Economic evaluation in decision models: a critical review and methodological propositions

Najat BARA[a,b] (Najat.Bara@emines.um6p.ma)

Frédéric GAUTIER [a,b]

Vincent GIARD [a,c]

Frédéric FONTANE [a,d]

[a] *EMINES, Mohammed VI Polytechnic University, Morocco*
[b] *IAE de Paris, Paris I Pantheon-Sorbonne University, 75006 Paris, France*
[c] *Paris-Dauphine University, PSL Research University, 75016 Paris, France*
[d] *Mines-Paris Tech, PSL Research University, 75005 Paris, France*

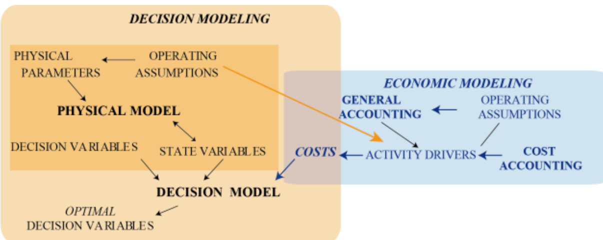
Abstract

Decision models of industrial management articles are often based on an economic criterion to find the proposed solution. They use economic parameters that are generally imported from the firm cost accounting system. When cost information is not adapted to the decision, the obtained solution of the model may be invalid. In this article, we deal with a critical literature review to report the methodological problems encountered in industrial management articles vis-à-vis the used costs. Finally we suggest methodological propositions to be kept in mind by authors when they are using costs in decision models.

Keywords: Industrial management, mathematical model, economic model

Introduction

We are interested in the management of a supply chain (SC) or a sub-system of a SC. It concerns strategic, tactical and operational decisions taken to design, and run production units. To improve their decision making process, managers call in decision models that attempt to reproduce, through a simplified physical model, the functioning of the studied productive sub-system. In these physical models, decisions to take are represented by *decision variables* that determine, through a number of causal relationships, their impact on some physical characteristics of the studied system (flow, stock, resource use …). Decision variables may be quantitative (capacity of a new plant, reorder points…) or qualitative (opening or closing facilities, production orders assignment…). Across a modelling, we focus more particularly on certain physical quantities calculated by this model and linked to the decision variables, because they condition the performance of the studied system. In modelling, these physical quantities are generally called



state variables and are used with costs to obtain an economic evaluation of the considered alternative decisions (Giard, 2017).

The physical model is bounded to a studied physical subsystem exchanging flows of goods and/or services with its environment. In a decision model, evaluation of alternative decisions lays on a criterion in relation with the global performance of the studied subsystem. Such criterion may be physical (machines utilization rate, % of unsatisfied demand…) and, in this case, it's supposed that the variation of the company financial performance (cost or margin) is linked with the one of the considered physical criteria and is assumed to vary always in the same direction (or in the opposite one). The decision criterion may be economic and called on costs information provided by a cost model. In that case, the relevance of the solution provided by the decision model depends on the compatibility of the implicit assumptions of the physical system functioning, used by the cost system with the one used in the decision model. A significant discrepancy invalids the relevance of the proposed solution. Most often, authors focus on the physical model development techniques and resolution methods, without paying attention to the consistency of the implicit functioning assumptions of the used cost model with the one of the physical model used by the decision model. It is assumed that the modelling teams can work independently of those of management accounting. The costs regularly provided by a firm management accounting system, cannot be suitable to any type of use.

This paper present a critical literature review to see to what extent authors check the adequacy of the used cost model with their developed decision model. In each article we dissect the economic function to highlight the considered costs, the way they were defined vis-à-vis the considered time and space horizons and whether the authors studied under which conditions, the proposed solution remains valid, especially when the given solution impacts the system design and the use of its productive capacity.

The rest of this paper is organized as follows, we begin with the theoretical framework, next we present the adopted methodology of the review. Subsequently we report the encountered methodological issues. And finally propositions of contributions and the conclusion are presented.

Theoretical framework

We focus here on a description and a literature review of the main theoretical concepts, that are necessary for the discussions dealt in the present paper. Firstly, we deal with highlighting the decision model characteristics, thereafter, we present some cost accounting approaches and briefly some economic concepts and costing theories.

Decision model underlying characteristics

Decision models are developed under the assumption that we can explain and capture the behavior of a physical system and/or a decision making process dealt by managers. Causal relationships exist between the considered variables of the model. These causal relationships enable the model to predict the future state of the modeled physical system (Bertrand and Fransoo, 2002).

A decision model has two key characteristics, they are space and time granularities (Giard, 2017). The space granularity concerns the covered perimeter of the studied productive system and the degree of details considered which in turn, determines the granularity of information provided for the user. The time granularity, defines whether the model deals with an operational, tactical or strategic issue. Space and time granularities are not independent; in general, the granularity is fine in operational decisions analysis and more aggregated in other cases. Granularity conditions bill of materials, production routings, product ranges and the definition of resources used in the physical model. It has an essential impact on the relevance of costs to be mobilized.

Concerning decision models development approaches, we can distinguish two main approaches, mathematical (operation research (OR)) and simulation modelling. The first one refers to *i*) optimisation that gives the best solution for a particular issue, it's a very visible and influential topic in the field of operations management and, *ii*) heuristics which are intelligent rules leading to "good" solution and are used when optimization is impossible or too expensive. The second approach refers to all simulation techniques (discrete event simulation, agent-based simulations, system dynamics).

Cost accounting

A cost system refers to means by which organizations calculate costs of products and services to make sales profitable. Moreover, cost system concerns the modeling of costs of organizations resources and operations in order to support internal decision making process. Cost information should be useful to help managers in managing the performance and the profitability of products, customers, productions processes… (Lawson, 2018). Here we distinguish the *traditional cost accounting* and the *Activity Based Costing* (ABC) approaches:

The traditional cost accounting system in a company aims to allocate, at the end of each month, costs to products and services. It's oriented toward a retrospective calculation of historical costs. It's based on a succession of spills of analysis centers expenses to other cost centers by means of volume key distribution. ABC is a cost accounting approach developed from the eighties. It's based on the principle that activities consume resources, and products and services consume activities. ABC focuses on the activities that take place within the company, the cost of carrying out each activity and the factors generating these activities. It goes beyond the traditional system by allocating resources, based not only on volume units, but also on the diversity and degrees of complexities of the products (Cooper and Kaplan, 1998). Hence, the ABC approach distinguishes different cost pools (activity drivers): *unit-level activities* are performed each time a unit is produced, *batch-level activities* are performed whenever a batch is processed, *product-level activities* (process engineering, design, etc.) are costs which come into play whenever a particular product (order) is manufactured and *facility sustaining activities* concern costs related for example to rent, utilities, maintenance, and facility management.

