**AN ENHANCED APPROXIMATION MATHEMATICAL MODEL INVENTORYING ITEMS IN A MULTI-ECHELON SYSTEM UNDER A CONTINUOUS REVIEW POLICY WITH PROBABILISTIC DEMAND AND LEAD-TIME**

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# Abstrak

Suatu sistem inventori berusaha mengimbangi antara lebihan stok and kekurangan stok bagi mengurangkan jumlah kos dan mencapai permintaan pengguna dalam masa yang tepat. Sistem inventori adalah seperti entiti yang tersembunyi dalam rantaian bekalan, yang mana rangkaian lengkap yang besar menyelaraskan satu siri proses yang saling berkaitan untuk sesuatu pengeluar, bagi mengubah bahan mentah kepada produk akhir dan mengagihkannya kepada pelanggan. Inventori optimum dan peruntukan dasar dalam rantaian bekalan untuk industri simen bagi kebanyakan jenis sistem pelbagai lapisan masih tidak diketahui. Dalam rangkaian pelbagai lapisan, kerumitan wujud apabila berbagai isu inventori timbul dalam pelbagai peringkat yang mana prestasi mereka dipengaruhi secara signifikan oleh permintaan dan masa-pendulu. Oleh itu, objektif kajian ini adalah untuk membangunkan satu model matematik teranggar yang ditambahbaik dalam satu sistem inventori pelbagai lapisan melalui dasar ulasan berterusan yang tertakluk kepada permintaan berkebarangkalian dan masa-pendulu. Fungsi taburan kebarangkalian permintaan semasa masa-pendulu dijana dengan membangunkan satu model simulasi baru berkaitan permintaan semasa masa-pendulu (*SMDDL*) menggunakan prosedur simulasi. Model ini berupaya meramal permintaan dan permintaan semasa masa-pendulu untuk masa hadapan. Permintaan semasa masa-pendulu untuk masa hadapan yang diperoleh digunakan untuk membangun satu model inventori pelbagai lapisan bersiri (*SMEI*) dengan menerbitkan fungsi kos inventori untuk mengira ukuran prestasi bagi sistem inventori industri simen. Berdasarkan ukuran prestasi tersebut, satu model inventori pelbagai lapisan taburan yang diubahsuai dengan aturan tiba dahulu layan dahulu (*FCFS*) (*DMEI-FCFS*) diterbitkan untuk menentukan jangka masa menunggu terbaik dan jangkaan bilangan peruncit dalam sistem berdasarkan min kadar ketibaan dan min kadar perkhidmatan. Kajian ini menghasilkan lima fungsi taburan baharu bagi permintaan semasa masa-pendulu. Semua fungsi taburan mampu menambahbaik ukuran prestasi yang mana ianya menyumbang kepada pengurangan dalam jangka masa menungu dalam sistem. Keseluruhannya, model teranggar ini dapat mencadangkan tempoh masa yang tepat bagi mengatasi masalah kekurangan inventori simen yang mana seterusnya memenuhi kepuasan pelanggan.



**Kata kunci**: Model inventori pelbagai lapisan, dasar ulasan berterusan, permintaan dan masa-pendulu berkebarangkalian , prosedur simulasi, aturan FCFS


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# Abstract

An inventory system attempts to balance between overstock and understock to reduce the total cost and achieve customer demand in a timely manner. The inventory system is like a hidden entity in a supply chain, where a large complete network synchronizes a series of interrelated processes for a manufacturer, in order to transform raw materials into final products and distribute them to customers. The optimality of inventory and allocation policies in a supply chain for a cement industry is still unknown for many types of multi-echelon inventory systems. In multi-echelon networks, complexity exists when the inventory issues appear in multiple tiers and whose performances are significantly affected by the demand and lead-time. Hence, the objective of this research is to develop an enhanced approximation mathematical model in a multi-echelon inventory system under a continuous review policy subject to probabilistic demand and lead-time. The probability distribution function of demand during lead-time is established by developing a new Simulation Model of Demand During Lead-Time (SMDDL) using simulation procedures. The model is able to forecast future demand and demand during lead-time. The obtained demand during lead-time is used to develop a Serial Multi-echelon Inventory (SMEI) model by deriving the inventory cost function to compute performance measures of the cement inventory system. Based on the performance measures, a modified distribution multi-echelon inventory (DMEI) model with the First Come First Serve (FCFS) rule (DMEI-FCFS) is derived to determine the best expected waiting time and expected number of retailers in the system based on a mean arrival rate and a mean service rate. This research established five new distribution functions for the demand during lead-time. The distribution functions improve the performance measures, which contribute in reducing the expected waiting time in the system. Overall, the approximation model provides accurate time span to overcome shortage of cement inventory, which in turn fulfil customer satisfaction.



**Keywords**: Approximation multi-echelon inventory model, continuous review policy, probabilistic demand and lead-time, simulation procedures, FCFS rule

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# CHAPTER ONE
# INTRODUCTION

Over time, there have been an increasing number of studies in the area of a multi-echelon inventory system, which is popularly called Supply Chain Management (SCM). The reason behind this continued interest is not only because of the complexity that arises from the interaction between the different stages (echelons) but also due to its immensely practical application in the real world.

A supply chain is a complete system or network that synchronizes a series of interrelated processes (businesses, works, or jobs) in order to transform raw materials into final products or semi-finished goods, and distribute these final products from a distribution center to retailers or to customers directly (Min & Zhou, 2002). The primary objective of a supply chain is to maximize the profitability for all partners involved. The partners can be a single firm or more than one firm. The objective can be met if all partners think 'win-win' and are not worried about their individual performance optimization (Chopra & Meindl, 2001).



Traditionally, inventories at various stocks in a supply chain were managed independently and stored with high inventories (Chen and Mushaluk 2014, Yvan 2011). Market globalization and competitive pressures have increasingly forced companies to make more efforts to optimally control their inventories while improving customer service (Yang and Geunes 2007, Agudelo 2009). As a result, industrial practitioners and academic researchers have begun to pay extra attention to multi-echelon inventory management, which takes the interactions between different stocks in a supply chain into consideration.

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## REFERENCES

Abdul-Jalbar, B., Gutiérrez, J., & Sicilia, J. (2005). Integer-ratio policies for distribution/inventory systems. *International Journal of Production Economics*, *93–94*(0), 407–415. doi:http://dx.doi.org/10.1016/j.ijpe.2004.06.037

Abu Alhaj, M., & Diabat, A. (2009). Joint location-two-echelon-inventory supply chain model with stochastic demand. In *41st International Conference on Computers & Industrial Engineeringst* (pp. 25–30).

Aggrwal, P. K., & Moinzadeh, K. (1994). Order expedition in multi-echelon production/distribution systems. *IIE Transactions*, *26*(2), 86–96. doi:10.1080/07408179408966599

Agudelo, I. (2009). *Supply Chain Management in the Cement Industry*. Massachusetts Institute of Technology.Universidad Javeriana Cali, Colombia.

Altiok, T. (1989). (R, r) Production/Inventory Systems. *Operations Research*, *37*(2), 266–276. doi:10.1287/opre.37.2.266

Altiok, T., & Melamed, B. (2001). Simulation Modeling and Analysis with Arena. Cyber Research. *Inc. and Enterprise Technology Solutions, Inc*.

Altiok, T., & Ranjan, R. (1995). Multi-stage, pull-type production/inventory systems. *IIE Transactions*, *27*(2), 190–200. doi:10.1080/07408179508936731

Atan, Z. (2010). *Inventory Management for Multi-Echelon Supply Chains*.US: Lehigh Unversity.

Averbakh, I., & Xue, Z. (2007). On-line supply chain scheduling problems with preemption. *European Journal of Operational Research*, *181*(1), 500–504. doi:10.1016/j.ejor.2006.06.004

Axsater, S. (1993). Exact and approximate evaluation of batch ordering policies for two-level inventory systems. *Operations Research*, *41*, 777–785.

Axsater, S. (2001). A framework for decentralized multi-echelon inventory control. *IIE Transactions*, *33*, 91–97.

Axsater, S. (2003). Approximate optimization of a two-level distribution inventory system. *International Journal of Production Economics*, *81*, 545–553.

Axsater, S. (2006a). A simple procedure for determining order quantities under a fill rate constraint and normally distributed lead-time demand. *European Journal of Operational Research*, *174*, 480–491. doi:10.1016/j.ejor.2005.01.037

Axsater, S. (2006b). *Inventory control*. (2nd ed.). New York, Springer.

Axsater, S. (2010). A capacity constrained production-inventory system with stochastic demand and production times. *International Journal of Production Research*, *48*(20), 6203–6209. doi:10.1080/00207540903283808

Axsäter, S. (1984). In-Process safety stock. In *23rd conference on Decision and Control* (pp. 839–842).

Axsäter, S. (1997). Simple evaluation of echelon stock (R, Q) policies for two-level inventory systems. *IIE Transactions*, *29*(8), 661–669.

Axsäter, S. (1998). Evaluation of installation stock based (R, Q)-policies for two-level inventory systems with Poisson demand. *Operations Research*, *46*(3-supplement-3), S135–S145.

Axsäter, S. (2000). Exact analysis of continuous review (R, Q) policies in two-echelon inventory systems with compound Poisson demand. *Operations Research*, *48*(5), 686–696.

Axsäter, S. (2007). On the First Come – First Served Rule in Multi-Echelon Inventory Control. *Wiley InterScience*, *54*(4), 485–491. doi:10.1002/nav

Axsäter, S. (2011). Inventory Control when the Lead-time Changes. *Production and Operations Management Society*, *20*(1), 72–80.

