Improving the logistic process of orders dispatching through a multi-criteria decision-making perspective

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Abstract: Far from being a mere production-oriented mission, competition among companies has to be considered as a much wider concept, largely based on effective supply chain management. Implementing suitable supply chain strategies is indeed crucial for enterprises seeking to strengthen their own position in the market against their competitors. With this recognition, one of the main issue in the logistic field is the suppliers and orders management, that is a complex decision-making problem depending on a wide set of aspects mutually correlated and often conflicting each other. This is the reason why assuming a Multi-Criteria Decision-Making (MCDM) perspective is useful to deal with the topic of interest. In particular, the present paper is aimed at sorting out a real world case study about distributing and dispatching orders, through a MCDM approach based on the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). On the one hand, this method is proposed to prioritise the vehicles used to transfer orders, by taking into account criteria such as pallet capacity, tailgate presence, energy type and so on. On the other hand, a final ranking of orders to be delivered will be achieved under the evaluation of aspects such as loading/unloading time, kind of vehicle and driver, among others. Final results will be helpful to establish a degree of priority in assigning orders to vehicles and their robustness will be checked by performing a sensitivity analysis on criteria weights.

Keywords: Orders management; Supply chain; Multi-criteria decision making

1. Introduction and objective

Logistic issues have a significant importance on business activities, playing a fundamental role for quality and safety results and being directly involved with legal requirements, organizational factors and economic aspects (Rolewicz-Kalińska, 2016). In this context, an interesting subject of research consists in establishing and optimising dispatching rules aimed at selecting the next order to be processed (from a wider list of waiting orders), gaining several benefits in terms of effective production planning and control as a consequence (Hübl *et al.*, 2013).

This contribution shows the usefulness of treating the mentioned topic of research through a Multi-Criteria Decision-Making (MCDM) approach, in order to deal with and manage various aspects, each one having associated a different degree of importance. The main objective of the present paper consists in sorting out a real-world case study focused on a fundamental problem related to the issue of Supply Chain Management (SCM), that is the process of orders dispatching. In particular, the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), firstly developed in the year 1981 by Hwang and Yoon (1981), is herein applied to two sets of alternatives, the first one reporting the transporting vehicles and the second one collecting the orders to be delivered. A double ranking of alternatives will be reached to assign orders to vehicles.

The paper is organised as follows. Section 2 presents the literature review about the field of interest and the integration with the TOPSIS method, whereas section 3 describes the steps to apply the proposed MCDM methodology. Section 4 discusses the real-world case study of orders management, section 5 underlines the main results achieved and section 6 reports conclusions along with possible future research developments.

2. Literature review

As underlined by Barbosa-Povoa and Pinto (2020), SCM has a direct influence on organisations' outcomes in terms of guaranteeing products and services availability by maximising financial success of all the involved stakeholders. The wide variety of material and information flow undoubtedly makes SCM a highly complex process, also given the presence of uncertainty affecting supply chain tasks (Peng *et al.*, 2020). So far, efforts in the literature have been devoted to further enhance the execution of SCM-related activities, above all for what concerns the process of logistic information management, by supporting a higher degree of automation through the use of new technologies (Madleňák *et al.*, 2016).

With this recognition, companies tend above all to adapt their business strategy in order to promptly respond to the fast and global market competition. Chen and Wang (2009) describe as enterprises should restructure their functions and systems to encourage the integration among spread manufacturing facilities, cut geographical distances and promote manufacturing and marketing of products on a wider global basis. Indeed, as pointed out by Eshtehadi *et al.* (2020), companies are pressured by the double objective of facing operational challenges aimed at sustaining economic growth, on one hand, and matching the newest customers' requirements, on the other hand. In detail, the authors refer to the need of dealing with an increasing number of shipments by simultaneously ensuring integration with all kinds of deliveries. Bădică *et al.* (2017) focus on the problem of defining optimal routes for transporting customer loads through available trucks, minimising departures of empty vehicles between two loading and/or unloading points. When it comes to transport on road terrestrial mode, as affirmed by Clément *et al.* (2017), tours have to respond to various issues such as economic, regulatory, environmental, societal, and so on. In particular, planning tours in terms of management of potential hazards is indispensable to guarantee their quality.