Furthermore, an activity cost may evolve in the long run. Value chain analysis is the way to analyse activities in order to achieve competitive advantages by performing these activities better than competitors. Each activity has its structure and behavior, which determine its cost. Porter calls these determinants "cost drivers". He distinguishes ten possible causes of an activity cost evolution: *i*) economies or diseconomies of scale (costs sensitive to volume), *ii*) learning phenomenon (unit costs depend on time), *iii*) capacity cost utilization (impacts the fixed unit costs), *iv*) the linkage between activities that makes an activity cost dependent of other activities costs, *v*) interrelationships (resources share between different strategic units), *vi*) the degree of vertical integration (impacts transaction costs), *vii*) the timing (first-mover reward), *viii*) discretionary policies that refer to products or services design, *ix*) localisation and *x*) change in institutional and regulatory factor that may affect unit costs. (Hergert and Morris, 1989) (Bouquin, 1997).

The absence of the concepts of activity drivers and cost drivers in the traditional cost system is one the reasons that make it inappropriate for the study and analysis of operational and strategic decisions respectively. The traditional system is characterised by a lack of cause and effect traceability (Stratton et al., 2009), that makes it inadequate to understand how activities are performed and makes it weak in cost traceability.

Cost concepts

There is a multitude of cost concept whose use relevance depends on the studied context:

- *Opportunity cost* is a concept that dates back to the nineteenth century. It is proposed by Friedrich von Wieser, (1851-1926) who was interested in determining the production factors value (Burch and Henry, 1974). He defined the opportunity cost as the net income generated by this factor of production in its best use. (Andreani, 1967) linked it to the existence of a conflict between opportunities that could lead to a shortfall. Opportunity costs are the revenues to be gained from possible actions, but lost because other actions have been taken to achieve a particular goal, (Andreani, 1967), (Vera-Munoz, 1998).
- *Marginal cost* is the cost incurred for the production of an additional unit. The marginal cost differs according to whether it is decided to momentarily increase the volume of production by one unit, or if it is decided to increase it durably by one unit (Boiteux, 1951). In the first case, the additional unit is satisfied by the current capacity, but the second case may require an increase in capacity.
- *Variable costs:* the traditional system accounting defines variable costs as those who change with production volume and fixed costs those who do not change with volume. Cooper and Kaplan propose to use short-term variable cost, they vary with production volume, long-term variable costs which do not vary with production volume but do vary with other activity measures (handling, setup…) and fixed costs that do not vary; in a given period; with any activity driver.
- *Capacity costs* are defined by the set of resources (facilities, staff...) in which the company is committed to achieve a given level of performance. This latter is linked to the estimated maximum demand, the intended degree of flexibility to respond to unforeseen demand and the desire to ensure products diversity. These capacity costs, also called fixed costs, are generated form strategic decisions defining the company's strategy and vision (Bouquin, 1997). "*Investments in resource capacity are made based on the expected demand because instantaneous adjustment of capacity is impossible and/or extremely costly*" (Balakrishnan et al, 2007). The difference between the maximum capacity and the actual activity level is called unused capacity.

Different economic criterions in decision models

Several economic criterions may be used to assess decisions, their relevance depends on the studied decision nature. Here we retain the three criterions of costs, profit and discounted cash flows (DCF) through Net Present Value (NPV). Investment decisions refer to long-run decisions which focus on studying different alternatives of investment (outflows) in one or several periods to generate returns (inflows) in one or several future periods. They differ from operational decisions in the way that their study requires the consideration of the value of money evolution over time (Shillinglaw, 1963) (Lucey, 2003). Hence, the NPV is the appropriate measure to study investment decisions, it calculates the present values of expected inflows and outflows. Operational and tactical decisions study is based on the anticipated current cash flow only. The profit is the sum of revenues minus costs. When the revues are constant (sales and prices are independent of decision variables), profit maximization can replaced by costs minimization. Accounting profits are not suitable for investment decisions, they are period oriented (quarter, year…) (Lucey, 2003).

Costs and spatial perimeter

Issues dealt by decision models may belong to any SC activity: production, inventory management, transportation, pricing, design, relationship management… We note then that a decision perimeter may either belong to the internal firm perimeter (production scheduling, investment, transportation…) or extends the firm boundaries (interrelationships management). The former case settles for the firm system accounting (intra costing) whereas the latter one necessitates an inter-organizational costing (inter costing). In fact a cost system is contingent to the studied physical system characteristics. Cost accounting systems of two cooperating companies are seldom similar. The difference between the two approaches creates inaccurate costs and ineffective practices (Kulmala et al 2002). Thus, creating relevant approaches for partnership relations is one of cost accounting challenges. Furthermore cooperation between a supplier and customer is based on trust and their readiness to open their book cost accounting. But this willingness to share information (reliability) is not enough, there should be dedicated approaches to generate relevant cost information (Kulmala et al 2002).

Costs at service of SC professionals

Previous research works has pointed out that often SC managers are not satisfied by the cost information provided by their firm accounting system. (Gurowka and Lawson, 2007) presented a road map to help managers in choosing the appropriate costing approach. When cost information is not correct and accurate, the accounting system has no value for the company, worst it can damage the organization decision making.

According to a survey done on 2003 by the Institute of Management Accountants (IMA)/Ernst and Young, only 23% of the interviewed managers are satisfied by their accounting information, 92% of them state that this information is distorted. (Gurowka and Lawson, 2007) say that if cost information still irrelevant, decisions are irrelevant and over time, departments managers may stop relying on financial criterion and make decisions based solely on non-financial data (more accurate).

The results of a recent survey (Lawson, 2017) shows that supply chain professionals often view their company's managerial costing system as being only slightly useful for generating questions and for making managerial decisions. According to (Lawson, 2017), three main causes explain this result: *i*) many organizations rely on externally oriented financial accounting systems to produce the information supporting internal business decision making; *ii*) many organizations use outdating cost models; these latter are not appropriate for the current organizations challenges and environment; *iii*) the third cause is the finance and accounting professionals resistance to change. This is amplified by little pressure from managers; who use costs; to improve data accuracy and relevance (Kilcarr, 2018).

In this paper, we complete this previous works, by a critical literature review of articles dealing with decisions models to highlight methodological problems related to the used costing models. It's to our knowledge, the first article that fully addresses this literature review.

Methodology

The adopted methodology leads to the selection and the evaluation of selected sources. We followed the same methodology adopted by (Maestrini et al., 2017). We first *i)* identify articles *ii)* we select articles, and finally *iii)* we evaluate and analyze them.

Articles identification

For the sources search we relied on the Business Source Complete base (BSC). Since we are interested in the study of the coherence between the developed decision model and the used economic model, we used the key words "industrial management", "mathematical model", "simulation model" and "economic model". To broaden the search range of articles, we used two key words combinations, in the first one we used “industrial management”, “mathematical model” and “economic model”, and in the second combination we replaced “mathematical model” by “simulation model”.

The use of two key words combinations gave a total of 1225 articles. We relied on SJR site, we investigate the journal scope and *H Index*. We considered only IJPE, IJPR, POM, OMEGA and PPC whose *H Index* varies between 61 and 141. We also limited the period of publication, we focused on the period between 2013 and 2018. We therefore get a sample of 202 articles.