Axsäter, S., & Juntti, L. (1996). Comparison of echelon stock and installation stock policies for two-level inventory systems. *International Journal of Production Economics*, *45*(1), 303–310.

Axsäter, S., & Marklund, J. (2008). Optimal Position-Based Warehouse Ordering in Divergent Two-Echelon Inventory Systems. *Operations Research*, *56*(4), 976–991. doi:10.1287/opre.1080.0560

Axsater, S., & Rosling, K. (1999). Ranking of generalised multi-stage KANBAN policies. *European Journal of Operational Research*, *113*, 560–567.

Axsäter, S., & Rosling, K. (1993). Installation vs. Echelon Stock Policies for Multilevel Inventory Control. *Management Science*, *39*(10), 1274–1280. doi:10.1287/mnsc.39.10.1274

Axsäter, S., & Viswanathan, S. (2012). On the value of customer information for an independent supplier in a continuous review inventory system. *European Journal of Operational Research*, *221*, 340–347. doi:10.1016/j.ejor.2012.03.022

Axsäter, S., & Zhang, W.F. (1999). A joint replenishment policy for multi-echelon inventory control. *International Journal of Production Economics*, *59*(1–3), 243–250. doi:http://dx.doi.org/10.1016/S0925-5273(98)00018-8

Bagchi, U., & Hayya, J. (1984). Demand during Lead Time for Normal Unit Demand and Erlang Lead Time. *Operations Research Society1*, *35*(2), 131–135.

Balakrishnan, N., & Nevzorov, V. B. (2003). *A primer on statistical distributions* Hamilton, Canada: McMaster University. doi:DOI: 10.1002/0471722227

Barton, R. R. (1992). Metamodels for Simulation Input-output Relations. In *Proceedings of the 24th Conference on Winter Simulation* (pp. 289–299). New York, NY, USA: ACM. doi:10.1145/167293.167352

Baten, M. A., & Kamil, A. (2009). An Optimal Control Approach to Inventory-Production Systems with Weibull Distributed Deterioration. *Mathematics and Statisitcs*, *5*(3), 206–214.

Bates, M. and Granger, C. (1969), “The Combination of Forecasts”, *Operations Research Society*, Vol. 20 No. 4, pp. 451–468.

Baumol, W., & Vinod, H. D. (1970). An Inventory Theoretic Model of Freight Transport Demand. *Management Science*, *16*(7), 413–421. doi:10.1287/mnsc.16.7.413

Baykal-Gurosy, M., & Erkip, N. (2010). Forecasting for Inventory Planning under Correlated. *Wiley Encyclopedia of Operations Research and Management Science*, 1–11. Doi: 10.1002/9780470400531.eorms0330

Beamon, B. M. (1998). Supply Chain Design and Analysis : Models and Methods. *International Journal of Production Economics*, *55*(3), 281–249.

Bell, P. C. (1978). A new procedure for the distribution of periodicals. *Journal of Operational Research Society*, *29*, 427–434.

Bengio, O. (2012). *The Kurds of Iraq: Building a state within a state*. Lynne Rienner Publishers Boulder.

Bernstein, F., & DeCroix, G. A. (2006). Inventory Policies in a Decentralized Assembly System. *Operations Research*, *54*(2), 324–336. doi:10.1287/opre.1050.0256

Bessler, S. A., & Veinott, A. F. (1966). Optimal policy for a dynamic multi-echelon inventory model. *Naval Research Logistics Quarterly*, *13*(4), 355–389. doi:10.1002/nav.3800130402

Bhat, N. (2015). *An introduction to queueing theory: modeling and analysis in applications*. Boston :Birkhäuser.

Bhat, U. N. (2008). *An Introduction to Queueing Theory Modeling and Analysis in Applications*. *Evaluation*. Boston: Birkhäuser. doi:10.1002/masy.200350723

Boddewyn, J. J., & Brewer, T. L. (2014). International-Business Behavior : New Theoretical Direction. *Academy of Managment Review*, *19*(1), 119–143.

Bolarín, F. C., Lisec, A., & Esteban, F. C. (2008). Inventory Cost Consequences of Variability Demand Process within a Multi-Echelon Supply Chain. *Logistics and Sustainable Transport*, *1*(3), 1-12.

Bollapragada,  rinivas, Akella, R., & Srinivasan, R. (1998). Centralized ordering and allocation policies in a two-echelon system with non-identical warehouses. *European Journal of Operational Research*, *106*(1), 74–81. doi:http://dx.doi.org/10.1016/S0377-2217(97)00148-3

Bookbinder, J., & Cakanyildrim, M. (1999). Random lead times and expedited orders in (Q, r) inventory systems. *European Journal of Operational Research*, *115*, 300–313.

Boucherie, R., & van Dijk, N. (2010). *Queueing networks: a fundamental approach* (Vol. 154). US: Springer Science & Business Media. doi: 10.1007/978-1-4419-6472-4

Boute, R. N., Lambrecht, M. R., & Van Houdt, B. (2007). Performance evaluation of a production/inventory system with periodic review and endogenous lead times. *Naval Research Logistics (NRL)*, *54*(4), 462–473. doi:10.1002/nav.20222

Bradford, J. W., & Sugrue, P. K. (1990). A Bayesian approach to the two-period style-goods inventory problem with single replenishment and heterogeneous Poisson demands. *Journal of Theoperational Research Society*, *41*(3),211–218.

Braun, M., Rivera, D., Flores, M., Carlyle, W., & Kempf, K. (2003). A model predictive control framework for robust management of multi-product, multi-echelon demand networks. *Annual Reviews in Control*, *27*(2), 229–245.

Brown, R. G. (1959). *Statistical forecasting for inventory control*. McGraw-Hill, New York.

Cachon, G. P., & Fisher, M. (2000). Supply chain inventory management and the value of shared information. *Management Science*, *46*(8), 1032–1048.

Caglar, D., Li, C. L., & Simchi-Levi, D. (2004). Two-echelon spare parts inventory system subject to a service constraint. *C IIE Transactions*, *36*(7), 655–666.

Chairman, S. (2012). Investment Overview of Iraq. *Republic of Iraq National Investment Commision*, 1–125.

Chan, F., Routroy, S., & Kodali, R. (2005). Differential evolution algorithm for supply chain inventory planning. *Journal of Manufacturing Technology Management*, *16*(1), 7–17.

Chandra, C., & Grabis, J. (2007). *Supply chain configuration: concepts, solutions, and applications*. New York, NY, USA: Springer US.

Chang, C., & Chun-Tao, C. (2004). An EOQ model with deteriorating items under inflation when supplier credits linked to order quantity. *International Journal of Production Economics*, *88*(3), 307–316. doi:10.1016/s0925-5273(03)00192-0

Chang, S. H., & Fyffe, D. E. (1971). Estimation of Forecast Errors for Seasonal-Style-Goods Sales. *Management Science*, *18*(2), B–89–B–96. doi:10.1287/mnsc.18.2.B89

Chen, F. (1998). Echelon reorder points, installation reorder points, and the value of centralized demand information. *Management Science*, *44*(12-part-2), S221–S234.

Chen, F. (1999). Decentralized supply chains subject to information delays. *Management Science*, *45*(8), 1076–1090.

Chen, F. (1999). Worst-case analysis of (R,Q) policies in a two-stage serial inventory system with deterministic demand and backlogging. *Operations Research Letters*, *25*(2), 51–58. doi:http://dx.doi.org/10.1016/S0167-6377(99)00035-8

Chen, F. (2000). Optimal Policies for Multi-Echelon Inventory Problems with Batch Ordering. *Operations Research*, *48*(3), 376–389. doi:10.1287/opre.48.3.376.12427

Chen, F., Federgruen, A., & Zheng, Y.-S. (2001). Coordination Mechanisms for a Distribution System with One Supplier and Multiple Retailers.*Management Science*, *47*(5), 693–708. doi:10.1287/mnsc.47.5.693.10484

Chen, F., Ryan, J., & Simchi-Levi, D. (2000). The impact of exponential smoothing forecasts on the bullwhip effect. *Naval Research Logistics*, *47*(4), 269–286.

Chen, F., & Samroengraja, R. (2000). A staggered ordering policy for one-warehouse, multiretailer systems,. *Operations Research*, *48*, 281–293.

Chen, J., & Mushaluk, G. (2014). Coordinating a Supply Chain with an EOQ Model. *Handbook of EOQ Inventory Problems SE - 10* (Vol. 197, pp. 201–220). US :Springer. doi:10.1007/978-1-4614-7639-9_10

Chen, J.-M., & Chen, T.-H. (2005). The multi-item replenishment problem in a two-echelon supply chain: the effect of centralization versus decentralization. *Computers & Operations Research*, *32*(12), 3191–3207. doi:http://dx.doi.org/10.1016/j.cor.2004.05.007

Chen, S., & Xu, J. (2010). Note on the optimality of ( s , S ) policies for inventory systems with two demand classes. *Operations Research Letters*, *38*(5), 450–453. doi:10.1016/j.orl.2010.07.005

Chen, X., & Zhang, J. (2009). A Stochastic Programming Duality Approach to Inventory Centralization Games. *Operations Research*, *57*(4), 840–851. doi:10.1287/opre.1090.0699

Chen, Y. M., & Lin, C.-T. (2009). A coordinated approach to hedge the risks in stochastic inventory-routing problem. *Computers & Industrial Engineering*, *56*(3), 1095–1112.