Makarova *et al.* (2017) explore the possibility to reduce logistic costs by implementing decision support systems based on SCM. The authors demonstrate these systems as to be capable of selecting both the best transport route and mean of transport within a set of available options. As a result, decisions related to the choice of routes and delivery schedule give insights about how to effectively manage both vehicles fleet and runs. Kuo *et al.* (2008) affirm as taking into account multiple operating conditions as well as criteria is indispensable to make sound dispatching decisions. This is the reason why the authors encourage to assume a MCDM perspective in this field of application. Zandieh and Aslani (2019) share the opinion about the capability of MCDM methods to effectively address the problem of allocating orders to suppliers while satisfying diverse and conflicting criteria/parameters, related for instance to time efficiency, cost management and so on (Rudnik and Kacprzak, 2017).

Among the wide range of MCDM methods, TOPSIS effectively works across different application areas, as affirmed by Behzadian *et al.* (2012). The technique easily allows to deal with real-valued data and solve decision-making problems addressed to the ranking of diverse alternatives (Carpitella *et al.*, 2017; 2018).

A detailed literature review on TOPSIS-based approaches is proposed by Behzadian *et al.* (2012). The authors analyse 269 papers and recognize the "Supply Chain Management and Logistics" to be one of the most popular topic for this kind of applications. Among the cited papers, Awasthi *et al.* (2011) and Boran *et al.* (2009) respectively deal with the selection of sustainable transportation systems and the selection of the most appropriate supplier through the TOPSIS method. A TOPSIS-based approach is also applied by Rashidi and Cullinane (2019) to produce a shortlist of potential sustainable suppliers by providing a basis for negotiating price and service quality commitments.

However, as observed by Nădăban *et al.* (2016), decision-making problems are often subjected to constraints and circumstances not accurately known. For this reason, the authors discuss some applications of the fuzzy evolution of the TOPSIS method, that is the FTOPSIS, developed by Chen (2000). In the particular case of the logistic field, Chen *et al.* (2006) apply the FTOPSIS to face a supplier-selection problem. Also Kozarević and Puška (2018) support the implementation of the fuzzy logic concept within the SCM field. They particularly analyse relationships between supply chain practices (by using dimensions such as relations between partners and suppliers, customer satisfaction, inner integrations, and information quality) and supply chain performances (in terms of flexibility, agility, quality, innovation, and sustainability).

Moreover, the TOPSIS has been successively integrated in the field of interest with other MCDM methods, for instance the Analytic Hierarchy Process (AHP) (Beikkhakhian *et al.*, 2015), the fuzzy AHP (FAHP) (Patil and Kant, 2014), the Analytic Network Process (ANP) (Chang *et al.*, 2015), and so on.

3. TOPSIS method description

TOPSIS compares alternatives under a set of opportunely weighted criteria, by normalising scores of alternatives for each evaluation criterion and calculating the distance between each alternative and two ideal solutions. As previously affirmed, the method permits to obtain a final ranking of alternatives showing as alternative to be preferred the one having the shortest distance from the positive ideal solution and the longest distance from the negative ideal solution.

The TOPSIS technique needs the following input data to be applied: a decision matrix (collecting the evaluations g_{ij} of each alternative i under each criterion j), the weights of criteria (representing their mutual importance) and their preference directions (in other terms it is necessary to establish if criteria have to be minimised or maximised).

The five main steps implementing the methodology are reported in the following.