Articles selection

We set boundaries to select the relevant articles to be considered in the present review. We select articles in which a decision model is developed to help users in making decisions related to a sub-system of the considered SC, hence there should be explicit variables that determine characteristics (functioning or design) of this system. The selection criterions are discussed and defined by authors of the present paper, and the task is done by two authors based on the abstract, the conclusion and eventually the introduction. Consequently, we selected a sample of 113 articles.

Articles evaluation and analysis

To evaluate the selected articles we started with an analysis grid. This grid attributes were defined based on previous literature review works (Maestrini et al., 2017), a SC taxonomy developed by (Capar et al., 2004) and additional attributes deduced from the theoretical framework above.

We begin with articles journal of publication. In the second stage we present the modelling approach on which the decision model is based (Bertrand and Fransoo, 2002). Thereafter, we highlight the considered time granularity in each article (Anthony, 1965), (Ansoff, 1980) and the considered perimeter that implicitly determines whether it’s an inter or intra costing. We additionally mention the considered objective function physical or economic and whether it’s costs, profit or NPV and the mobilized cost concepts. A grid summary is presented in table 1 bellow.

Findings

In this section we will present the mains results obtained from the reviewed articles analysis. We begin by reporting the articles journals of publication. In the second stage, we report the decision criteria. And finally, we focus on articles in which an economic model is used, in order to highlight the main encountered methodological issues.

Publication journal

The final number of the reviewed articles is 113. The largest percentage 49% of articles belong to IJPE, succeeded by 40% that bong to IJPR , and succeeded by 7%, 3% and 2%, that belong to OMEGA, PPC and POM respectively.

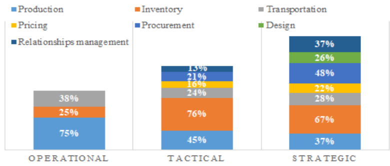
Decision criteria

13 out of 113 articles deal with problematics in which the developed decision model gives the solution based on the minimization or the maximization of a physical criteria. Most of these articles (11 out of 13) deal with operational and tactical levels issues

12% of articles consider both an economic and physical criteria. In the rest (76 %), the choice of the proposed solution is based solely on an economic criterion. Hereafter, we will exclude articles which are limited to the study of a physical criteria, we retain 100 article.

Encountered methodological issues

In this stage we based on the grid analysis to report the widespread methodological problems encountered in each article.



This figure presents for each decision level the SC activities dealt with. Bellow, we discuss issues related to cost content explanation (activity drivers), costs traceability, inter or intra costing nature, appropriateness of used economic criteria, capacity costs, cost drivers in the long run and finally the eventual impact of the obtained solution.

In the quasi totality of the reviewed articles, the authors gave no explanation about the used economic model parameters. These latter, are considered as given parameters provided by an external source which is generally the firm accounting system. They do not discuss the relevance of the used cost content according to the spatiotemporal perimeter. This suppose the assumption that modelling and accounting teams can work independently, as if costs could be absolute. No article uses activity drivers to define the relevant content of the used cost parameters. In some articles the authors give details about some used costs, for instance in [90] the unit transportation cost "*includes costs of fuel, salaries, wages, operating supplies, insurance, and depreciation*", [62] explain that the unit inventory cost is due to "*inventory obsolescence costs and capital costs related to slow-moving parts*", and that the unit manufacturing cost excludes all capacity costs (e.g. machines depreciation).

Generally a firm system accounting has its standards, it regularly calculates costs at the end of a predefined period (month). When a decision model is developed, it may necessitate the introduction of some specific costs that the firm system accounting is regularly not interested in. So here we identify a problem of traceability. In [69] and [105], the salvage value is difficult to be determined a priori, elsewhere there should be a sufficient data to can to estimate it. [37], [66]…models use penalty cost of unsatisfied demand, [103] developed a model for a retailer replenishment under supplier prices discount, and he uses a penalty cost induced whenever the retailer change his order quantity. [12], [33] mobilize the opportunity costs which are future costs that need to be known a priori. In [98] costs of non-conformity and rework cost are considered. Furthermore, some papers deal with batch or order level costs, if the firm system accounting is not based on ABC approach, these costs are not provided. Here then, we mention that there are several costs that are needed by the developed decision models in a company but for which there is no traceability in the system accounting.

The objective in [69] is the comparison between different relationship scenarios between a manufacturer, a distributor centre (DC) and a retailer (i) not using contract, ii) using buyback contract or iii) revenue sharing contract). [105] developed a model to coordinate between a supplier and retailer, it determines e-concession as a decision variable (a concession that both retailer and supplier need to make to maximize the whole system profit). Their model mobilizes the following economic parameters the supplier production cost, the retailer wholesale price, retailer salvage value and the retailer shortage penalty. [21] focus on the comparison between centralized and decentralized strategies between a retailer and its supplier. These examples of articles and others that compare different relationship strategies between different SC players imply that the applicability of the presented models is conditioned by the involvement and willingness of the considered firms to collaborate and share their costs information with other firms, which is not evident in practice. Through this inter costing necessity we signal the problem of the model perimeter which presents a new methodological issue.

In several of the reviewed articles, the authors deal with some top strategic issues. [37] developed a decision model for a network design, it determines facilities (production plants, warehouses and DC…) to be opened, the supplier selection. [66] models defines production and inventory capacities in a correctional institution… [92] presents a model to compare different strategies to meet demand satisfaction, one of which consists on capacity investment. Even if all these issues imply investment with long term impact, the authors used costs rather than the NPV. They mix in one economic function costs related investment decisions and recurrent costs related to operating decisions. Here we identify the problem of discounting that should be considered when we deal with investment decisions whose impact is recorder along several periods. In the strategic level costs aren't the relevant to solely be considered, but they still the criteria adopted by the majority of authors. Only 3 of all reviewed articles [41], [34] and [104] consider NPV as the choice criteria.

In this paragraph we are interested in reporting the methodological issues related to capacity costs. We separate strategic form operational and tactical levels:

- Strategic level: in 85% of the studied articles consider full costs. However, since the activity levels are not necessarily the capacity level, they are decision variables of the model, the use of full costs leads to sank costs that penalizes the considered cost objects (products, orders…). [37] , [79], [78]… determine the production level in each plant and the inventory level in each SC node (e.g. DC, warehouse). [21], [109]…present models that determine economic order quantity (EOQ). Full costs include capacity costs that are not generated by the chosen activity level but rather by the firm strategy. These sunk costs are due to unused capacity. One article [93] considered unused capacity costs concept.
- Operational and tactical level: capacity costs are not controlled in the operational and tactical levels. Decisions related for example to week production planning, or orders scheduling during a month don't affect this category of costs. [106] model determines products scheduling in production machine. [71], [67] developed a model that define the orders distribution planning, they consider as decision variables, each product start and end dates, number of storage days… In [58] the model determines the production orders scheduling in parallel machines. In all these examples, the authors consider full costs, which are not relevant to all kind of uses as the case for operational decisions. Only 6 out of 16 articles consider variable or marginal costs rather than full costs to evaluate operational decisions. This full costs lead to biased economic evaluation.

