
Supply chain planning, execution, modelling and optimisation in the internet age

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The internet is no longer the 'new' technology that brought with it hyped-up promises of cost savings and operational efficiencies. It has now been established as a vital part in connecting all partners into a single supply chain moving them from integrated supply chains to supply webs or nets. E-business has created more tightly integrated supply nets where collaboration among different parties plays a key role since sharing demand information electronically more frequently in real-time has become possible and less costly.

This special issue has attracted papers from academics and practitioners across a broad geographical spectrum covering the experimental and pilot phase of using internet technologies to optimise supply chains. The selection of theoretical and case-based papers demonstrates that a body of knowledge and best practice surrounding supply chain planning, execution, modelling and optimisation in the internet age, is beginning to emerge. The articles in this special issue represent a spectrum of approaches to optimisation of supply chains influenced by the internet to support agile systems and organisations. Four major themes have been identified and the papers have been organised accordingly under each theme in the next section. There is however an overlap as they all explore issues of supply chain optimisation from different perspectives.

1 The impact of internet technology on supply chain agility

The underlying theme here is that the emerging new internet based technologies have created new possibilities for developing supply chain management and e-business solutions. The paper by Lau *et al.* 'Design of an adaptable logistics workflow management system for e-business', identifies a need for organisations to instil supply chain management for e-ventures with the ability to cope with e-procurement, systems logistics management and workflow management to allow the logistics processes to be performed efficiently, allow concurrency and synchronisation. They propose a flexible physical domain, centred around an information system which adopts XML and OLAP, that allows participants to communicate within the value chain network and build an e-value chain partnership that responds to changes in global strategy. The workflow model proposed is believed to provide an improved supply chain and logistics management system, which improves the customer satisfaction by lowering delivery costs and guaranteeing stock availability.

Tassabehji *et al.* in 'Re-aligning reverse e-auctions for organisational agility', examine the role of internet technologies on procurement as a means of introducing organisational agility. This paper specifically reviews and evaluates reverse e-auctions, as an e-procurement tool, from the perspective of providing responsiveness and flexibility in supply chains. The review finds that while the use of reverse e-auctions is still immature, there is much potential for their effective implementation and recommendations are made for developing strategies to align reverse e-auctions with agile systems.

2 Information flows and supply chains

Helaakoski *et al.* in 'Agent technology for supporting real-time supply chain management', explore how agents can transmit supply chain related information between different companies and their ERP systems by developing an agent-based prototype which works as a mutual system for networked companies. They present the findings of their prototype agent in a number of steel companies in Finland. The Steelnet prototype, demonstrates how agent technology is adopted in a shared information system within a business network to achieve transparency and strategic utilisation of information. They maintain that by utilising emerging technologies to support supply chain management, companies can gain competitive advantage.

Bremang *et al.* in 'An information system's architecture to support responsive supply chains', provide an alternative method for designing information flows for more responsive supply chains. The research presented in the paper investigated an internet design as a viable means for the automated exchange of information between supply chain partners. The prototyping of the design for the case study, produced a tightly integrated architecture that was successful in making production information accessible to all supply partners within the automotive industry value stream studied. This was found to have improved overall performance as a result of reduced inventory and increased responsiveness.

3 Modelling and optimising supply networks

Artamonov and Pidd in 'Examining the potential of distributed supply chain simulation', review simulation methods that have long been applied in production-inventory systems and increasingly are used in supply chain management. They analyse supply chains as distributed entities applying distributed computation to their simulation with the internet as a logical inter-operation medium. They explore the reasons why distributed supply simulation is not used in industry and identify five potential drivers for its increased usage. They conclude that distributed supply chain simulation should focus less on technology and more on business issues, but in order to achieve this, ways must be found to enhance and demonstrate how distributed supply chain simulation can add business value.

The following papers by Wallace *et al.* 'Stochastic automata and supply chain agility in the time limited supply industry', and Wang and Yu 'Cost minimisation for downstream outsourcing supply chain under demand uncertainty', attempt to address the business issues by demonstrating how simulation can add value to supply chain and organisational agility through improved decision-making.

Wallace *et al.* present a stochastic automaton approach to stock ordering of time-limited goods, to minimise the bullwhip effect enabling agile inventory management. Stochastic automaton simulations reveal that this approach can be used to generate orders that satisfy demand, and can reduce the effect of bullwhip, providing visibility and responsiveness in ordering between tightly coupled retailer-supplier partnerships.

Wang and Yu consider downstream outsourcing supply chains where there are uncertainties in the lead time and delivery time is relatively long for European companies. This paper develops a cost model under demand lead time uncertainties, and a new formula to measure demand uncertainty is also proposed. A simulation method is also used to analyse influences of uncertainty on the optimal order quantity and minimum costs.

4 New methods of supply chain forecasting and planning

Technology is forcing businesses to re-orient their strategies towards integrated strategic partnerships. This redirection has resulted in the need for effective and efficient decision-making throughout the supply chain. The following papers, present methods for dealing with improved decision-making for supply chain forecasting and planning, in the time and cost pressured environment of the new digital economy influenced by the internet and emergent new business models.

The paper by Routroy and Kodali 'Decision framework for capacity decision in supply chain', presents simulated annealing to resolve capacity decision problems in supply chains. This method can be used to incorporate qualitative and quantitative criteria using a combination of AHP and multi-objective programming to make decisions about the capacity selection of new or existing locations. It considers the total priority that has to be maximised, and the total cost along the supply chain that has to be minimised, to provide good optimised capacity solutions in the supply chain. The

framework developed by the authors, is applicable to different types of industry by allowing managers to structure their unique problems into priority weights, which can reflect their own priority considerations.

Kumanan *et al.* in 'Performance analysis of supply chain network using a genetic algorithm and simulation', propose the use of a genetic algorithm and spreadsheet simulation for optimising the distribution plan of a two-stage supply chain. The simulation model based on real-time information sharing, is developed to identify customer responsiveness and service level in a stochastic environment for a robust and viable solution for supply chain modelling and analysis.

The papers in this special issue, bring together a broad range of views from international researchers and we would like to thank all our contributors for their submission and we would like to especially thank all the reviewers for their diligence and high quality feedback.