Cheng, T. C. E. (1989). An economic order quantity model with demand-dependent unit cost. *European Journal of Operational Research*, *40*(2), 252–256. doi:http://dx.doi.org/10.1016/0377-2217(89)90334-2

Cheung, K. L., & Hausman, W. H. (2000). An exact performance evaluation for the supplier in a two-echelon inventory system. *Operations Research*, *48*(4), 646–653.

Childerhouse, P., & Towill, D. (2000). Engineering supply chains to match customer requirements. *Logistics Information Management*, *13*(6), 337–346. doi:10.1108/09576050010355635

Chiu, S. W., Ting, C., & Chiu, Y. P. (2005). Optimal order policy for EOQ model under shortage level constraint. *Engineering Modeling*, *18*(2), 41–46.

Choi, T.-M., Chiu, C.-H., & Fu, P.-L. (2011). Periodic Review Multiperiod Inventory Control Under a Mean–Variance Optimization Objective. *IEEE Transactions on Systems, Man, and Cybernetics - Part A: Systems and Humans*, *41*(4), 678–682. doi:10.1109/TSMCA.2010.2089515

Chopra, S., & Meindi, P. (2010). *Supply Chain Management strategy, Planning and Operation* (Fourth.). US: Springer.

Chopra, S., & Meindl, P. (2001). *Supply Chain Management – Strategy Planning and Operation*. Prentice Hall, New Jersey.

Chopra, S., & Meindl, P. (2007). *Supply chain management. Strategy, planning & operation* (Second.). US: Springer.

Chung, S., Wee, H., & Yang, P. (2008). Optimal policy for a closed-loop supply chain inventory system with remanufacturing. *Mathematical and Computer Modelling*, *48*, 867–881. doi:10.1016/j.mcm.2007.11.014

Clark, A. J. (1972). An informal survey of multi-echelon inventory theory. *Naval Research Logistics Quarterly*, *19*(4), 621–650. doi:10.1002/nav.3800190405

Clark, A., & Scarf, H. (1960). Optimal policies for a Multi-echelon inventory problem. *Management Science*, *6*(4), 475–490.

Cohen, M., & Lee, H. (1989). Resource deployment analysis of global manufacturing and distribution networks. *Journal of Manufacturing and Operations Management*, *2*(2), 81–104.

Cohen, M., & Moon, S. (1990). Impact of production scale economies, manufacturing complexity, and transportation costs on supply chain facility networks. *Journal of Manufacturing and Operations Management*, *3*(4), 269–292.

Conover, W. (1999). *Practical Nonparametric Statistics* (3rd editio.). New York: John Wiley & Sons, Inc.

Cook, A. (2006). Logistics cost under pressure. *Logistics Management*.

Corbeit, C. (2001). Stochastic inventory systems in a supply chain with asymmetric ... *Operations Research*, *49*(4), 487–500.

Crouse, P., Doyle, W., & Young, J. (2011). Workplace learning strategies, barriers, facilitators and outcomes: a qualitative study among human resource management practitioners. *Human Resource Development International*, *14*(1), 39–55. doi:10.1080/13678868.2011.542897

Croux, C., Gelper, S., & Mahieu, K. (2010). Robust exponential smoothing of multivariate time series. *Computational Statistics & Data Analysis*, *54*(12), 2999–3006.

Das, C., & Tyagi, R. (1999). Effect of correlated demands on safety stock centralization: patterns of correlation versus degree of centralization. *Journal of Business Logistics*, *20*, 205–214.

De Bodt, M. A., & Graves, S. C. (1985). Continuous-review policies for a multi-echelon inventory problem with stochastic demand. *Management Science*, *31*(10), 1286–1299.

Dekker, R., Kleijn, M., & De Kok, A. (1998). The break quantity rule's effect on inventory costs in a 1-warehouse, N-retailers distribution system. *International Journal of Production Economics*, *56*, 61–68.

Demeter, K., & Golini, R. (2014). Inventory configurations and drivers: An international study of assembling industries. International Journal of Production Economics, 157(1), 62–73. doi:10.1016/j.ijpe.2013.10.018.

Deng, J., Song, S., Ji, P., & Zhang, B. (2010). An inventory model with stochastic lead-time and stochastic demand. In *IEEE International conference on control and Automation* (pp. 1778–1782). IEEE. doi:10.1109/ICCA.2010.5524275

Diks, E. B., & de Kok, A. G. (1998). Optimal control of a divergent multi-echelon inventory system. *European Journal of Operational Research*, *111*(1), 75–97. doi:http://dx.doi.org/10.1016/S0377-2217(97)00327-5

Diks.A, Kok.A, D., & Lagodimos.A. (1996). Multi-echelon systems : A service measure perspective. *European Journal of Operational Research*, *95*, 241–263.

Ding, H., Guo, B., & Liu, Z. (2011). Information sharing and profit allotment based on supply chain cooperation. *International Journal of Production Economics*, *133*(1), 70–79.

Dolgui, A., Ben Ammar, O., Hnaien, F., & Louly, M. A. O. (2013). A state of the art on supply planning and inventory control under lead time uncertainty. *Studies in Informatics and Control*, *22*(2), 255–268. doi:10.3182/20130619-3-RU-3018.00592

Dong, L., & Lee, H. (2003). Optimal policies and approximations for a serial multiechelon inventory system with time-correlated demand. *Operations Research*, *51*(6), 969–980.

Doyle, W., Reid, J. G., & Young, J. D. (2008). Barriers to and facilitators of managers' workplace learning in small and large knowledge-based firms. *Small Business Institute Research Review*, *35*, 79–93.

Doyle, W., & Young, J. (2007). Workplace learning strategies of managers in small and large firms in knowledge-based industries. In *Proceedings of the University Forum on Human Resource Development* (pp. 27–29).

Duffield, M. (2012). Challenging environments: Danger, resilience and the aid industry. *Security Dialogue*, *43*(5), 475–492. doi:10.1177/0967010612457975

Durbin, J., & Koopman, S. J. (2012). *Time series analysis by state space methods* (2$^{nd}$ ed.). UK: Oxford University Press.

Edwards, P. (2012). Iraqi cement. *Global Cemen Magazine*, (January), 54–61.

Elhasia, T., Noche, B., & Zhao, L. (2013b). Simulation of a Sustainable Cement Supply Chain ; Proposal Model Review. *Engineering and Technology*, *7*(3), 464–472.

Elimam, a. a., & Dodin, B. (2013). Project scheduling in optimizing integrated supply chain operations. *European Journal of Operational Research*, *224*(3), 530–541. doi:10.1016/j.ejor.2012.09.007

Ellinger, A., & Cseh, M. (2007). Contextual factors influencing the facilitation of others' learning through everyday work experiences. *Journal of Workplace Learning*, *19*(7), 435–452.

Eppen, G. D., & Iyer, A. V. (1997). Improved Fashion Buying with Bayesian Updates. *Operations Research*, *45*(6), 805–819. doi:10.1287/opre.45.6.805

Ettl, M., Feigin, G. E., Lin, G. Y., & Yao, D. D. (2000). A Supply Network Model with Base-Stock Control and Service Requirements. *Operations Research*, *48*(2), 216–232. doi:10.1287/opre.48.2.216.12376

Everaert, P., Bruggeman, W., Sarens, G., Anderson, S. R., & Levant, Y. (2008). Cost modeling in logistics using time-driven ABC: Experiences from a wholesaler. *International Journal of Physical Distribution & Logistics Management*, *38*(3), 172–191.

Federgruen, A. (1993). Centralized planning models for multi-echelon inventory systems under uncertainty, Handbooks in operations research and management science, *4*, (pp. 133–173).

Federgruen, A., & Zipkin, P. (1984). Allocation policies and cost approximations for multilocation inventory systems. *Naval Research Logistics Quarterly*, *31*(1), 97–129. doi:10.1002/nav.3800310112

Federgruen, A., & Zipkin, P. (1984a). An efficient of dynamic algorithm for computing optimal (s, S) policy. *Operations Research*, *32*, 818–832.

Federgruen, A., & Zipkin, P. (1984b). Approximations of Dynamic, Multilocation Production and Inventory Problems. *Management Science*, *30*(1), 69–84. doi:10.1287/mnsc.30.1.69

Federgruen, A., & Zipkin, P. (1984c). Computational Issues in an Infinite-Horizon, Multiechelon Inventory Model. *Operations Research*, *32*(4), 818–836. doi:10.1287/opre.32.4.818

Fisher, M., & Raman, A. (1996). Reducing the Cost of Demand Uncertainty Through Accurate Response to Early Sales. *Operations Research*, *44*(1), 87–99. doi:10.1287/opre.44.1.87

Fishman, G. S. (1973). *Concepts and methods in discrete event digital simulation*. New York: Wiley.

Flatt, R. J., Roussel, N., & Cheeseman, C. R. (2012). Concrete: An eco material that needs to be improved. *Journal of the European Ceramic Society*, *32*(11), 2787–2798. doi:10.1016/j.jeurceramsoc.2011.11.012

Forbes, C., Evans, M., Hastings, N., & Peacock, B. (2011). *Statistical Distributions* (4th ed.). NY: Wiley Subscription Services, Inc.

Forsberg, R. (1997). Exact evaluation of (R, Q)-policies for two-level inventory systems with Poisson demand. *European Journal of Operational Research*, *96*(1), 130–138.