Concerning cost drivers, none of the reviewed article considers cost drivers implying the eventual evolution of unit costs on the long run.

A new methodological problem is related to the impact of the obtained solution on the productive system. [93], [97], [37], [78], [26]… present developed models that define SC network designs. [1] developed a model for cellular manufacturing design, in each plant the model determines installed capacity in terms of machines number of workers… This kind of models, start from an initial physical system from which we deduce a cost model, and then the model use these information to obtain an optimal solution. The decision variables in these cases may affect the physical system, which calls into question the used cost parameters and then the obtained optimal solution. None of studied articles, studies the impact of the obtained solution on the used cost parameters.

Table 1: Grid summary

Decision level	Operational level				Tactical level				Startegic level						
	16				38				46						
Modeling approach	Math	Simulation		Combined	Math	Simulation		Combined	Math		Simulation			Combined	
	12	2		2	31			7	37		5			4	
Economic criteria	Costs	Profit		NPV	Costs	Profit		NPV	Costs		Profit			NPV	
	16				26	12			27		17			3	
Cost concepts	Variable costs	Full costs	Marginal costs	Opportunity costs	Variable costs	Full costs	Marginal costs	Opportunity costs	Variable costs		Full costs	Patial cost	Direct cost	Marginal costs	Opportunity costs
	6	12			7	28	1	4	4		39	1	1	2	2
Methodological issue	Explanation	Traceability	Inter costing	Capacity costs	Explanation	Traceability	Inter costing	Capacity costs	Explanation	Traceability	Inter costing	Capacity costs	discounting	Cost drivers	
	16	14	4	12	38	27	14	24	45	24	36	17	17	11	

Contributions

The presented results reveal that indeed authors neglect the costs relevance which leads to the reported methodological issues that affect the relevance of the proposed solution. In this section, we suggest some methodological guides that industrial management researchers need to keep in mind when they define costs in their decisions models

- *Need of reprocessing the firm accounting system information*: One of the main revealed findings, is that authors consider costs as given parameters without any explanation. A cost calculation makes sense if it is only adapted to the decision-making system that will use it. As a result, a decision model cannot take the output of full cost calculation without analysis and reprocessing. This means that decision models need to be provided by an ad hoc economic evaluation adapted to their spatiotemporal perimeter. If not, these decision models do not really improve the decision making, since the solution search relies on this economic evaluation. Therefore, the costs introduced in the decision models cannot be considered as valid physical parameters regardless of the physical system that they seek to improve. They are contingent to physical and functioning characteristics.
- *Costs specification and appropriate cost approach*: To ensure a relevant economic evaluation, the one need to determine charges that are impacted by the studied decision and exclude from the evaluation all charges that do not steam form this decision. The understanding of costs behaviour; through the use of relevant activity drivers; and the use of appropriate cost concepts help to establish incremental cash flow report that measures the *real impact* of each scenario on the company income statement. Our findings also explore the use of specific costs (nonconformity costs, product or batch level cost…) or specific contexts (inter costing) which generally are not included in traditional system accounting. The companies need to change or complete their cost accounting by new costing approaches. If not, an inappropriate costing system will produce distorted information leading to a poor decision making (Gurowka and Lawson, 2007).
- *Collaboration between cost accounting and production management*: As a result of the two previous points, cost accounting, modelling and SC managers cannot be independent. They need to collaborate in order to determine and calculate the adequate costs to each studied context. This can help to overcome the resistance of accounting professionals to integrate new costing methodologies.
- *Impact of the obtained solution*: Concerning decisions related to production system design, one starts from a basic scenario from which he deduces cost parameters. He feeds a decision model by these cost information to obtain a new design solution. Since, costs are contingent to the organization physical characteristics, the solution of the decision model can lead to inconsistencies between the initial costs used and hypothesis, and the physical system new characteristics. This may make the obtained solution unworkable.

Conclusion

This article is grounded on the question: to what extent authors of industrial management articles study the adequacy between their decision models and the used cost system.

To answer this question we led a critical literature review whose finding reveal several methodological issues encountered when defining costs in decision models. *i*) In almost all articles authors give no explanation about the used economic parameters content, they assume costs as given parameters provided by an external source; *ii*) the reviewed decisions models use some costs that are not necessary traceable in the firm system accounting; *iii*) some articles suggest models that involve different companies, the applicability of this kind of models depends on the willingness of these companies to share their cost information; *iv*) the majority of search articles which study investment decisions having multi periods impact still base their decision criterion on costs rather than NPV; *v*) the majority of articles use full costs which generate inconsistencies related to capacity costs.

This work is intended to attract industrial management specialists to pay more attention about the relevance of the costs they use in decision models. The full costs of traditional system accounting cannot be used without reprocessing. To provide relevant and accurate costs, accounting professionals need to be open to integrate new costing methodologies. Modelling and cost accounting teams should be interconnected and work together to provide ad hoc economic evaluation for each decision model and finally we emphasize that decision models are a priori decision making oriented they need to integrate relevant costs concepts and to use activity drivers to can compare the existing alternative decisions and measure the impact on the company income statement.

References

Andreani, E. (1967), "Le coût d'opportunité", *Revue économique*, Vol. 18, No. 5, pp. 840-858.

Anthony, R.N, 1965, *Planning and Control Systems: a framework for analysis*, Harvard University Press, Boston

Ansoff, H.I., (1980), "Strategic issue management", *Strategic management journal*, Vol. 1, No. 2, pp. 131–148.

Balanchandran, K R. Li.S and Radhakrishnan. S. (2007), "A Framework for Unused Capacity: Theory and Empirical Analysis", *Journal of Applied Management Accounting Research*, Vol. 5, No. 1, pp. 21.

Boiteux, M. (1951), "La tarification au coût marginal et les demandes aléatoires", *Cahiers du Séminaire d'économétrie*, pp. 56-69.

Bouquin, H. (1997), *Comptabilité de gestion* , 2nd Ed, Sirey, Paris

Burch, E.E. and Henry, W.R. (1974), "Opportunity and incremental cost : attempt to define in systems terms : a comment", *The Accounting Review*, Vol. 49, No. 1, pp. 118-123.

Capar, I., Ulengin, F. and Reisman, A. (2004), "A taxonomy for supply chain management literature".

Cooper, R. and Kaplan, R.S. (1992), "Activity-based systems: Measuring the costs of resource usage", *Accounting horizons*, Vol. 6, No. 3, pp. 1-13.

Copeer, R. and Kaplan, R.S, (1998), *Cost & effect: using integrated cost systems to drive profitability and performance*, Harvard Business Press, Boston

Giard, V. (2017), "Methodological problems in defining costs used in industrial management decision models", *7th IESM Conference*, Saarbrücken, Germany, pp. 443-448. http://iesm17.org/wp-content/uploads/2017/10/Proceedings_IESM2017_Part1_.pdf

Gurowka, J. and Lawson, R.A. (2007), "Selecting the right costing tool for your business needs", *Journal of Corporate Accounting & Finance*. Vol. 18, No. 3, pp. 21–27.