- Building the weighted normalized decision matrix, for which the generic element u_{ij} is calculated by the following equation (1).

$$u_{ij} = w_j \cdot z_{ij}, \forall i, \forall j; \tag{1}$$

where w_j is the weight of criterion j and z_{ij} is the score of the generic solution i under the criterion j, normalized by means of the equation (2):

$$z_{ij} = \frac{g_{ij}}{\sqrt{\sum_i g_{ij}^2}} \forall i, \forall j. \tag{2}$$

- Identifying the positive ideal solution, A^+, and the negative ideal solution, A^-, calculated through the following equations (3) and (4).

$$A^+ = \{u_1^+, ..., u_k^+\} = \\ = \left\{ \left(\max_i u_{ij} \mid j \in I' \right), \left(\min_i u_{ij} \mid j \in I'' \right) \right\}; \tag{3}$$

$$A^- = \{u_1^-, ..., u_k^-\} = \\ = \left\{ \left(\min_i u_{ij} \mid j \in I' \right), \left(\max_i u_{ij} \mid j \in I'' \right) \right\} ; \quad (4)$$

I' and *I"* being the sets of criteria to be, respectively, maximized and minimized.

- Computing the distance from each alternative *i* to the positive ideal solution A^+ and to the negative ideal solution A^- by equations (5) and (6).

$$S_i^+ = \sqrt{\sum_j (u_{ij} - u_j^+)^2}, \forall i ; \quad (5)$$

$$S_i^- = \sqrt{\sum_j (u_{ij} - u_j^-)^2}, \forall i . \quad (6)$$

- Calculating, for each alternative *i*, the closeness coefficient C_i representing how solution *i* performs with respect to the ideal positive and negative solutions (7).

$$C_i = \frac{S_i^-}{S_i^- + S_i^+}, \forall i ; \; 0 \le C_i \le 1 . \quad (7)$$

- Obtaining the final ranking of alternatives on the basis of the closeness coefficients calculated above. In particular, with relation to two generic solutions *i* and *z*, solution *i* must be preferred to solution *z* when $C_i \geq C_z$.

4. Real case study

The case study refers to a French company working in the logistic field and focuses on a decision-making problem aimed at implementing a delivery program of orders through a fleet of road cargo vehicles. To this aim, the TOPSIS method is used to get two separate rankings with relation to two lists of alternatives, that are twelve vehicles and twenty-five orders. The two set of vehicles and orders are respectively analysed according to six and thirteen evaluation criteria, codified and described in Table 1, which also reports the Preference Directions (PD) of criteria, their weights and the evaluation scale of alternatives against criteria. In both cases, criteria weights have been established thanks to the collaboration of a panel made of differently weighted experts.

For a better understanding of the subject, evaluation criteria are described hereafter. The criterion "dedicated vehicle" (CV_1) is used to evaluate if the vehicle is dedicated to serve just a single customer (1) or not (2). If not, the criterion "partially dedicated vehicle" (CV_2) indicates if the vehicle can be reserved for a specific customer (1) or deliver orders for all customers (2). The criterion "energy type" (CV_3), refers to electric (1) or gas (2) vehicles, as well as their "pallet capacity" (CV_4), referring to the capacity of the vehicle, that is a storage space of 4, 6, 8 or 10 pallets. For orders of precious material, it is also possible to require a secured vehicle (CV_5), by attributing the value of 1 to the related criterion, 2 otherwise. Finally, especially for shops in the city centre, vehicles may have asked for "tailgate presence" (CV_6) to unload on the ground (1 if the tailgate is present, 2 otherwise).

As concerns customers' orders, they can be regular or punctual (criterion "order type", CO_8). Customers can refuse certain vehicles ("authorised vehicle", CO_1) or certain drivers ("authorised driver", CO_2) if they do not match established requirements. There are many constraints on the delivery time ("hour to delivery", CO_3) but also on the possibility of delivering at a fixed time or within a time window ("type of hour", CO_7). This constraint is supplemented by the margins accepted by the customer ("margin before", CO_{10} and "margin after", CO_{11}). The customer's requirements can be on vehicle security ("secured vehicle", CO_4) but the customer can also accept or refuse that his/her orders are mixed with the orders of another customer ("goods mix", CO_5). The complexity ("complexity", CO_6) corresponds to the general level of difficulty perceived by the driver for delivering a given order (1 and 2 respectively for low or high difficulty). The driver can deliver goods to a dock ("unloading at dock", CO_9) and its working time ("unloading priority", CO_{12} and "loading priority", CO_{13}) on the site is estimated.