Frederick, S. H., & Gerald, J. L. (2001). *Introduction To Operations Research* (seven edit.). McGraw-Hill, New York.

French, K. (1986). Detecting Spot Price Forecasts In Futures Prices. *Journal of Business*, *59*(2, Part 2: Futures and Options Markets), S39–S54. doi:10.1086/296338

Funaki, K. (2012). Strategic safety stock placement in supply chain design with due-date based demand. *International Journal of Production Economics*, *135*(1), 4–13. doi:10.1016/j.ijpe.2010.11.015

Gallego, G., Ozer, O., & Zipkin, P. (2007). Bounds, heuristics, and approximations for distribution systems. *Operations Research*, *55*, 503–517.

Ganeshan, R. (1999). Managing supply chain inventories: A multiple retailer, one warehouse, multiple supplier model. *International Journal of Production Economics*, *59*(1-3), 341–354. doi:10.1016/S0925-5273(98)00115-7

Ghafour, K. (2007). Inventory Control Model building for slow Moving Items in Baghdad Electricity Distribution State. *Tanmiat Al-Rafidain*, *29*(85), 137–150.

Ghosh, J., Delampady, M., & Tapas, S. (2006). *An introduction to Bayesian Analysis*. Springer US. Retrieved from http://www.library.wisc.edu/selectedtocs/bg0146.pdf

Giannoccaro, I., Pontrandolfo, P., & Scozzi, B. (2003). A fuzzy echelon approach for inventory management in supply chains. *European Journal of Operational Research*, *149*(1), 185–196. doi:http://dx.doi.org/10.1016/S0377-2217(02)00441-1

GMDH-SHELL. (2014). Business Forecasting Solution for Business. Retrieved from https://www.gmdhshell.com/

Goh, M., Lim, J. Y. S., & Meng, F. (2007). A stochastic model for risk management in global supply chain networks. *European Journal of Operational Research*, *182*, 164–173. doi:10.1016/j.ejor.2006.08.028

Good, P. I., & Hardin, J. W. (2006). *Common Error in Statistics* (2nd ed.). New Jersy: John Wiley & Sons, Inc.

Graves, C., & Willems, P. (2000). Optimizing Strategic Safety Stock Placement in Supply Chains. *Manufacturing & Service Operations Management*, *2*(1), 68–83. doi:10.1287/msom.2.1.68.23267

Graves, S. (1986). A Multi-Echelon Inventory Model for a Repairable Item with One-For-One. *Managenetn Science*, *31*(10), 1247–1256.

Graves, S. C. (1996). A multiechelon inventory model with fixed replenishment intervals. *Management Science*, *42*(1), 1–18.

Graves, S. C., Kletter, D. B., & Hetzel, W. B. (1998). A dynamic model for requirements planning with application to supply chain optimization. *Operations Research*, *46*(3-supplement-3), S35–S49.

Graves, S., & Lesnaia, E. (2004). Optimizing safety stock placement in general network supply chains. *Innovation in Manufacturing Systems and Technology (IMST)*, *1,* 7-13.

Graves, S., & Willems, S. (2003). *Supply chain design: safety stock placement and supply chain configuration*. *operations research and management science* (Vol. 11). Chicago: operations research and management science.

Greenstone, M., & Syverson, C. (2012). The Effects of Environmental Regulation on the copetitiveness of U.S. Manufacturing. UK: *MIT Center for Energy and Enviromental Policy Research*, (September).

Gümüs, a T., & Güneri, a F. (2007). Multi-echelon inventory management in supply chains with uncertain demand and lead times: literature review from an operational research perspective. *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, *221*(10), 1553–1570. doi:10.1243/09544054JEM889

Gurgur, C., & Altiok, T. (2004). Approximate Analysis of Decentralized, Multi-Stage, Pull-Type Production/Inventory Systems. *Annals of Operations Research*, *125*(1-4), 95–116. doi:10.1023/B:ANOR.0000011187.52502.37

Hadley, G., & Whitin, T. M. (1975). *Analysis of inventory systems*. Englewood Cliffs: Prentice Hall.

Hamdy, A. T. (2007). *Operations research: An introduction* (7th ed.). US: Pearson Prentic Hall..

Hammel, T. R., & Kopczak, L. R. (1993). Tightening the supply chain. *Production and Inventory Management Journal*, *34*(2), 63–70.

Hariga, M. (1998). A single-period, multi-echelon stochastic model under a mix of assemble to order and assemble in advance policies. *Naval Research Logistics (NRL)*, *45*(6), 599–614. doi:10.1002/(SICI)1520-6750(199809)45:6<599::AID-NAV4>3.0.CO;2-Y

Hariga, M., & Ben-Daya, M. (1999). Some stochastic inventory models with deterministic variable lead time. *European Journal of Operational Research*, *113*, 42–51.

Harter, H. L. (1967). Maximum-Likelihood Estimation of the Parameters of a Four-Parameter Generalized Gamma Population from Complete and Censored Samples. *Technometrics*, *9*(1), 159–165. doi:10.1080/00401706.1967.10490449

Hausman, W., & Erkip, N. (1994). Multi-echelon vs . single-echelon inventory control policies. *Management Science*, *40*(5), 597–602.

Hausman, W. H., & Peterson, R. (1972). Multiproduct Production Scheduling for Style Goods with Limited Capacity, Forecast Revisions and Terminal Delivery. *Management Science*, *18*(7), 370–383. doi:10.1287/mnsc.18.7.370

Hayya, J. C., Harrison, T. P., & Chatfield, D. C. (2009). A solution for the intractable inventory model when both demand and lead time are stochastic. *International Journal of Production Economics*, *122*(2), 595–605.

HC, B. (2010). *Orascom Construction Industries ( OCI ) Re-Initiation of Coverage Report*. Retrieved from www.hc-si.com

He, Q., Jewkes, E., & Buzacott, J. (2002). Optimal and near-optimal inventory control policies for a make-to-order inventory–production system. *European Journal of Operational Research*, *141*(1), 113–132. doi:http://dx.doi.org/10.1016/S0377-2217(01)00257-0

Hertz, D. B., & Schaffir, K. H. (1960). A Forecasting Method for Management of Seasonal Style-Goods Inventories. *Operations Research*, *8*(1), 45–52. doi:10.1287/opre.8.1.45

Hesse, M., & Rodrigue, J. P. (2004). The transport geography of logistics and freight distribution. *Journal of Transport Geography*, *12*(3), 171–184. doi:10.1016/j.jtrangeo.2003.12.004

Hicks, E., Bagg, R., Doyle, W., & Young, J. (2007). Canadian accountants: examining workplace learning. *Journal of Workplace Learning*, *19*(2), 61–77.

Hii, Y., Rocklöv, J., Wall, S., Ng, L., Tang, C., & Ng, N. (2012). Optimal Lead Time for Dengue Forecast. *PLoS Neglected Tropical Diseases*, *6*. doi:10.1371/journal.pntd.0001848

Hillier, F. S., & Lieberman, G. J. (2010). *Introduction to operations research (pp. 195-259). Dubuque, IA: McGraw-Hill* (Dubuque, I.). Dubuque, IA: McGraw-Hill, New York.

Hiros, H. (2000). Maximum likelihood parameter estimation by model augmentation with applications to the extended four-parameter generalized gamma distribution. *Mthrmatical and Computer in Simulation*, *54*(1), 81–97.

Hosoda, T., & Disney, S. (2006). On variance amplification in a three-echelon supply chain with minimum mean square error forecasting. *The International Journal of Management Science*, *34*, 344–358. doi:10.1016/j.omega.2004.11.005

Hsieh, C., & Chou, W. (2010). An Integrated Location-Inventory Model for Vendor-Managed Inventory in the Retail Supply Chain. In *IEEE* (pp. 1258–1262).

Huang, B., & Xue, X. (2012). An application analysis of cluster supply chain: a case study of JCH. *Kybernetes Emerald*, *41*(1), 254–280. doi:10.1108/03684921211213070

Huang, P., & Huang, T. (2006). On new Moment Estimation of Parameters of the Generalized Gamma Distribution using it's Characterization. *TAIWANESE Journal of Mathematics*, *10*(4), 1083–1093.

Humair, S., Ruark, J. D., Tomlin, B., & Willems, S. P. (2013). Incorporating stochastic lead times into the guaranteed service model of safety stock optimization. *Interfaces*, *43*(5), 421–434. doi:10.1287/inte.2013.0699

Humair, S., & Willems, S. P. (2006). Optimizing strategic safety stock placement in supply chains with clusters of commonality. *Operations Research*, *54*(4), 725–742.

Humair, S., & Willems, S. P. (2011). Technical Note-optimizing Strategic Safety Stock Placement in General Acyclic Networks. *Operations Research*, *59*(3), 781–787.

Hwan Lee, C., & Rhee, B.-D. (2010). Coordination contracts in the presence of positive inventory financing costs. *International Journal of Production Economics*, *124*(2), 331–339. doi:http://dx.doi.org/10.1016/j.ijpe.2009.11.028

IBM.(2011).SPSS Advanced Statistics 20.0. Retrieved from http://www-01.ibm.com/software/analytics/spss/

Ignaciuk, P., & Bartoszewicz, A. (2009). LQ optimal inventory control for multi-supplier periodic-review systems with disparate lead-time delay. In *48h IEEE Conference on Decision and Control (CDC) held jointly with 2009 28th Chinese Control Conference* (pp. 6244–6249). Ieee. doi:10.1109/CDC.2009.5399901

Inderfurth, K. (1991). Safety stock optimization in multi-stage inventory systems. *International Journal of Production Economics*, *24*(1), 103–113.

