang *et al.* (2015) emphasize the importance of recycling facilities in supporting green warehousing. Furthermore, green warehousing might well reduce the expense of pollution control by generating no waste or emitting neither emissions, which may lead to enhanced economic performance and might even save companies from financial penalties for environmental violations (Agyabeng-Mensah *et al.*, 2020). According to Torabizadeh *et al.* (2020) green warehousing seems to have an advantageous effect on company performance.

In recent times, more businesses have recognized the importance of green warehousing in terms of cost and energy savings. However, the initial cost and time investment required to transform to this type of warehousing frightens many businesses (Rostamzadeh *et al.*, 2015; Dheeraj & Vishal, 1992). Even though the advantages of green warehousing on economic growth would appear indefinable or far away. However, implementing energy-saving strategies, such as shifting lighting systems to minimize electricity usage, does have a beneficial economic impact. Long-term benefits include reduced risks from climate change, energy shocks, and water shortages.

3. Research methodology

3.1 Data collection and analysis

Data from suppliers were gathered from the boss of a small import-export company founded in 2013 that trades clothing and furniture to countries in the Middle East, where customers are difficult to satisfy due to high living standards. The company is based in Yiwu, China, and their suppliers are from different parts of China. The suppliers of clothes were evaluated using a 9-point Likert scale. After asking the person to rank the criteria in order of importance to his business, we asked him how satisfied he is with the performance of these suppliers on these nine criteria. Nonetheless, the respondent did not give any supplier the highest rating.

The current study evaluated six suppliers using the Dynamic GRA against nine criteria. The Rank Reciprocal (RR) method was used to determine the weights of the criteria. For comparative analyses, TOPSIS and OPA were applied. For TOPSIS as well, the criteria weights were estimated through the RR method. The Dynamic GRA and TOPSIS were executed in MS Excel, while the OPA was executed in Amin Mahmoudi's OPA Solver. The algorithms of the OPA and TOPSIS can be found in Mahmoudi and Javed (2022) and Hwang and Yoon (1981), respectively.

3.2 Criteria weight estimation

The weights of the nine attributes for both Dynamic GRA and TOPSIS were calculated using the Rank Reciprocal (RR) method. The Rank Reciprocal (RR) weights are estimated through the following formula (Stillwell, 1981).

$$\mathrm{W_j} = \frac{\frac{1}{R_j}}{\sum_{j=1}^{n}\left(\frac{1}{R_j}\right)} \tag{1}$$

where, $\mathrm{W_j}$ is the normalized weight of the jth criterion, R_j is the rank for the jth criterion, and n is the number of criteria.

3.3 Dynamic grey relational analysis

The Grey System Theory (GST) is an emerging methodology that was proposed by Julong Deng in the 1980s (Mahmoudi *et al.*, 2021). Since then, the model has been applied in numerous fields and has gained recognition as a leading theory of uncertainty analysis and managing systems with imperfectly known information. For instance, Abifarin *et al.* (2021) used the GRA for optimization

of engineering parameters. Tsoy (2022) used it to identify the key expectations of Russians from the increased supplies of Russian natural gas to Europe. Ivanova (2022) used the GRA to identify the main factors affecting the food safety of the Russian supply chain. Kharipzhanova and Irfan (2022) used the GRA to identify and evaluate multiple barriers to the development of GB's travel & tourism industry in Pakistan. Oyedeji *et al.* (2022) used the GRA for optimization of the mechanical properties of palm oil processing plant in Nigeria.

The Grey Relational Analysis (GRA) is a measure of correlation that becomes more evident in multiple criteria decision-making (MCDM), clustering of data, and optimization (e.g., in mechanical engineering) and it is an important part of the Grey systems theory (GST). Deng's GRA is the most influential form of the GRA and has become an influential multiple attribute decision-making method along with the Analytical Hierarchy Process (AHP) and the Technique for Order Preference by Similarity to an Ideal Solution (TOPSIS). However, the method has certain shortcomings, e.g., the value of its distinguishing coefficient is chosen subjectively and normalization of input data is mandatory. In 2022, Javed *et al.* (2022) overcome these shortcomings by proposing the Dynamic GRA model.

The Grey Relational Grade (GRG) (Γ_{0k}) is:

$$\Gamma_{0k} = \sum_{j=1}^{n} w(j) \times \gamma_{0k}(j) \tag{2}$$

where, the Grey Relational Coefficient (GRC) ($\gamma_{0k}(j)$) is:

$$\gamma_{0k}(j) = \frac{\Delta_{min} + \xi(j)\Delta_{max}}{|\Delta_{0k}(j)| + \xi(j)\Delta_{max}}, k = 1,2,\ldots.m \tag{3}$$

Here,

$$|\Delta_{0k}(j)| = |x_0(j) - x_k(j)| \tag{4}$$

$$\Delta_{min} = min_k min_j |x_0(j) - x_k(j)| \tag{5}$$

$$\Delta_{max} = max_k max_j |x_0(j) - x_k(j)| \tag{6}$$

$$\xi(j) = \{\xi(1), \xi(2), \ldots, \xi(n)\}, \xi(j) \in (0,1] \tag{7}$$

In the Dynamic GRA, $\xi(j)$ is the vector of the Dynamic Distinguishing Coefficients. The method to estimate this vector is available in Javed *et al.* (2022).