Table 1: Criteria details for vehicles and orders

	ID	Criterion	PD	Weight	Scores
Set of Vehicles	CV_1	Dedicated vehicle	MIN	43.15%	1; 2
	CV_2	Partially dedicated vehicle	MIN	26.07%	1; 2
	CV_3	Energy type	MIN	14.47%	1; 2
	CV_4	Pallet capacity	MAX	7.69%	4; 6; 8; 10
	CV_5	Secured vehicle	MIN	6.04%	1; 2
	CV_6	Tailgate presence	MIN	2.58%	1; 2
Set of Orders	CO_1	Authorised vehicle	MIN	21.14%	any
	CO_2	Authorised driver	MIN	21.14%	any
	CO_3	Hour to delivery	MIN	12.79%	any
	CO_4	Secured vehicle	MIN	9.80%	1; 2
	CO_5	Goods mix	MIN	9.80%	1; 2
	CO_6	Complexity	MIN	6.86%	1; 2
	CO_7	Type of hour	MIN	6.31%	1; 2
	CO_8	Order type	MIN	4.21%	1; 2
	CO_9	Unloading at dock	MAX	2.19%	1; 2
	CO_{10}	Margin before	MIN	1.63%	any
	CO_{11}	Margin after	MIN	1.63%	any
	CO_{12}	Unloading priority	MAX	1.25%	any
	CO_{13}	Loading priority	MAX	1.25%	any

Tables 2 reports input evaluations of vehicles under criteria CV_j (with *i*=1,..,6) of Table 1, whereas Tables 3A and 3B report evaluations of orders against criteria CO_j (with *j*=1,.., 13) of the same table. For example, the intersection O_1- CO_1 means that 12 vehicles are authorized to deliver the order O_1.

Table 2: Input evaluations of vehicles

Vehicles/ Criteria		CV_1	CV_2	CV_3	CV_4	CV_5	CV_6
V_1	GNV_1	1	1	2	10	1	2
V_2	GNV_2	1	1	2	10	1	2
V_3	Modec_1	1	1	1	4	2	1
V_4	Modec_2	1	1	1	4	2	1
V_5	Modec_3	1	1	1	4	2	1
V_6	Modec_4	1	1	1	4	2	1
V_7	Modec_5	1	1	1	6	2	1
V_8	Modec_6	1	1	1	6	2	1
V_9	Modec_7	1	1	1	6	2	1
V_{10}	Modec_8	1	1	1	8	2	1
V_{11}	Modec_9	1	1	1	8	2	1
V_{12}	Modec_10	1	1	1	8	2	1

Table 3A: Input evaluations of orders (under criteria 1-6)

Orders/ Criteria		CO_1	CO_2	CO_3	CO_4	CO_5	CO_6
O_1	Cergy	12	12	330	1	1	1
O_2	Eragny	12	12	435	1	1	1
O_3	Poissy	12	12	510	1	1	1
O_4	Italie	12	12	390	1	1	1
O_5	Av de France	12	12	420	1	1	1
O_6	St Germain	12	12	450	1	1	1
O_7	R Commerce	12	12	300	1	1	1
O_8	Passage du Havre	12	12	405	1	1	1
O_9	Temple	12	12	450	1	1	1
O_{10}	Haussman	12	12	360	1	1	1
O_{11}	Rivoli	12	12	405	1	1	1
O_{12}	St Placide	12	12	450	1	1	1
O_{13}	Ternes	12	12	390	1	1	1
O_{14}	Colombes	12	12	450	1	1	1
O_{15}	Taverny	12	12	480	1	1	1
O_{16}	Forum3	12	12	390	1	1	1
O_{17}	La Canopée	12	12	450	1	1	1
O_{18}	Parino	12	12	300	1	1	1
O_{19}	Aéroville	12	12	435	1	1	1
O_{20}	Claye Souilly	12	12	495	1	1	1
O_{21}	Gare du nord	12	12	360	1	1	1
O_{22}	Hotel de ville	12	12	420	1	1	1
O_{23}	Passy	12	12	405	1	1	1
O_{24}	Boulogne	12	12	435	1	1	1
O_{25}	Beauvais JDP	12	12	480	1	1	1