Inderfurth, K., & Minner, S. (1998). Safety stocks in multi-stage inventory systems under different service measures. *European Journal of Operational Research*, *106*(1), 57–73.

Inderfurth, K., & Vogelgesang, S. (2013). Concepts for safety stock determination under stochastic demand and different types of random production yield. *European Journal of Operational Research*, *224*(2), 293–301. doi:10.1016/j.ejor.2012.07.040

Ishii, K., Takahashi, K., & Muramatsu, R. (1988). Integrated production, inventory and distribution systems. *International Journal of Production Research*, *26*(3), 473–482. doi:10.1080/00207548808947877

Jain, G., & Sigman, K. (1996). A Pollaczek-Khintchine formula for M/G/1 queues with disasters. *Journal of Applied Probability*, *33*(4), 1191–1200.

Jain, S., & Raghavan, N. R. S. (2003). Performance analysis of make to stock supply chains using discrete-time queueing models. In U. Leopold-Wildburger, F. Rendl, & G. Wäscher (Eds.), *Operations Research Proceedings 2002 SE - 10* (Vol. 2002, pp. 65–70). Berlin: Springer Berlin Heidelberg. doi:10.1007/978-3-642-55537-4_10

Jain, S., & Raghavan, S. (2008). A queuing approach for inventory planning with batch ordering in multi-echelon supply chains. *Central European Journal of Operations Research*, *17*(1), 95–110. doi:10.1007/s10100-008-0077-8

Jie, W., & Cong, Z. (2009). Simulation Research on Multi-echelon Inventory System in Supply Chain Based on Arena. In *the 1st international conference on Information Science and Engineering* (pp. 397–400).

Johansen, S. G. (2005). Base-stock policies for the lost sales inventory system with Poisson demand and Erlangian lead times. *International Journal of Production Economics*, *93*, 429–437.

Jung, J. Y., Blau, G., Pekny, J. F., Reklaitis, G. V, & Eversdyk, D. (2008). Integrated safety stock management for multi-stage supply chains under production capacity constraints. *Computers & Chemical Engineering*, *32*(11), 2570–2581.

Kalchschmidt, M., Zotteri, G., & Verganti, R. (2003). Inventory management in a multi-echelon spare parts supply chain. *International Journal of Production Economics*, *81–82*(0), 397–413. doi:http://dx.doi.org/10.1016/S0925-5273(02)00284-0

Karaman, A. S. (2007). *Performance analysis and design of batch ordering policies in supply chains*. New Brunswick, New Jersey: The State University of New Jersey.

Karmakar, U. (1987). Lot sizes, lead times and in-process inventories. *Management Science*, *33*(3), 409–418.

Kevin Chiang, W., & Monahan, G. (2005). Managing inventories in a two-echelon dual-channel supply chain. *European Journal of Operational Research*, *162*(2), 325–341.

Khan, M., Jaber, M. Y., & Bonney, M. (2011). An economic order quantity (EOQ) for items with imperfect quality and inspection errors. *International Journal of Production Economics*, *133*(1), 113–118. doi:10.1016/j.ijpe.2010.01.023

Khan, M., Jaber, M. Y., Guiffrida, A. L., & Zolfaghari, S. (2011). A review of the extensions of a modified EOQ model for imperfect quality items. *International Journal of Production Economics*, *132*(1), 1–12. doi:http://dx.doi.org/10.1016/j.ijpe.2011.03.009

Khodabin, M., & Ahmadabadi, A. (2010). Some properties of generalized gamma distribution. *Mathematical Science*, *4*(1), 9–28.

Kian Ng, W., Piplani, R., & Viswanathan, S. (2003). Simulation workbench for analysing multi-echelon supply chains. *Integrated Manufacturing Systems*, *14*(5), 449–457.

Kiesmüller, G., de Kok, T., Smits, S., & Van Laarhoven, P. (2004). Evaluation of divergent N-echelon (s, nQ)-policies under compound renewal demand. *Operations Research-Spektrum*, *26*(4), 547–577.

Kim, C. O., Jun, J., Baek, J. K., Smith, R. L., & Kim, Y. D. (2005). Adaptive inventory control models for supply chain management. *The International Journal of Advanced Manufacturing Technology*, *26*(9-10), 1184–1192.

Kim, I., & Tang, C. S. (1997). Lead time and response time in a pull production control system. *European Journal of Operational Research*, *101*(3), 474–485. doi:http://dx.doi.org/10.1016/S0377-2217(96)00174-9

Kimball, G. E. (1988). General principles of inventory control. *Journal of Manufacturing and Operations Management*, *1*(1), 119–130.

Klosterhalfen, S., Dittmar, D., & Minner, S. (2013). An integrated guaranteed-and stochastic-service approach to inventory optimization in supply chains. *European Journal of Operational Research*, *231*(1), 109–119.

Kock, H. (2007). The team as a learning strategy: Three cases of team-based production in the Swedish manufacturing industry. *Journal of Workplace Learning*, *19*(8), 480–496.

Koehler, A., Snyder, R., Ord, J. K., & Beaumont, A. (2012). A study of outliers in the exponential smoothing approach to forecasting. *International Journal of Forecasting*, *28*(2), 477–484. doi:10.1016/j.ijforecast.2011.05.001

Krakowski, M. (1974). Arrival and departure processes in queues. Pollaczek-Khintchine formulas for bulk arrivals and bounded systems. *RAIRO-Operations Research-Recherche Opérationnelle*, *8*(V1), 45–56.

Lafarge. (2012). *Annual Report Registration Document*, 29-34.

Lafont, B. (2011). *Sustain ability, Lafarge's presence in the world. 11th report*, 1-82.

Lau, H.-S., & Hing-Ling Lau, A. (1996). Estimating the demand distributions of single-period items having frequent stockouts. *European Journal of Operational Research*, *92*(2), 254–265. doi:http://dx.doi.org/10.1016/0377-2217(95)00134-4

Lee, H., & Billington, C. (1993). Material Management in Decentralized Supply Chains. *Operations Research*, *41*(5), 835–847. doi:10.1287/opre.41.5.835

Lee, H. L., & Moinzadeh, K. (1987a). Operating characteristics of a two?echelon inventory system for repairable and consumable items under batch ordering and shipment policy. *Naval Research Logistics (NRL)*, *34*(3), 365–380.

Lee, H. L., & Moinzadeh, K. (1987b). Two-Parameter Approximations For Multi-Echelon Repairable Inventory Models With Batch Ordering Policy. *IIE Transactions*, *19*(2), 140–149. doi:10.1080/07408178708975380

Lee, H., & Whang, S. (1999). Decentralized Multi-Echelon Supply Chains: Incentives and Information. *Management Science*, *45*(5), 633–640. doi:10.1287/mnsc.45.5.633

Lee, W. (2005). Inventory model involving controllable backorder rate and variable lead time demand with the mixtures of distribution. *Applied Mathematics and Computation*, *160*, 701–717. doi:10.1016/j.amc.2003.11.039

Levy, L. D. (1995). International Sourcing and Supply Chain Stability. *Journal of International Business Studies*, *26*(2), 343–360

Li, J., & Sheng, Z. (2008). Simulating the (S, s) Controlled Stochastic System in Different Supply Chains by a Multi-Agent System. In *2008 International Conference on Computer Science and Information Technology* (pp. 785–790). Ieee. doi:10.1109/ICCSIT.2008.117

Li, P. (2013). Optimization of (R, Q) policies for serial inventory systems using the guaranteed service approach. *Computers and Industrial Engineering*, *80*, 261–273. doi:10.1016/j.cie.2014.12.003

Li, Y., Xu, X., & Ye, F. (2007). Research on Supply Chain Inventory Optimization and Benefit Coordination with Controllable Lead Time. In *International Conference on Wireless Communications, Networking and Mobile Computing* (pp. 6507–6510). Ieee. doi:10.1109/WICOM.2007.1598

Liang, W., & Huang, C. (2006). Agent-based demand forecast in multi-echelon supply chain. *Decision Support System*, *42*, 390–407. doi:10.1016/j.dss.2005.01.009

Liberopoulos, G., & Koukoumialos, S. (2005). Tradeoffs between base stock levels, numbers of kanbans, and planned supply lead times in production/inventory systems with advance demand information. *International Journal of Production Economics*, *96*(2), 213–232.

Lohman, M. (2000). Environmental inhibitors to informal learning in the workplace: A case study of public school teachers. *Adult Education Quarterly*, *50*(2), 83–101.

Lohman, M. (2005). A survey of factors influencing the engagement of two professional groups in informal workplace learning activities. *Human Resource Development Quarterly*, *16*(4), 501–527.

Lohman, M. (2009). A survey of factors influencing the engagement of information technology professionals in informal learning activities. *Information Technology, Learning, and Performance Journal*, *25*(1), 43.

Manna, S. K., Chaudhuri, K. S., & Chiang, C. (2007). Replenishment policy for EOQ models with time-dependent quadratic demand and shortages. Research. *International Journal of Operational*, *2*(3), 321–337.

Martel, A. (2003). Policies for multi-echelon supply: DRP systems with probabilistic time-varying demands1. *INFOR*, *41*(1), 71.