4. Results and discussion

For clarity, the suppliers are labelled as follows: first supplier (S1), second supplier (S2), third supplier (S3), fourth supplier (S4), fifth supplier (S5), and sixth supplier (S6). The same person was requested to assess the suppliers based on the following nine criteria: Cost (C1), Technological Capability (C2), Late Delivery Rate (C3), Defective Rate (C4), Pollution Control (C5), Environmental Management (C6), Technical Assistance (C7), Green Warehousing (C8), and Green Transportation (C9). Thus, C1, C2, C3, C4, and C7 considered as economic dimensions, while C5, C6, C8 and C9 as environmental dimensions (see, Table 2).

The environmental performance of businesses has gotten a lot of care in latest years from government entities, scholars, and environmentally responsible citizens. As a result, industry decision-makers are becoming more mindful of the impact of businesses on the environment. Therefore, green supply chain systems are now becoming extremely relevant. The current study used the Dynamic GRA for the evaluation of six suppliers against nine criteria. The original data is shown in Table 3, while the Grey Relational Coefficients and the Grey Relational Grades are shown in Tables 4 and 5, respectively. For the comparative analyses, the Technique for Order Preference by Similarity to an Ideal Solution (TOPSIS) and the Ordinal Priority Approach (OPA) have been used. To estimate the weights of the criteria for both the Dynamic GRA and TOPSIS, Stillwell's Rank Reciprocal (RR) method was used, and then both the Dynamic GRA and TOPSIS

Table 3. Input data

	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
Priority	1st	1st	2nd	3rd	4th	4th	5th	5th	6th
S1	8	6	8	8	5	4	4	2	4
S2	8	7	7	8	5	4	5	2	6
S3	7	6	7	7	5	4	4	2	5
S4	8	6	5	6	4	3	4	2	4
S5	6	8	8	8	5	4	5	3	4
S6	6	8	7	8	4	3	6	4	5

Table 4. Criteria weights, dynamic grey relational coefficients and distinguishing coefficients

	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**C8**	**C9**
W	0.256	0.256	0.128	0.085	0.064	0.064	0.051	0.051	0.043
S1	1.00	1.00	1.00	0.54	1.00	0.57	1.00	0.57	0.60
S2	1.00	1.00	0.67	0.70	1.00	0.73	1.00	1.00	0.60
S3	0.63	0.50	0.67	0.54	1.00	0.57	1.00	0.73	0.60
S4	1.00	0.33	0.40	0.54	0.40	0.57	0.40	0.57	0.60
S5	0.45	1.00	1.00	1.00	1.00	0.73	1.00	0.57	0.75
S6	0.45	1.00	0.67	1.00	0.40	1.00	0.40	0.73	1.00
$\xi(j)$	0.56	0.78	0.67	0.33	0.22	0.22	0.89	1.00	0.89

Table 5. Dynamic grey relational grade and ranking

	GRG	**Rank**
S1	0.894	2
S2	0.897	1
S3	0.635	5
S4	0.577	6
S5	0.810	3
S6	0.734	4

were executed on MS Excel. While the OPA was performed through Amin Mahmoudi's OPA Solver.

According to the Dynamic GRA's findings, the second supplier (S2) is the best, while the fourth supplier (S4) is by far the worst (Table 5; Figure 1). As a result, the decision-makers of this Chinese company should sustain a fairly close connection with the suppliers (S2) and (S1) and minimize the risks associated with the supplier (S4) because it may lead to lost profits or even the ruination of the company's reputation. According to the study, suppliers (S2) and (S1) are the most trustable suppliers who could deliver supplies with much less environmental effects while achieving economic advantages. On the other hand, the remaining suppliers are not as reliable. As a result, the manager should observe closely their performance and take into account whether requesting them to enhance their performance in the above criteria (Table 2) within a specific timespan or ending their partnership.

The results show that the second supplier (S2) is best among all six cloth suppliers, and the Cost (C1), and Technological Capability (C2) are the two criteria with highest importance for the buyer. For comparative analysis the OPA (Mahmoudi & Javed, 2022) and the TOPSIS (Hwang & Yoon, 1981) methods were applied. The TOPSIS and OPA results confirmed the earlier Dynamic GRA outcomes that the second supplier (S2) is the most reliable among the six suppliers, whereas, the fourth supplier (S4) is the least reliable (Table 6). The reason of the superior performance of S2 can be attributed to its relatively better performance on most of the criteria (economic and environmental dimensions).