Table 3B: Input evaluations of orders (under criteria 7-13)

Orders/ Criteria		CO_7	CO_8	CO_9	CO_{10}	CO_{11}	CO_{12}	CO_{13}
O_1	Cergy	1	1	2	0.01	0.01	10	10
O_2	Eragny	1	1	2	0.01	0.01	10	10
O_3	Poissy	1	1	2	0.01	0.01	10	10
O_4	Italie	1	1	2	0.01	0.01	10	10
O_5	Av de France	1	1	2	0.01	0.01	10	10
O_6	St Germain	1	1	2	0.01	0.01	20	10
O_7	R Commerce	1	1	2	0.01	0.01	10	10
O_8	Passage du Havre	1	1	2	0.01	0.01	10	10
O_9	Temple	1	1	2	0.01	0.01	20	10
O_{10}	Haussman	1	1	2	0.01	0.01	20	10
O_{11}	Rivoli	1	1	2	0.01	0.01	20	10
O_{12}	St Placide	1	1	2	0.01	0.01	20	10
O_{13}	Ternes	1	1	2	0.01	0.01	10	10
O_{14}	Colombes	1	1	2	0.01	0.01	10	10
O_{15}	Taverny	1	1	2	0.01	0.01	10	10
O_{16}	Forum3	1	1	2	0.01	0.01	20	10
O_{17}	La Canopée	1	1	2	0.01	0.01	20	10
O_{18}	Parino	1	1	2	0.01	0.01	10	10
O_{19}	Aéroville	1	1	2	0.01	0.01	10	10
O_{20}	Claye Souilly	1	1	2	0.01	0.01	20	10
O_{21}	Gare du nord	1	1	2	0.01	0.01	10	10
O_{22}	Hotel de ville	1	1	2	0.01	0.01	10	10
O_{23}	Passy	1	1	2	0.01	0.01	20	10
O_{24}	Boulogne	1	1	2	0.01	0.01	20	10
O_{25}	Beauvais JDP	1	1	2	0.01	0.01	20	10

By leading two separate TOPSIS applications on the two sets of input data, the two final rankings obtained are reported in Tables 4 and 5 with the correspondent values of closeness coefficient C_i for each alternative belonging to the two sets. These rankings highlight priorities to be attributed according to the considered criteria. A final sensitivity analysis (Tables 6 and 7) has been led to test robustness of results and, in particular, three different scenarios of criteria weights have been analysed, both for vehicles and orders. The following scenarios have been determined by reducing the higher weight/s of quantities respectively fair to 0.15, 0.25 and 0.35 and simultaneously equally increasing the remaining criteria weights:

I. w_{CV} = [0.2816, 0.2907, 0.1747, 0.1069, 0.0904, 0.0558] and w_{CO} = [0.1364, 0.1364, 0.1415, 0.1116, 0.1116, 0.0823, 0.0767, 0.0558, 0.0355, 0.0299, 0.0299, 0.0261, 0.0261];

II. w_{CV} = [0.1816, 0.3107, 0.1947, 0.1269, 0.1104, 0.0758] and w_{CO} = [0.0864, 0.0864, 0.1506, 0.1207, 0.1207, 0.0914, 0.0858, 0.0649, 0.0446, 0.0390, 0.0390, 0.0352, 0.0352];

III. w_{CV} = [0.0816, 0.3307, 0.2147, 0.1469, 0.1304, 0.0958] and w_{CO} = [0.0364, 0.0364, 0.1597, 0.1298, 0.1298, 0.1005, 0.0949, 0.0740, 0.0537, 0.0481, 0.0481, 0.0443, 0.0443].