Hergert, M. and Morris, D. (1989), "Accounting data for value chain analysis", *Strategic Management Journal*, Vol. 10, No. 2, pp, 175-188

Johnson H. T. and Kaplan R.S. (1987), *Relevance Lost. The rise and fall of management accounting*, Harvard Business School Press, Boston.

Kilcarr, S. (2018), "Heads up: New supply chain costing methods are being called for", *Fleet Owner Exclusive Insight*, p1-1

Kulmala, H.I. Paranko, J. Uusi-Rauva, E. (2002), "The role of cost management in network relationships", *International Journal of Production Economics*, Vol. 79, No. 1, pp. 33-43

Maestrini, V. Luzzini, D. Maccarrone, P. and Caniato, F. (2017), "Supply chain performance measurement systems: A systematic review and research agenda", *International Journal of Production Economics*, Vol. 183, 299–315.

Lawson, R. (2017), "Working together to Enhance Supply Chain Management with Better Costing Practices", *APICS & IMA Report*

Lucey, T. (2003). Management accounting, 5th Ed, Continuum, London

Shillinglaw G. (1963), "The concept of attributable cost", *Journal of Accounting Research*, Vol. 1, No. 1, pp. 73-85.

Vera-Munoz, S.C. (1998), "The effects of accounting knowledge and context on the omission of opportunity costs in resource allocation decisions", *Accounting Review*, pp. 47-72.

Stratton, W.O., Desroches, D., Lawson, R.A. and Hatch, T. (2009), "Activity-based costing: is it still relevant?", *Management accounting quarterly*, Vol. 10, No. 3, pp.31.

Will M. Bertrand, J. and Fransoo, J.C. (2002), "Operations management research methodologies using quantitative modelling", *International Journal of Operations & Production Management*, Vol. 22, No. 2, pp. 241–264.

Appendix 1: Reviewed articles

[1] Aalaei, A. and Davoudpour, H. (2017), "A robust optimization model for cellular manufacturing system into supply chain management". *International Journal of Production Economics,* Vol.183, pp. 667–679.

[2] Acar, Y. and Atadeniz, S.N. (2015), "Comparison of integrated and local planning approaches for the supply network of a globally-dispersed enterprise", *International Journal of Production Economics,* Vol.167, pp. 204–219.

[3] Agard, B. and Bassetto, S. (2013), "Modular design of product families for quality and cost", *International Journal of Production Research*, Vol.51, pp. 1648–1667.

[4] Akkermans, H.A and Van Wassenhove, L.N. (2013), "Searching for the grey swans: the next 50 years of production research". International Journal of Production Research 51, 6746–6755.

[5] Azadnia, A.H., Saman, M.Z.M. and Wong, K.Y. (2015), "Sustainable supplier selection and order lot-sizing: an integrated multi-objective decision-making process", *International Journal of Production Research* Vol.53, pp. 383–408.

[6] Babic, Z. and Peric, T. (2014), "Multiproduct vendor selection with volume discounts as the fuzzy multi-objective programming problem", *International Journal of Production Research* Vol.52, No.14, pp. 4315–4331.

[7] Bandaly, D., Satir, A. and Shanker, L. (2016), "Impact of lead time variability in supply chain risk management", *International Journal of Production Economics,* Vol.180, pp. 88–100.

[8] Banerjee, S. and Golhar, D.Y. (2017), "Economic analysis of demand uncertainty and delayed information sharing in a third-party managed supply chain", *Production Planning & Control* Vol. 28, No. 14, pp. 1107–1115.

[9] Battini, D., Persona, A. and Sgarbossa, F. (2014), "A sustainable EOQ model: Theoretical formulation and applications", *International Journal of Production Economics* Vol. 149, pp. 145–153.

[10] Bazan, E., Jaber, M.Y., Zanoni, S. and Zavanella, L.E. (2014), "Vendor Managed Inventory (VMI) with Consignment Stock (CS) agreement for a two-level supply chain with an imperfect production process with/without restoration interruptions", *International journal of production economics* Vol. 157, pp. 289–301.

[11] Beck, F.G., Glock, C.H. and Kim, T., (2017), "Coordination of a production network with a single buyer and multiple vendors with geometrically increasing batch shipments", *International Journal of Production Economics,* Vol. 193, pp. 633–646.

[12] Ben-Daya, M., Hassini, E., Hariga, M. and AlDurgam, M.M., (2013), "Consignment and vendor managed inventory in single-vendor multiple buyers supply chains", *International Journal of Production Research* Vol. 51, No. 5, pp. 1347–1365.

[13] Beullens, P. (2014), "Revisiting foundations in lot sizing—Connections between Harris, Crowther, Monahan, and Clark", *International Journal of Production Economics*, Vol. 155, pp. 68–81.

[14] Bischak, D.P., Robb, D.J., Silver, E.A. and Blackburn, J.D. (2014), "Analysis and Management of Periodic Review, Order-Up-To Level Inventory Systems with Order Crossover", *Production & Operations Management* Vol. 23, No. 5, pp. 762–772.

[15] Bono, K., Jang, W., Noble, J. (2014), "An inventory model with emergency orders under explicit energy cost considerations", *International Journal of Production Research,* Vol.52, No.1, pp. 203–220.

[16] Bozorgi, A., Pazour, J. and Nazzal, D. (2014), "A new inventory model for cold items that considers costs and emissions", *International Journal of Production Economics,* Vol.155, pp. 114–125.

[17] Braglia, M., Gabbrielli, R. and Zammori, F. (2013), "Consignment stock theory with a fixed batch manufacturing process", *International Journal of Production Research,* Vol.51, No. 8, pp. 2377–2398.

[18] Bylka, S. (2013), "Non-cooperative consignment stock strategies for management in supply chain", *International Journal of Production Economics,* Vol.143, No.2, pp. 424–433.

[19] Bruno, G., Genovese, A. and Piccolo, C. (2014), "The capacitated Lot Sizing model: A powerful tool for logistics decision making", *International Journal of Production Economics* Vol.155, pp. 380–390.

[20] Cao, E., Wan, C., Lai, M., 2013. Coordination of a supply chain with one manufacturer and multiple competing retailers under simultaneous demand and cost disruptions. International Journal of Production Economics 141, 425–433.

[21] Cao, E., Zhou, X. and Lü, K. (2015), "Coordinating a supply chain under demand and cost disruptions", *International Journal of Production Research,* Vol.53, No. 1, pp. 3735–3752.

[22] Chakraborty, A., Chatterjee, A. k. and Mateen, A. (2015), "A vendor-managed inventory scheme as a supply chain coordination mechanism", *International Journal of Production Research,* Vol. 53, No. 1, pp. 13–24.