Matheus, P., & Gelders, L. (2000). The (R, Q) inventory policy subject to a compound Poisson demand pattern. *International Journal of Production Economics*, *68*(3), 307–317. doi:http://dx.doi.org/10.1016/S0925-5273(99)00110-3

Mathwave. (2015). EasyFit-Distribution fitting software-Benefits. Retrieved from http://www.mathwave.com/products/easyfit.html

Maydeu-Olivares, A., & Garcia-Forero, C. (2010). Goodness-of-Fit Testing. *International Encyclopedia of Education*, *7*, 190–196.

Mihe, V. (2010). On a general class of modified gamma approximating operators. *General Mathematics*, *18*(1), 71–80.

Min, H., & Zhou, G. (2002). Supply chain modeling: past, present and future. *Computers & Industrial Engineering*, *43*(1-2), 231–249. doi:10.1016/S0360-8352(02)00066-9

Minner, S. (1997). Dynamic programming algorithms for multi-stage safety stock optimization. *Operations-Research-Spektrum*, *19*(4), 261–271.

Minner, S. (2001). Strategic safety stocks in reverse logistics supply chains. *International Journal of Production Economics*, *71*(1), 417–428.

Mital, K. .(2012). Queuing analysis for outpatient and inpatient services: a case study. *Management Decision*, *48*(3), 419–439. doi:http://dx.doi.org/10.1108/09564230910978511

Mitra, S., & Chatterjee, A. (2004a). Echelon stock based continuous review (R,Q) policy for fast moving items. *Omega*, *32*(2), 161–166. doi:http://dx.doi.org/10.1016/j.omega.2003.10.003

Mitra, S., & Chatterjee, A. K. (2004b). Leveraging information in multi-echelon inventory systems. *European Journal of Operational Research*, *152*, 263–280. doi:10.1016/S0377-2217(02)00656-2

Mohebbi, E., & Posner, M. J. (1998). Sole versus dual sourcing in a continuous-review inventory system with lost sales. *Computers & Industrial Engineering*, *34*(2), 321–336.

Moinzadeh, K., & Aggarwal, P. (1997). An Information Based Multiechelon Inventory System with Emergency Orders. *Operations Research*, *45*(5), 694–701. doi:10.1287/opre.45.5.694

Moinzadeh, K., & Lee, H. L. (1986). Batch Size and Stocking Levels in Multi-Echelon Repairable Systems. *Management Science*, *32*(12), 1567–1581. doi:10.1287/mnsc.32.12.1567

Moslemi, H., & Zandieh, M. (2011). Comparisons of some improving strategies on MOPSO for multi-objective (r, Q) inventory system. *Expert Systems with Applications*, *38*(10), 12051–12057. doi:10.1016/j.eswa.2011.01.169

Moussourakis, J., & Haksever, C. (2013). Models for Ordering Multiple Products Subject to Multiple Constraints , Quantity and Freight Discounts. *American Journal of Operations Reseach*, *3*, 521–535. Retrieved from http://dx.doi.org/10.4236/ajor.2013.36051

Muckstadt, J. (1973). A model for a multi-item, multi-echelon, multi-indenture inventory system. *Management Science*, *20*(4 part1), 472–481.

Muckstadt, J. (1986). A Model for a Multi-Item , Multi-Echelon , Multi-Indenture Inventory System. *Management Science*, *20*(4), 472–481.

Muharremoglu, A., & Tsitsiklis, J. N. (2003). A single-unit decomposition approach to multi-echelon inventory systems. *Operations Research Center*., 59(5), 1089-1103.

Nahmias, S., & Smith, S. A. (1994). Optimizing Inventory Levels in a Two-Echelon Retailer System with Partial Lost Sales. *Management Science*, *40*(5), 582–596. doi:10.1287/mnsc.40.5.582

Noche, B., & Elhasia, T. (2013). Approach to Innovative Supply Chain Strategies in Cement Industry; Analysis and Model Simulation. *Procedia - Social and Behavioral Sciences*, *75*(0), 359–369. doi:http://dx.doi.org/10.1016/j.sbspro.2013.04.041

Noufaily, A., Jones, M. C., & Mk, M. K. (2013). On Maximisation of the Likelihood for the Generalised Gamma Distribution. *Computational Statistics*, *28*(2), 505–517.

Novoa, C., & Storer, R. (2009). An approximate dynamic programming approach for the vehicle routing problem with stochastic demands. *European Journal of Operational Research*, *196*(2), 509–515.

Nozick, L. K., & Turnquist, M. A. (2001). A two-echelon inventory allocation and distribution center location analysis. *Transportation Research Part E: Logistics and Transportation Review*, *37*(6), 425–441. doi:http://dx.doi.org/10.1016/S1366-5545(01)00007-2

Olsen, D., & Eikebrokk, T. (2010). Training, competence, and business performance: Evidence from E-business in European small and medium-sized enterprises. *International Journal of E-Business Research*, *1*, 92–116.

Osman, H., & Demirli, K. (2012). Integrated safety stock optimization for multiple sourced stockpoints facing variable demand and lead time. *International Journal of Production Economics*, *135*(1), 299–307. doi:10.1016/j.ijpe.2011.08.004

Ouweneel, A., Taris, T., van Zolingen, S., & Schreurs, P. (2009). How task characteristics and social support relate to managerial learning: empirical evidence from Dutch home care. *The Journal of Psychology*, *143*(1), 28–44.

Paige, H. (2002). An exploration of learning, the knowledge-based economy, and owner-managers of small bookselling businesses. *Journal of Workplace Learning*, *14*(6), 233–244.

Pal, B., Sankar, S., & Chaudhuri, K. (2012a). A multi-echelon supply chain model for reworkable items in multiple-markets with supply disruption. *Economic Modelling*, *29*(5), 1891–1898. doi:10.1016/j.econmod.2012.06.005

Pal, B., Sankar, S., & Chaudhuri, K. (2012b). A three layer multi-item production – inventory model for multiple suppliers and retailers. *Economic Modelling*, *29*(6), 2704–2710. doi:10.1016/j.econmod.2012.08.022

Pattnaik, M. (2014). Optimality test in fuzzy inventory model for restricted budget and space: Move forward to a non-linear programming approach. *Yugoslav Journal of Operations Research*, *201*(00), 23–34. doi:10.2298/YJOR130517023P

Pentico, D. W., & Drake, M. J. (2011). A survey of deterministic models for the EOQ and EPQ with partial backordering. *European Journal of Operational Research*, *214*(2), 179–198.

Pyke, D. F., & Cohen, M. A. (1993). Performance characteristics of stochastic integrated production-distribution systems. *European Journal of Operational Research*, *68*(1), 23–48. doi:http://dx.doi.org/10.1016/0377-2217(93)90075-X

Qi-feng, W., Xiao-shen, L., & Wei, H. (2012). Multi-source Supply Chains with Disruption Risk. In *2012 Fifth International Joint Conference on Computational Sciences and Optimization* (pp. 428–432). Ieee. doi:10.1109/CSO.2012.100

Rau, H., Wu, M.-Y., & Wee, H.-M. (2003). Integrated inventory model for deteriorating items under a multi-echelon supply chain environment. *International Journal of Production Economics*, *86*(2), 155–168. doi:http://dx.doi.org/10.1016/S0925-5273(03)00048-3

Ravichandran, N. (1995). Theory and Methodology Stochastic analysis of a continuous review perishable inventory system with positive lead time and Poisson demand. *European Journal of Operational Research*, *84*(93), 444–457.

Rentz, J., & Reynolds, F. (1991). Forecasting the effects of an aging population on product consumption: An age-period-cohort framework. *Journal of Marketing Research*, 355–360.

Reyes, P. M. (2005). A mathematical example of the two-echelon inventory model with asymmetric market information. *Applied Mathematics and Computation*, *162*, 257–264. doi:10.1016/j.amc.2003.12.095

Rezaei, J. (2014). Economic order quantity for growing items. *International Journal of Production Economics*, *155*, 109–113. doi:10.1016/j.ijpe.2013.11.026

Rezg, N., Xie, X., & Mati, Y. (2004). Joint optimization of preventive maintenance and inventory control in a production line using simulation. *International Journal of Production Research*, *42*(10), 2029–2046.

Rhee, B. Van Der, Veen, J., Venugopal, V., & Reddy, V. (2010). A new revenue sharing mechanism for coordinating multi-echelon supply chains. *Operations Research Letters*, *38*(4), 296–301. doi:10.1016/j.orl.2010.03.004

Rosenbaum, B. A. (1981). Service Level Relationships in a Multi-Echelon Inventory System. *Management Science*, *27*(8), 926–945. doi:10.1287/mnsc.27.8.926

Roy, D. (2005). A Stochastic Petri Net Approach for Inventory Rationing in Multi-Echelon Supply Chains. *Journal of Heuristics*, *11*((5-6)), 421–446.

Saffari, M., & Haji, R. (2009). Queueing system with inventory for two-echelon supply chain. In *2009 International Conference on Computers & Industrial Engineering* (Vol. 2, pp. 835–838). Ieee. doi:10.1109/ICCIE.2009.5223801

Saharidis, G. K. D., Kouikoglou, V. S., & Dallery, Y. (2009). Centralized and decentralized control polices for a two-stage stochastic supply chain with subcontracting. *International Journal of Production Economics*, *117*(1), 117–126.

Sahraeian, R., Bashiri, M., & Ramezani, M. (2010). A Stochastic Multi-Product , Multi-Stage Supply Chain Design Considering Products Waiting Time in the Queue. In *International conference on Industrial Engineering and operations management JANUARY,2010* (pp. 123–129). Dhoka, Bangladesh.