Table 4: Final ranking of vehicles with original weights

Vehicles		C_i	Ranking position
V_1	GNV_1	0.38344943	4th
V_2	GNV_2	0.38344943	4th
V_3	Modec_1	0.61655057	3rd
V_4	Modec_2	0.61655057	3rd
V_5	Modec_3	0.61655057	3rd
V_6	Modec_4	0.61655057	3rd
V_7	Modec_5	0.68833883	2nd
V_8	Modec_6	0.68833883	2nd
V_9	Modec_7	0.68833883	2nd
V_{10}	Modec_8	0.765136595	1st
V_{11}	Modec_9	0.765136595	1st
V_{12}	Modec_10	0.765136595	1st

Table 5: Final ranking of orders with original weights

Orders		C_i	Ranking position
O_1	Cergy	0.817013186	2nd
O_2	Eragny	0.352675645	11th
O_3	Poissy	0	17th
O_4	Italie	0.560897253	6th
O_5	Av de France	0.422565265	9th
O_6	St Germain	0.304805041	12th
O_7	R Commerce	0.886334358	1st
O_8	Passage du Havre	0.492036786	8th
O_9	Temple	0.304805041	12th
O_{10}	Haussman	0.717512002	3rd
O_{11}	Rivoli	0.507963214	7th
O_{12}	St Placide	0.304805041	12th
O_{13}	Ternes	0.560897253	6th
O_{14}	Colombes	0.282487998	13th
O_{15}	Taverny	0.141507099	15th
O_{16}	Forum3	0.577434735	5th
O_{17}	La Canopée	0.304805041	12th
O_{18}	Parino	0.886334358	1st
O_{19}	Aéroville	0.352675645	11th
O_{20}	Claye Souilly	0.136505265	16th
O_{21}	Gare du nord	0.695194959	4th
O_{22}	Hotel de ville	0.422565265	9th
O_{23}	Passy	0.507963214	7th
O_{24}	Boulogne	0.371182272	10th
O_{25}	Beauvais JDP	0.182986814	14th

Table 6: Sensitivity analysis for vehicles

Vehicles		Ranking position		
		I	II	III
V_1	GNV_1	4th	4th	4th
V_2	GNV_2	4th	4th	4th
V_3	Modec_1	3rd	3rd	3rd
V_4	Modec_2	3rd	3rd	3rd
V_5	Modec_3	3rd	3rd	3rd
V_6	Modec_4	3rd	3rd	3rd
V_7	Modec_5	2nd	2nd	2nd
V_8	Modec_6	2nd	2nd	2nd
V_9	Modec_7	2nd	2nd	2nd
V_{10}	Modec_8	1st	1st	1st
V_{11}	Modec_9	1st	1st	1st
V_{12}	Modec_10	1st	1st	1st

Table 7: Sensitivity analysis for orders

Orders		Ranking position		
		I	II	III
O_1	Cergy	2nd	3rd	2nd
O_2	Eragny	10th	12th	11th
O_3	Poissy	15th	17th	16th
O_4	Italie	5th	7th	6th
O_5	Av de France	8th	10th	10th
O_6	St Germain	9th	11th	9th
O_7	R Commerce	1st	1st	1st
O_8	Passage du Havre	7th	8th	7th

O_{9}	Temple	9th	11th	9th
O_{10}	Haussman	2nd	2nd	1st
O_{11}	Rivoli	6th	6th	5th
O_{12}	St Placide	9th	11th	9th
O_{13}	Ternes	5th	7th	6th
O_{14}	Colombes	11th	14th	14th
O_{15}	Taverny	14th	16th	15th
O_{16}	Forum3	4th	5th	3rd
O_{17}	La Canopée	9th	11th	9th
O_{18}	Parino	1st	1st	1st
O_{19}	Aéroville	10th	12th	11th
O_{20}	Claye Souilly	13th	15th	13th
O_{21}	Gare du nord	3rd	4th	4th
O_{22}	Hotel de ville	8th	10th	10th
O_{23}	Passy	6th	6th	5th
O_{24}	Boulogne	8th	9th	8th
O_{25}	Beauvais JDP	12th	13th	12th