[23] Chan, C.K., Wong, W.H., Langevin, A. and Lee, Y. c. e. (2017), "An integrated production-inventory model for deteriorating items with consideration of optimal production rate and deterioration during delivery", *International Journal of Production Economics,* Vol. 189, pp. 1–13.

[24] Chen, L.G. and Gavirneni, S. (2013), "A note on the effectiveness of scheduled balanced ordering in a one-supplier two-retailer system with uniform end-customer demands", *International Journal of Production Economics,* Vol. 146, No.1, pp. 240–245.

[25] Chiang, C.-Y., Lin, W.T., Suresh, N.C., 2016. An empirically-simulated investigation of the impact of demand forecasting on the bullwhip effect: Evidence from U.S. auto industry. International Journal of Production Economics 177, 53–65.

[26] Choudhary, A., Sarkar, S., Settur, S. and Tiwari, M.K. (2015), "A carbon market sensitive optimization model for integrated forward–reverse logistics", *International Journal of Production Economics*, Vol. 164, pp. 433–444.

[27] Dillon, M., Oliveira, F. and Abbasi, B. (2017), "A two-stage stochastic programming model for inventory management in the blood supply chain", *International Journal of Production Economics,* Vol. 187, pp. 27–41
[28] Dobhan, A. and Oberlaender, M. (2013), "Hybrid contracting within multi-location networks", *International Journal of Production Economics,* Vol.143, No. 2, pp. 612–619.
[29] Duan, Q. and Warren Liao, T. (2013), "Optimization of replenishment policies for decentralized and centralized capacitated supply chains under various demands", *International Journal of Production Economics,* Vol. 142, No. 1, pp. 194–204.
[30] Egri, P., Kis, T., Kovács, A. and Váncza, J. (2014), "An inverse economic lot-sizing approach to eliciting supplier cost parameters", *International Journal of Production Economics,* Vol. 149, pp. 80–88.
[31] Fahimnia, B., Sarkis, J., Choudhary, A. and Eshragh, A. (2015), "Tactical supply chain planning under a carbon tax policy scheme: A case study", *International Journal of Production Economics,* Vol. 164, pp. 206–215.
[32] Fang, C., Liao, X. and Xie, M. (2016), "A hybrid risks-informed approach for the selection of supplier portfolio", *International Journal of Production Research*, Vol. 54, No. 7, pp. 2019–2034.
[33] Fernandes, R., Gouveia, B. and Pinho, C. (2013), "Integrated inventory valuation in multi-echelon production/distribution systems", *International Journal of Production Research*, Vol. 51, No. 9, pp. 2578–2592.
[34] Gaur, J., Amini, M. and Rao, A. k. (2017), "Closed-loop supply chain configuration for new and reconditioned products: An integrated optimization model", *Omega*, Vol. 66, pp. 212–223
[35] Ghasemy Yaghin, R., Fatemi Ghomi, S. m. t. and Torabi, S. a. (2014), "Enhanced joint pricing and lotsizing problem in a two-echelon supply chain with logit demand function", *International Journal of Production Research*, Vol. 52, No. 17, pp. 4967–4983.
[36] Gong, J., Mitchell, J.E., Krishnamurthy, A. and Wallace, W.A. (2014), "An interdependent layered network model for a resilient supply chain", *Omega*, Vol. 46, 104–116.
[37] Govindan, K. and Fattahi, M. (2017), "Investigating risk and robustness measures for supply chain network design under demand uncertainty: A case study of glass supply chain", *International Journal of Production Economics*, Vol. 183, pp. 680–699.
[38] Govindan, K., Jha, P. c. and Garg, K. (2016), "Product recovery optimization in closed-loop supply chain to improve sustainability in manufacturing", *International Journal of Production Research,* Vol. 54, No. 5, 1463–1486.
[39] Habibi, M.K., Battaïa, O., Cung, V.-D. and Dolgui, A. (2017). "Collection-disassembly problem in reverse supply chain", *International Journal of Production Economics*, Vol. 183, pp. 334–344.
[40] Hammami, R. and Frein, Y. (2014), "Redesign of global supply chains with integration of transfer pricing: Mathematical modeling and managerial insights", *International Journal of Production Economics,* Vol. 158, pp. 267–277.
[41] Hassanzadeh, F., Modarres, M., Nemati, H.R. and Amoako-Gyampah, K. (2014), "A robust R&D project portfolio optimization model for pharmaceutical contract research organizations", *International Journal of Production Economics*, Vol.158, pp. 18–27.
[42] Hlioui, R., Gharbi, A. and Hajji, A. (2015), "Replenishment, production and quality control strategies in three-stage supply chain", *International Journal of Production Economics,* Vol. 166, pp. 90–102.
[43] Hnaien, F. and Afsar, H.M. (2017), "Robust single-item lot-sizing problems with discrete-scenario lead time", *International Journal of Production Economics*, Vol.185, pp.223–229.
[44] Huang, S.-M. and Su, J.C. (2013), "Impact of product proliferation on the reverse supply chain", *Omega,* Vol. 41, pp. 626–639.
[45] Hübl, A., Jodlbauer, H. and Altendorfer, K. (2013), "Influence of dispatching rules on average production lead time for multi-stage production systems", *International Journal of Production Economics,* Vol.144, No.2, pp. 479–484.
[46] Ivanov, D. (2017), "Simulation-based ripple effect modelling in the supply chain*", International Journal of Production Research,* Vol.55, No. 7, pp. 2083–2101.
[47] Ivanov, D. and Sokolov, B. (2013), "Dynamic co-ordinated scheduling in the supply chain under a process modernization", *International Journal of Production Research,* Vol.51, No.9, pp. 2680–2697.
[48] Ivanov, D., Sokolov, B. and Dolgui, A. (2014), "Multi-stage supply chain scheduling with non-preemptive continuous operations and execution control", *International Journal of Production Research,* Vol. 52, No. 13, pp. 4059–4077.
[49] Jaber, M.Y., Zanoni, S. and Zavanella, L.E. (2014), "A consignment stock coordination scheme for the production, remanufacturing and waste disposal problem", *International Journal of Production Research,* Vol. No. 1, pp. 52, 50–65.
[50] Jadidi, O., Zolfaghari, S. and Cavalieri, S. (2014), "A new normalized goal programming model for multi-objective problems: A case of supplier selection and order allocation", *International Journal of Production Economics,* Vol. 148, pp. 158–165.
[51] Ji, P., Ma, X. and Li, G. (2015), "Developing green purchasing relationships for the manufacturing industry: An evolutionary game theory perspective", *International Journal of Production Economics,* Vol. 166, pp. 155–162.
[52] Jin, X., Li, K. and Sivakumar, A.I. (2013), "Scheduling and optimal delivery time quotation for customers with time sensitive demand", *International Journal of Production Economics,* Vol.145, No. 1, pp. 349–358.
[53] Johansen, S.G. (2013), "Modified base-stock policies for continuous-review, lost-sales inventory models with Poisson demand and a fixed lead time*", International Journal of Production Economics,* Vol. 143, No. 2, pp. 379–384.