Salameh, M. K., & Jaber, M. Y. (2000). Economic production quantity model for items with imperfect quality. *International Journal of Production Economics*, *64*(3), 59–64. doi:http://dx.doi.org/10.1016/S0925-5273(99)00044-4

Sana, S. S., & Chaudhuri, K. S. (2008). A deterministic EOQ model with delays in payments and price-discount offers. *European Journal of Operational Research*, *184*(2), 509–533. doi:http://dx.doi.org/10.1016/j.ejor.2006.11.023

Santos, I., & Santos, P. (2007). Simulation metamodels for modeling output distribution parameters. In *IEEE, Simulation Conference.* (pp. 910–918). doi:10.1109/WSC.2007.4419687

Schmidt, C. P., & Nahmias, S. (1985). Optimal Policy for a Two-Stage Assembly System under Random Demand. *Operations Research*, *33*(5), 1130–1145. doi:10.1287/opre.33.5.1130

Schwarz, L. B. (1973). A Simple Continuous Review Deterministic One-Warehouse N-Retailer Inventory Problem. *Management Science*, *19*(5), 555–566. doi:10.1287/mnsc.19.5.555

Schwarz, L., Deuermeyer, B., & Badinelli, R. (1985). Fill-Rate Optimization in a One-Warehouse N-Identical Retailer Distribution System. *Management Science*, *31*(4), 488–498. doi:10.1287/mnsc.31.4.488

Schwarz, L., Frederick, S. H., Gerald, J. L., & Hamdy, A. T. (1972). Economic order quantities for products with finite demand horizons. *A I I E Transactions, 4*(3), 234-237.

Schwarz, M., Sauer, C., Daduna, H., Kulik, R., & Szekli, R. (2006). M/M/1 Queueing systems with inventory. *Queueing Systems*, *54*(1), 55–78. doi:10.1007/s11134-006-8710-5

Seliaman, M. E., & Rahman, A. (2008). Optimizing inventory decisions in a multi-stage supply chain under stochastic demands. *Applied Mathematics and Computation*, *206*(2), 538–542. doi:10.1016/j.amc.2008.05.057

Seo, Y., Jung, S., & Hahm, J. (2002). Optimal reorder decision utilizing centralized stock information in a two-echelon distribution system. *Computer and Operations Research*, *29*, 171–193.

Shang, K. H. (2012). Single-stage approximations for optimal policies in serial inventory systems with nonstationary demand. *Manufacturing & Service Operations Management*, *14*(3), 414–422.

Sharma, S., Panda, B., Mahapatra, S., & Sahu, S. (2011). Analysis of Barriers for Reverse Logistics: An Indian Perspective. *International Journal of Modeling and Optimization*, *1*(2), 101–106. doi:10.7763/IJMO.2011.V1.18

Sheng, X., & Wang, Z. (2014). Cost Model and Profit Sharing of Jointly Managed Inventory between Vendor and Retailer. *International Journal of Applied Mathematics and Statistics™*, *52*(5), 177–184.

Sherbrooke, C. (1968). METRIC: A Multi-Echelon Technique for Recoverable Item Control. *Operations Research*, *16*(1), 122–141. doi:10.1287/opre.16.1.122

Simchi-Levi, D., & Zhao, Y. (2005). Safety Stock Positioning in Supply Chains with Stochastic Lead Times. *Manufacturing & Service Operations Management*, *7*(4), 295–318. doi:10.1287/msom.1050.0087

Simpson Jr, K. F. (1958). In-process inventories. *Operations Research*, *6*(6), 863–873.

Sinha, C., Sobel, M. J., & Babich, V. (2010). Computationally simple and unified approach to finite-and infinite-horizon Clark–Scarf inventory model. *IIE Transactions*, *43*(3), 207–219.

Sleptchenko, A., van der Heijden, M., & van Harten, A. (2002). Effects of finite repair capacity in multi-echelon, multi-indenture service part supply systems. *International Journal of Production Economics*, *79*(3), 209–230. doi:http://dx.doi.org/10.1016/S0925-5273(02)00155-X

Snyder, R., Koehler, A., Hyndman, R., & Ord, J. K. (2004). Exponential smoothing models: Means and variances for lead-time demand. *European Journal of Operational Research*, *158*(2), 444–455. doi:10.1016/S0377-2217(03)00360-6

So, K. C., & Zheng, X. (2003). Impact of supplier's lead time and forecast demand updating on retailer's order quantity variability in a two-level supply chain. *International Journal of Production Economics*, *86*(2), 169–179. doi:http://dx.doi.org/10.1016/S0925-5273(03)00050-1

So, K. u t c, & Pinault, S. C. (1988). Allocating buffer storages in a pull system. *International Journal of Production Research*, *26*(12), 1959–1980. doi:10.1080/00207548808948008

Song, J. (1994). The Effect of Leadtime Uncertainty in a Simple Stochastic Inventory Model. *Management Science*, *40*(5), 603–613. doi:10.1287/mnsc.40.5.603

Song, L., Li, X., & Garcia-Diiaz, A. (2008). Multi-Echelon Supply Chain simulation using METAMODEL. In *2008 Winter Simulation Conference* (pp. 2691–2699).

Stacy, E. . (1962). A generalization of the gamma distribution. *The Annals of Mathematical Statistics*, *33*(3), 1187–1192.

Stacy, E. W., & Mihram, G. A. (1965). Parameter Estimation for a Generalized Gamma Distribution. *Technometrics*, *7*(3), 349–358. doi:10.1080/00401706.1965.10490268

Stadtler, H. (2005). Supply chain management and advanced planning - Basics, overview and challenges. *European Journal of Operational Research*, *163*(3), 575–588. doi:10.1016/j.ejor.2004.03.001

Starostka-Patyk, M., Zawada, M., Pabian, A., & Abed, M. (2013). Barriers to reverse logistics implementation in enterprises. In *2013nternational Conference on Advanced Logistics and Transport, ICALT 2013* (pp. 506–511). doi:10.1109/ICAdLT.2013.6568510

StatSoft.Inc. (2007). Statistica dta analysis software system. Retrieved from www.statsoft.com

Stephens, M. A. (1992). Introduction to Kolmogorov (1933) on the empirical determination of a distribution. *Breakthroughs in statistics* (pp. 93–105). New York: Springer. DOI: 10.1007/978-1-4612-4380-9_9

Stephens, M. A. (1992). Introduction to Kolmogorov (1933) on the empirical determination of a distribution. In *Breakthroughs in statistics* (pp. 93–105). Springer.

Stewart, M. G., Wang, X., & Nguyen, M. N. (2012). Climate change adaptation for corrosion control of concrete infrastructure. *Structural Safety*, *35*, 29–39. doi:10.1016/j.strusafe.2011.10.002

Svoronos, A., & Zipkin, P. (1988). Estimating the Performance of Multi-Level Inventory Systems. *Operations Research*, *36*(1), 57–72. doi:10.1287/opre.36.1.57

Syntetos, A., Boylan, J., & Disney, S. (2009). Forecasting for inventory planning: a 50-year review. *Journal of the Operational Research Society*, *60*, S149–S160. doi:10.1057/jors.2008.173

Taleizadeh, A. A., Pentico, D. W., Jabalameli, M. S., & Aryanezhad, M. (2013a). An economic order quantity model with multiple partial prepayments and partial backordering. *Mathematical and Computer Modelling*, *57*(3–4), 311–323. doi:http://dx.doi.org/10.1016/j.mcm.2012.07.002

Taleizadeh, A. A., Pentico, D. W., Saeed Jabalameli, M., & Aryanezhad, M. (2013b). An EOQ model with partial delayed payment and partial backordering. *Omega*, *41*(2), 354–368. doi:http://dx.doi.org/10.1016/j.omega.2012.03.008

Tallon, W. J. (1993). The impact of inventory centralization on aggregate safety stock: the variable supply lead time case. *Journal of Business Logistics,14(1), 185*.

Tan, F. (1974). Optimal Policies for a Multi-Echelon Inventory Problem with Periodic Ordering. *Management Science*, *20*(7), 1104–1111.

Tan, L., & Xu, S. (2008). Model check stochastic supply chains. In *2008 IEEE International Conference on Information Reuse and Integration* (pp. 416–421). Ieee. doi:10.1109/IRI.2008.4583067

Tang, O., & Grubbström, R. (2003). The detailed coordination problem in a two-level assembly system with stochastic lead times. *International Journal of Production Economics*, *81*, 415–429.

Tarim, A., & Kingsman, B. (2004). The stochastic dynamic production/inventory lot-sizing problem with service-level constraints. *International Journal of Production Economics*, *88*(1), 105–119. doi:10.1016/S0925-5273(03)00182-8

Tee, Y.S., & Rossetti, M. D. (2002). A robustness study of a multi-echelon inventory model via simulation. *International Journal of Production Economics*, *80*(3), 265–277. doi:http://dx.doi.org/10.1016/S0925-5273(02)00259-1

Teng, J.T., Yang, H.-L., & Ouyang, L.-Y. (2003). On an EOQ model for deteriorating items with time-varying demand and partial backlogging. *J Oper Res Soc*, *54*(4), 432–436. Retrieved from http://dx.doi.org/10.1057/palgrave.jors.2601490

Torabi, S. A., & Hassini, E. (2009). Multi-site production planning integrating procurement and distribution plans in multi-echelon supply chains: an interactive fuzzy goal programming approach. *International Journal of Production Research*, *47*(19), 5475–5499.