The procurement manager at the Chinese company realizes the essential benefits of implementing a green supplier selection for the well-being of their long-term business goals. It does provide the Chinese company as well as other businesses in the same industry with a complete picture of the most significant factors to seriously consider in supplier selection. Thus, this study might very well help tremendously the less-performing suppliers in enhancing their strategies and

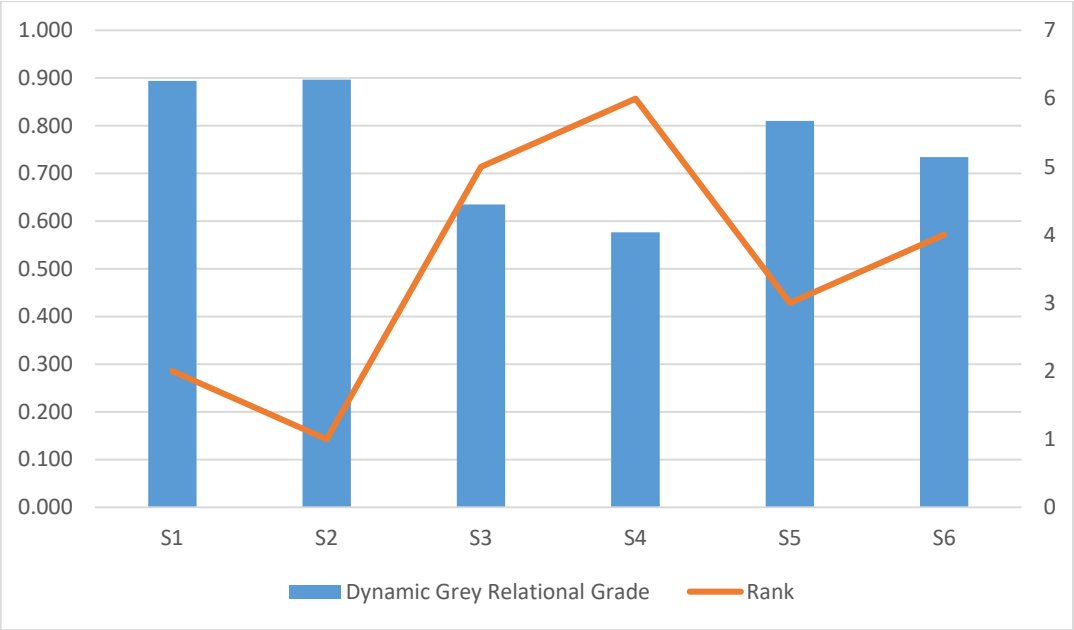

Figure 1. The Dynamic Grey Relational Grade-based ranking of the suppliers

adopting new policies that go along with the customers and environmental goals as well as with the economic competitive advantages.

The selection of suppliers can be overwhelming and tiring. Especially, if the manager needs to choose between a dozens of suppliers with different performance levels (and with a lack of information). However, when applying MCDM models would make it easier for decision-makers in various industries. Also, choosing the right MCDM model is another headache. Thus, scholars and researchers have to double their effort to simplify or update the models to make them easier for real-life managers.

5. Conclusion and implications

At the present time, achieving sustainable development through the incorporation of environmental, economic, and social performance is indeed a business's biggest challenge. Thus, supplier selection (SS) is the process of choosing suppliers who consider economic goals besides sustainability goals. Therefore, the goal of this study was to advocate using The Dynamic GRA to solve Green SS issues and to make better decisions when choosing between suppliers. The OPA and TOPSIS models confirmed the accuracy of the results produced through the Dynamic GRA. Six suppliers and nine criteria were used in this study. The findings demonstrated that the cost and technological capabilities criteria are important criteria for the companies importing cloths/ garments from China and exporting to Middle East.

According to our findings, companies must take serious measures to deal with impending environmental issues and continually evaluate the sustainability and social performance of their supply chain partners. In addition, business owners should create strong relationships with their suppliers and implement creative plans to transform them from mere financial records to an essential part of their businesses. It is impossible to overstate the importance of choosing green

Table 6. Comparison between the Dynamic GRA, the TOPSIS, and the OPA

	Dynamic GRA	TOPSIS	OPA
S1	2	2	2
S2	1	1	1
S3	5	5	5
S4	6	6	6
S5	3	3	3
S6	4	4	4

suppliers in order to achieve Sustainable Development Goals (SDGs). If businesses continue to ignore environmental issues (pollution and climate change, etc.) it will be harder to mitigate their negative effects on the environment in the future.

Supplier selection is indeed an essential step in all domains. Therefore, managers should focus more on how and why they choose one supplier over another. According to our research, ignoring the green criterion when evaluating/selecting suppliers can result in financial losses and possibly destroy the business' reputation. Moreover, firms should prioritize long-term goals over immediate (short-term) economic benefits. All business owners are responsible for reducing the negative impact on the environment.

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