[54] Jonrinaldi. and Zhang, D. z. (2013), "An integrated production and inventory model for a whole manufacturing supply chain involving reverse logistics with finite horizon period", *Omega,* Vol.41, No. 3, pp. 598–620.

[55] Kang, H.-Y. and Lee, A.H.I. (2013), "A stochastic lot-sizing model with multi-supplier and quantity discounts", *International Journal of Production Research,* Vol. 51, No. 1, pp. 245–263.

[56] Kannan, G., Grigore, M.C., Devika, K. and Senthilkumar, A. (2013), "An analysis of the general benefits of a centralised VMI system based on the EOQ model", *International Journal of Production Research,* Vol. 51, No. 1, pp. 172–188.

[57] Kim, T. and Glock, C.H. (2018), "Production planning for a two-stage production system with multiple parallel machines and variable production rates", *International Journal of Production Economics,* Vol. 196, pp. 284–292.

[58] Kim, T., Glock, C.H. and Kwon, Y. (2014), "A closed-loop supply chain for deteriorating products under stochastic container return times", *Omega,* Vol. 43, pp. 30–40.

[59] Kouki, C. and Jouini, O. (2015), "On the effect of lifetime variability on the performance of inventory systems", *International Journal of Production Economics*, Vol. 167, pp. 23–34.

[60] Leung, L.C., Wong, W.H., Hui, Y.V. and Wan, Y. (2013), "Managing third-party logistics under uncertainty: A decision scheme and managerial implications", *International Journal of Production Economics*, Vol.145, No. 2, pp. 630–644.

[61] Li, C., (2013), "An integrated approach to evaluating the production system in closed-loop supply chains" *International Journal of Production Research*, Vol. 51, No, 13, pp. 4045–4069.

[62] Li, Y., Jia, G., Cheng, Y. and Hu, Y. (2017), "Additive manufacturing technology in spare parts supply chain: a comparative study", *International Journal of Production Research*, Vol. 55, No. 5, pp. 1498–1515.

[63] Liu, Weihua, Ge, M. and Yang, D. (2013), "An order allocation model in a two-echelon logistics service supply chain based on the rational expectations equilibrium", *International Journal of Production Research,* Vol. 51, No. 13, pp. 3963–3976.

[64] Liu, Wei-hua, Xie, D., and Xu, X. (2013), "Quality supervision and coordination of logistic service supply chain under multi-period conditions", *International Journal of Production Economics,* Vol. 142, N. 2, pp. 353–361.

[65] Long, Q. (2014), "Distributed supply chain network modelling and simulation: integration of agent-based distributed simulation and improved SCOR model", *International Journal of Production Research,* Vol. 52, No. 23, pp. 6899–6917.

[66] Luangkesorn, K. l., Klein, G. and Bidanda, B. (2016), "Analysis of production systems with potential for severe disruptions", *International Journal of Production Economics*, Vol. 171, pp. 478–486.

[67] Ma, Y., Wang, N., Che, A., Huang, Y., and Xu, J. (2013), "The bullwhip effect on product orders and inventory: a perspective of demand forecasting techniques", *International Journal of Production Research,* Vol. 51, No. 1, pp. 281–302.

[68] Mekhtiev, M.A., (2013), "Analytical evaluation of lead-time demand in polytree supply chains with uncertain demand, lead-time and inter-demand time", *International Journal of Production Economics*, Vol. 145, No. 1, pp. 304–317.

[69] Meng, Q., Li, Z., Liu, H. and Chen, J. (2017), "Agent-based simulation of competitive performance for supply chains based on combined contracts", *International Journal of Production Economics*, Vol. 193, No pp. 663–676.

[70] Moghaddam, K.S. (2015), "Supplier selection and order allocation in closed-loop supply chain systems using hybrid Monte Carlo simulation and goal programming", *International Journal of Production Research*, Vol. 53, No. 20, pp. 6320–6338.

[71] Mogre, R., Wong, C.Y. and Lalwani, C.S. (2014), "Mitigating supply and production uncertainties with dynamic scheduling using real-time transport information", *International Journal of Production Research*, Vol. 52, No. 17, pp. 5223–5235.

[72] Moncayo-Martínez, L.A. and Zhang, D.Z. (2013), "Optimising safety stock placement and lead time in an assembly supply chain using bi-objective MAX–MIN ant system", I*nternational Journal of Production Economics,* Vol. 145, No. 1, pp. 18–28.

[73] Mou, Q., Liao, H. and Cheng, Y. (2017), "A note on "lead time reduction strategies in a single-vendor-single-buyer integrated inventory model with lot size-dependent lead times and stochastic demand", *International Journal of Production Economics*, Vol. 193, pp. 827–831.

[74] Munoz, A. and Dunbar, M. (2015), "On the quantification of operational supply chain resilience", *International Journal of Production Research*, Vol. 53, No. 22, pp. 6736–6751.

[75] Najafi Tavani, S., Sharifi, H., Soleimanof, S. and Najmi, M. (2013), "An empirical study of firm's absorptive capacity dimensions, supplier involvement and new product development performance", *International Journal of Production Research*, Vol. 51, No. 11, pp. 3385–3403.

[76] Nedaei, H. and Mahlooji, H. (2014), "Joint multi-objective master production scheduling and rolling horizon policy analysis in make-to-order supply chains", *International Journal of Production Research,* Vol. 52, No. 9, pp. 2767–2787.

[77] Neidigh, R.O. and Harrison, T.P. (2013), "Optimising lot sizing with nonlinear production rates in a multi-product single-machine environment", *International Journal of Production Research*, Vol. 51, No. 12, pp. 3561–3573.

[78] Nurjanni, K.P., Carvalho, M.S. and Costa, L. (2017), "Green supply chain design: A mathematical modeling approach based on a multi-objective optimization model", *International Journal of Production Economics,* Vol. 183, pp. 421–432.

[79] Özceylan, E. and Paksoy, T. (2013), "A mixed integer programming model for a closed-loop supply-chain network", *International Journal of Production Research*, Vol. 51, No. 3, pp. 718–734.

[80] Paul, S.K., Sarker and R., Essam, D. (2014), "Managing real-time demand fluctuation under a supplier–retailer coordinated system", *International Journal of Production Economics*, Vol. 158, pp. 231–243.

[81] Piewthongngam, K., Pathumnakul, S. and Homkhampad, S. (2013), "An interactive approach to optimize production–distribution planning for an integrated feed swinecompany", *International Journal of Production Economics,* Vol. 142, No. 2, pp. 290–301.

[82] Rad, R.H., Razmi, J., Sangari, M.S. and Ebrahimi, Z.F. (2014), "Optimizing an integrated vendor-managed inventory system for a single-vendor two-buyer supply chain with determining weighting factor for vendor′ s ordering cost", *International Journal of Production Economics,* Vol. 153, pp. 295–308.