Towill, D. R. (1991). Supply chain dynamics. *International Journal of Computer Integrated Manufacturing*, *4*(4), 197–208. doi:10.1080/09511929108944496

Towill, D. R., Naim, M. M., & Wikner, J. (1992). Industrial dynamics simulation models in the design of supply chains. *Management, International Journal of Physical Distribution & Logistics*, *22*(5), 3–13.

Tyagi, R., & Das, C. (1998). Extension of the square-root law for safety stock to demands with unequal variances. *Journal of Business Logistics*, *19*, 197–203.

United Nations Environment Program. (2011). *UNEP; Division of Early Warning and Assessment "Keeping Track of Our Changing Environment: From Rio to Rio+20 (1992-2012)."* Nairobi. Retrieved from ISBN: 978-92-807-3190-3.

Urgeletti Tinarelli, G. (1983). Inventory control Models and problems. *European Journal of Operational Research*, *14*(1), 1–12.

USAID, I. (2007). Iraq private sector growth and employmaent generation. *USAID / IRAQA*, (November), 1–28.

Van der Heijden, M. C. (1999). Multi-echelon inventory control in divergent systems with shipping frequencies. *European Journal of Operational Research*, *116*(2), 331–351. doi:http://dx.doi.org/10.1016/S0377-2217(98)00048-4

Van der Heijden, M., Diks, E., & De Kok, T. (1999). Inventory control in multi-echelon divergent systems with random lead times. *Operations Research-Spektrum*, *21*(3), 331–359.

Van der Vorst, J., Beulens, A., & van Beek, P. (2000). Modelling and simulating multi-echelon food systems. *European Journal of Operational Research*, *122*(2), 354–366. doi:http://dx.doi.org/10.1016/S0377-2217(99)00238-6

Van Houtum, G. (2006). Multi-echelon production/inventory systems: Optimal policies, heuristics, and algorithms. *Tutorials in Operations Research*, 163–199.

Van Houtum, G. J., & Zijm, W. H. M. (1991). Computational procedures for stochastic multi-echelon production systems. *International Journal of Production Economics*, *23*(1–3), 223–237. doi:http://dx.doi.org/10.1016/0925-5273(91)90065-2

Vanany, I., Zailani, S., & Pujawan, N. (2009). Supply Chain Risk Management : Literature Review and Future Research. *Int Journal of Information System and Supply Chain Managment*, *2*(1), 16–33.

Verrijdt, J. H. C. M., & De Kok, A. G. (1996). Distribution planning for a divergent depotless two-echelon network under service constraints. *European Journal of Operational Research*, *89*(2), 341–354.

Venkateswaran, J., & Son, Y. J. (2007). Effect of information update frequency on the stability of production -- inventory control systems. *Int. J. Prod. Econ.*, *106*(1), 171–190.

Vrat, P. (2014). Probabilistic inventory models. *Materials management* (pp. 123–150). India: Springer. dio: 10.1007/978-81-322-1970-5_8

Wagner, H. M. (1974). The Design of Production and Inventory Systems for Multifacility and Multiwarehouse Companies. *Operations Research*, *22*(2), 278–291. doi:10.1287/opre.22.2.278

Wang, C. (2009). Using the third order exponential smoothing forecasts on reducing the bullwhip effect and inventory costs in supply chain. In *2009 IEEE International Conference on Grey Systems and Intelligent Services (GSIS 2009)* (pp. 1612–1617). Ieee. doi:10.1109/GSIS.2009.5408172

Wang, K.J., Bunjira, M., & Lin, Y. S. (2010). Forecasting based inventory management for supply chain. In *2010 Seventh International Conference on Fuzzy Systems and Knowledge Discovery* (pp. 2964–2967). Ieee. doi:10.1109/FSKD.2010.5569080

Wang, X., & Liu, L. (2007). Coordination in a retailer-led supply chain through option contract. *International Journal of Production Economics*, *110*(1–2), 115–127. doi:http://dx.doi.org/10.1016/j.ijpe.2007.02.022

Warring, N., Döös, M., Wilhelmson, L., Backlund, T., & Dixon, N. (2005). Functioning at the edge of knowledge: a study of learning processes in new product development. *Journal of Workplace Learning*, *17*(8), 481–492.

Wee, H.-M. (1995). A deterministic lot-size inventory model for deteriorating items with shortages and a declining market. *Computers & Operations Research*, *22*(3), 345–356. doi:http://dx.doi.org/10.1016/0305-0548(94)E0005-R

Weng, Z. K., & Parlar, M. (1999). Integrating early sales with production decisions: analysis and insights. *IIE Transactions*, *31*(11), 1051–1060. doi:10.1023/A:1007671407701

White, J., Armstrong, H., Armstrong, P., Bourgeault, I., Choiniere, J., & Mykhalovskiy, E. (2000). The impact of managed care on nurses' workplace learning and teaching*. *Nursing Inquiry*, *7*(2), 74–80.

Wild, T. (2007). *Best practice in inventory management*. Canada: John Wiley & Sons, Inc.

Willemain, T., Smart, C., & Schwarz, H. (2004). A new approach to forecasting intermittent demand for service parts inventories. *International Journal of Forecasting*, *20*(3), 375–387. doi:10.1016/S0169-2070(03)00013-X

Williams, J. F. (1982). Note—On the Optimality of Integer Lot Size Ratios in "Economic Lot Size Determination in Multi-Stage Assembly Systems." *Management Science*, *28*(11), 1341–1349. doi:10.1287/mnsc.28.11.1341

WinQSB, Inc. (2002). WinQSB-queueing model analysis software, 2.0.

Wu, J., Lee, W., & Tsai, H.-Y. (2007). Computational algorithmic procedure of optimal inventory policy involving a negative exponential crashing cost and variable lead time demand. *Applied Mathematics and Computation*, *184*, 798–808. doi:10.1016/j.amc.2006.05.202

Xia, Y., Chen, B., & Kouvelis, P. (2008). Market-Based Supply Chain Coordination by Matching Suppliers' Cost Structures with Buyers' Order Profiles. *Management Science*, *54*(11), 1861–1875. doi:10.1287/mnsc.1080.0900

Xu, J., Zhang, J., & Liu, Y. (2009). An adaptive inventory control for a supply chain. In *2009 Chinese Control and Decision Conference* (pp. 5714–5719). Ieee. doi:10.1109/CCDC.2009.5195218

Yang, B., & Geunes, J. (2007). Inventory and lead time planning with lead-time-sensitive demand. *IIE Transactions*, *39*, 439-452 doi:10.1080/07408170600838456

Yang, J., Ding, H., Wang, W., & Dong, J. (2008). A New Optimal Policy for Inventory Control problem with Nonstationary Stochastic Demand. In *IEEE* (pp. 1668–1673).

Yao, D., Yue, X., Mukhopadhyay, S. K., & Wang, Z. (2009). Strategic inventory deployment for retail and e-tail stores. *The International Journal of Management Science*, *37*, 646–658. doi:10.1016/j.omega.2008.04.001

Yoo, Y., Kim, W., & Rhee, J. (1997). Efficient inventory management in multi-echelon distribution systems. *Computers & Industrial Engineering*, *33*(3–4), 729–732. doi:http://dx.doi.org/10.1016/S0360-8352(97)00233-7

You, F., & Grossmann, I. (2010). Integrated multi-echelon supply chain design with inventories under uncertainty: MINLP models, computational strategies. *AIChE Journal*, *56*(2), 419–440. doi:10.1002/aic.12010

You, F., & Grossmann, I. E. (2011). Stochastic inventory management for tactical process planning under uncertainties: MINLP models and algorithms. *AIChE Journal*, *57*(5), 1250–1277. doi:10.1002/aic.12338

Yvan, N. (2011). *Supply Chain performance – The impact of interactions between flexibility enablers and uncertainty*. France: Unversity of Neuchatel.

Zangwill, W. I. (1969). A Backlogging Model and a Multi-Echelon Model of a Dynamic Economic Lot Size Production System—A Network Approach. *Management Science*, *15*(9), 506–527. doi:10.1287/mnsc.15.9.506

Zaojie, K., & Guoying, H. (2007). The Effect of Information Sharing on Inventory in A Two-stage Supply Chain. In *2007 IEEE International Conference on Automation and Logistics* (pp. 2883–2886). Ieee. doi:10.1109/ICAL.2007.4339073

Zhao, X., Hou, J., & Gilbert, K. (2014). Measuring the variance of customer waiting time in service operations. *Management Decision*, *52*(2), 296–312. doi:10.1108/MD-01-2013-0012

Zhao, D., Zhan, Y. A. N., Huo, Y., & Wu, X. (2006). Lot-Sizing Disposal Model in Reverse Logistics. In *the Fifith International Conference on Machine Learning and cybernetics* (pp. 13–16).

Zipkin, P. (1986). Stochastic leadtimes in continuous-time inventory models. *Naval Research Logistics Quarterly*, *33*(4), 763–774. doi:10.1002/nav.3800330419

Zipkin, P. H. (2000). *Foundations of inventory management* (vol 2.). New York: McGraw-Hill.

Zong, Z. (2011). *Information-Theoretic Methods for Estimating Complicated Probability Distribution*. (Oxford, Ed.). Amsterdam: Elsevier B.V.

Zunes, S. (2009). The US invasion of Iraq: the military side of globalization. *Globalizations*, *6*(1), 99–105.