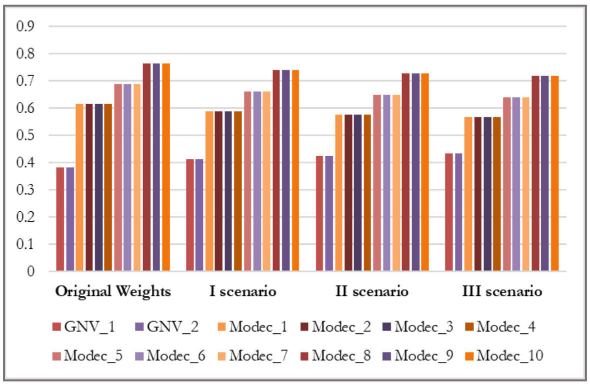

Figure 1: Sensitivity analysis for vehicles

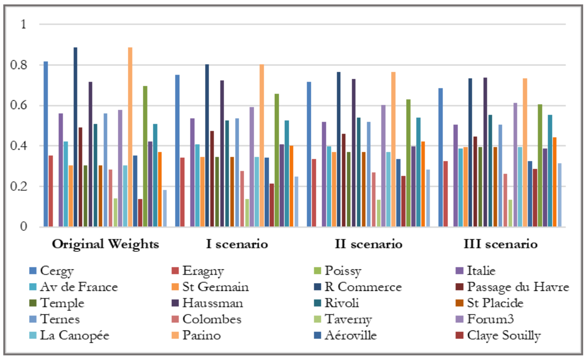

Figure 2: Sensitivity analysis for orders

Figures 1 and 2 lastly synthetize sensitivity analysis results by showing the values of closeness coefficients with original criteria weights and in the three above described scenarios of criteria weights for both vehicles and alternatives. As it is possible to appreciate by observing the figures, rankings of both sets of vehicles and orders are barely affected by the variations of criteria weights, what is an indicator of robustness for the final solution.

5. Discussion of results

On the basis of the list of orders obtained by TOPSIS, the planner will assign such orders to the different available vehicles while also assessing the feasibility of solutions. In particular, he/she will try to place the first order in the list in the first vehicle, checking that all the constraints are satisfied, such as the possibility of delivery on time along with transportation costs. If constraints are not satisfied by the first vehicle in the list, the planner will try to place the order on the next vehicle until order is assigned to a vehicle. Then he/she selects the second order, checks the constraints and so on for all orders. At the end of planning, the planner will have assigned all orders to vehicles for the tour by respecting the established constraints, what guarantees the feasibility of the final solution. Obtained results of the different rankings have been presented to the planners of each company. The first observation is that the ranking of vehicles is similar to the one already performed by the planners themselves, whereas ranking of orders is different. The second observation is that the proposed solution is better economically than the solution produced for the same data set. This contribution shows the usefulness of assuming a multi-criteria decision-making approach (MCDM) in supporting the decision-making problem of interest and, in particular, in adopting the combination representing the best trade-off among the considered criteria, differently weighted. The importance of this method is to keep human reasoning during planning but expanding, at the same time, the set of evaluation criteria including also the ones until now forgotten or neglected by the planner. This classification method is the first step of a tour-planning algorithm implemented in the prototype RIO-Suite (https: //research-gi.mines-albi.fr/display/RIOSUITE/Welcome).

6. Conclusions

This paper treats the topic of logistic management for companies with a special focus on the process of orders dispatching through an available fleet of road cargo vehicles. A MCDM-based perspective making use of the TOPSIS method is suggested as suitable approach to face the mentioned problem, given the presence of many different aspects to be taken into account. A case study referring to a real French company has been sorted to provide decision makers with a tool able to support a delivery program of orders by means of the available transport vehicles. Robustness of results has been checked through a sensitivity analysis by varying criteria weights.

Further possible extensions of this research may regard the integration of economic evaluations and feasibility analysis of scenarios along with the development of the weights derivation process for criteria. The last one will be aimed at capturing uncertainty and analysing the existence of possible interdependencies among the elements of analysis.

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