[83] Roni, M.S., Eksioglu, S.D., Jin, M. and Mamun, S. (2016), "A hybrid inventory policy with split delivery under regular and surge demand", *International Journal of Production Economics*, Vol. 172, pp. 126–136.

[84] Russell, R.A.(2017), "Mathematical programming heuristics for the production routing problem", *International Journal of Production Economics*, Vol. 193, pp. 40–49.

[85] Ryu, K., Moon, I., Oh, S. and Jung, M. (2013), "A fractal echelon approach for inventory management in supply chain networks", *International Journal of Production Economics,* Vol. 143, No. 2, pp. 316–326.

[86] Saghaei, A., Najafi, H., Mighi, A. and Mosanna, Z. (2014), "Mathematical modelling to improve Rolled Throughput Yield in a supply chain", *Production Planning & Control,* Vol. 25, No..5, pp. 414–424.

[87] Sağlam, Ü. and Banerjee, A. (2018), "Integrated multiproduct batch production and truck shipment scheduling under different shipping policies", *Omega*, Vol. 74, pp. 70–81.

[88] Salehi, H., Taleizadeh, A.A. and Tavakkoli-Moghaddam, R. (2016), "An EOQ model with random disruption and partial backordering" *International Journal of Production Research*, Vol. 54, No. 9, pp. 2600–2609.

[89] Schaal, K. and Hübner, A. (2018), "When does cross-space elasticity matter in shelf-space planning? A decision analytics approach", *Omega*, Vol. 80, pp. 135–152.

[90] Shankar, R., Bhattacharyya, S. and Choudhary, A. (2018), "A decision model for a strategic closed-loop supply chain to reclaim End-of-Life Vehicles", *International Journal of Production Economics*, Vol. 195, pp. 273–286.

[91] Shao, J., Krishnan, H. and Thomas McCormick, S. (2013), "Distributing a Product Line in a Decentralized Supply Chain", *Production & Operations Management,* Vol. 22, No. 1, pp.151–163.

[92] Sinha, A.K., Davich, T. and Krishnamurthy, A, (2016), "Optimisation of production and subcontracting strategies", *International Journal of Production Research*. Vol. 54, No. 8, pp. 2377–2393.

[93] Soleimani, H., Seyyed-Esfahani, M. and Kannan, G. (2014), "Incorporating risk measures in closed-loop supply chain network design", *International Journal of Production Research*, Vol. 52, No. 6, pp. 1843–1867.

[94] Tahirov, N., Hasanov, P. and Jaber, M.Y. (2016), "Optimization of closed-loop supply chain of multi-items with returned subassemblies", *International Journal of Production Economics*, Vol. 174, pp. 1–10.

[95] Tang, L., Jing, K. and He, J. (2013), "An improved ant colony optimisation algorithm for three-tier supply chain scheduling based on networked manufacturing", *International Journal of Production Research*, Vol. 51, No. 13, pp. 3945–3962.

[96] Van der Heijden, M. c., Alvarez, E. m. and Schutten, J. m. j. (2013), "Inventory reduction in spare part networks by selective throughput time reduction", *International Journal of Production Economics*, Vol. 143, No.2, pp. 509–517.

[97] Von Massow, M. and Canbolat, M. (2014), "A strategic decision framework for a value added supply chain" *International Journal of Production Research*, Vol. 52, No.7, pp. 1940–1955.

[98] Wang, E.-J., Su, T.-S., Tsai, D.-M and, Lin, C.-Y., (2013), "Fuzzy multiple-goal programming for analysing outsourcing cost-effectiveness in hi-tech manufacturing", *International Journal of Production Research*, Vol. 51, No.13, pp. 3920–3944.

[99] Wang, H.-F. and Huang, Y.-S. (2013), "A two-stage robust programming approach to demand-driven disassembly planning for a closed-loop supply chain system", *International Journal of Production Research*, Vol. 51, No. 8, pp. 2414–2432.

[100] Wang, S.-Y., Sheen, G.-J. and Yeh, Y. (2015), "Pricing and shelf space decisions with non-symmetric market demand", *International Journal of Production Economics*, Vol. 169, pp. 233–239.

[101] White, S.W. (2013), "An experimentally confirmed resource planning model of services under production function uncertainties", *International Journal of Production Economics,* Vol. 141, No. 2, pp. 478–484.

[102] Wu, B. and Sarker, B.R. (2013), "Optimal manufacturing and delivery schedules in a supply chain system of deteriorating items", *International Journal of Production Research*, Vol. 51, No. 3, pp. 798–812.

[103] Xia, Y. (2016), "Responding to supplier temporary price discounts in a supply chain through ordering and pricing decisions. *International Journal of Production Researc*h, Vol. 54, No. 7, pp. 1938–1950.

[104] Xie, Z., Park, C.S. qnd Zheng, L. (2013), "Procurement models under purchase price uncertainty for Chinese oil refineries", *International Journal of Production Research*, Vol. 51, No. 10, pp. 2952–2968.

[105] Xu, X. and Meng, Z. (2014), "Coordination between a supplier and a retailer in terms of profit concession for a two-stage supply chain", *International Journal of Production Research*, Vol. 52, No. 7, pp. 2122–2133.

[106] Yan, C., Liao, Y. and Banerjee, A. (2013), "Multi-product lot scheduling with backordering and shelf-life constraints", *Omega*, Vol. 41, No. 3, 510–516.

[107] Yao, J. (2017), "Optimisation of one-stop delivery scheduling in online shopping based on the physical Internet", *International Journal of Production Research*, Vol. 55, No. 2, pp. 358–376.

[108] Yuan, K.F., Ma, S.H., He, B. and Gao, Y. (2015), "Inventory decision-making models for a closed-loop supply chain system with different decision-making structures", *International Journal of Production Research*, Vol. 53, No. 1, pp. 183–219.

[109] Zanoni, S., Mazzoldi, L. and Jaber, M.Y. (2014), "Vendor-managed inventory with consignment stock agreement for single vendor–single buyer under the emission-trading scheme", *International Journal of Production Research*, Vol. 52, No. 1, pp. 20–31.

[110] Zhang, J., Liu, G., Zhang, Q. and Bai, Z. (2015), "Coordinating a supply chain for deteriorating items with a revenue sharing and cooperative investment contract", *Omega,* Vol. 56, No. 3, pp. 37–49.

[111] Zhou, Y. and Xie, J. (2014), "Potentially self-defeating: Group buying in a two-tier supply chain", *Omega*,, Vol. 49, pp. 42–52.

[112] Zhou, Y., Xiong, Y., Li, G., Xiong, Z. and Beck, M. (2013), "The bright side of manufacturing–remanufacturing conflict in a decentralised closed-loop supply chain", *International Journal of Production Research*, Vol. 51, No. 9, pp. 2639–2651.

[113] Zhu, S.X. (2013), "Dynamic replenishment, production, and pricing decisions, in the face of supply disruption and random price-sensitive demand", *International Journal of Production Economics*, Vol. 146, No. 2, pp. 612–619.