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<input type="checkbox"/>	Doctor's thesis

Subject	Logistics	Date	21.9.2006
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		Number of pages	106
Title	The bullwhip effect in business simulation		
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Abstract

The term bullwhip effect (or Forrester effect) refers to the upstream amplifying variance of demand in a supply chain, a symptom characteristic to dynamic systems, which is recorded in several industries. It causes unnecessary fluctuations in the production and shipment levels, inventory swings and need to increase inventories in order to buffer against the uncertainties of variable demand. This thesis studies how, or if at all, the bullwhip effect is presented in the Realgame business simulation.

First, the theoretical framework of the thesis presents different points of view on the bullwhip effect. The thesis then classifies the main causes of the bullwhip effect: information distortion due to forecasting and inventory system design; order batching; time delays; price fluctuation; and rationing and shortage gaming in a situation where the supplier has delivery difficulties. The issue of measuring the bullwhip effect is discussed, and a set of business and managerial journal articles related to this topic is reviewed. Finally, the means to counteract the bullwhip effect are presented. A chapter is also dedicated to the basic concepts of business games, simulation and computer simulation.

The thesis is a multiple case study with two cases. The first case is a Beer Game gaming event, an academically well-known business game simulating a four echelon supply chain, where the bullwhip effect is known to manifest. The game was conducted as a part of an international seminar for under-graduate and Master's students. The second case consists of three Realgame gaming sessions conducted in two Finnish companies with both production and office personnel. The Realgame is a part of the logistics research and development program EGLO (Enhancing Global Logistics) of the Ministry of Transportation and Communication. The Realgame business simulation is a business process learning tool for the supply chain management, which was developed in the Turku School of Economics as a part of a Doctor's dissertation, and which simulates a manufacturing company. The two business games of this thesis form not only the research environment but the data collecting method, too: The study compares charts of production rates and received orders in the Realgame, and the charts of orders placed by each supply chain member in the Beer Game. Measures of dispersion for incoming demand are also presented for each echelon in both games.

The bullwhip effect is not found to manifest in the Realgame gaming events of this case, since the produced amounts are tens of times larger than the orders received, possibly due the misperception of the players. The main factor contributing to the production rate in these gaming sessions seems to be the availability of the raw material. With more education on the topic before the gaming event and some alterations, though, the game may be used to demonstrate the bullwhip effect.

Key words	Bullwhip effect, Forrester effect, business game, Beer Game, system dynamics, supply chain uncertainty, inventory management, demand forecasting
Further information	