"Wood supply game - simulation"

Mr Kim Sjöström, Chief Technologist
President of the worldwide WOOD LOGISTICS RESEARCH NETWORK
postal mailing address: Anjas 3 A 33, 02230 Espoo, Finland
tel in Finland: 040 5500 780, internationally +358 405 500 780
fax +1 801 904 6757
homepage: http://members.surfeu.fi/sjostrom/
main email address: sjostrom@iki.fi

The forest sector is an industry comprised of primary production and of raw-material-processing manufactures. Supply chains there, from consumption back to raw materials, are lengthy and filled with diverse stages. The sector in question is sensitive for example for economic fluctuations. When utilizing any raw material, the material flows diverge towards several different products (divergent logistics). If separate stages of the supply chain are independent decision-making units, parties of the chain are unable to work in synchron. Information is an important tool for management of logistics. Imperfect information -that always is present- causes problems to quantities, timing and location of the commodities. This game emulates supply chain(s) of the forest sector, attempting to make the flow of materials through the supply chains from raw material to consumption more lucid, to emphasize the importance of information sharing, industrial dynamics, as well as significance of constraints set by technical facts in the sector.

We form at least two teams that compete against each other. Each team receives an own industrial alliance to play. A full team comprises of 8 persons. Each game round simulates one week. The length of the game may be e.g 50 weeks. The length of the supply chain is simulated by inserting at least four sequential stages (game positions) into each alliance. Their titles are not important, but we can call them as wood procurement, mill, wholesaler, retailer. The divergent nature of the sector is simulated by dividing the material into at least two sub-chains: from wood procurement to solid wood and to fiberwood branches. In this game, 50% to sawmill and 50% to pulp mill is regarded as the ideal division share. Deviation from this sharing ratio worsens the game result of the alliance: in this game, if you use good sawlogs to pulping, you will be penalized by a quality cost that is ten times the warehousing cost. In this game, warehousing costs are the gist of logistical performance. Each position owns a warehouse, where all inventory stored causes a cost. The inventory, in general, is a logistical "battlefield" where several interests, usually conflicting, meet. Chief interests tend to be the warehousing costs vs the service level. Availability of commodity is a factor of the service level: a needed quantity in the right spot at the right moment. If some quantity lacks when demand exists, it means minus to the company. In this game, bad service level is simulated by lack cost that is warehousing cost doubled.

In each week, the players change only standardized information - only by placing an order, stating the quantity, to the closest upstream position. And, the wood procurement position decides each week the quantities it directs to sawmill and to pulping. No none sees the total situation of the entire alliance, not even the situation of one sub-chain. The game leader gives

the consumption demand quantity each week to those positions closest to consumer stage. The game contains one or several variations in demand - we simulate economic fluctuations.
I have used the simuation as a game for a couple of times in my teaching groups. Students seem to react positively to this sort of practical use og their logistics and professional knowledge.
Some conclusions about applicability and application of the simulation:

1. This sort of setting is all too large to be lead as one enterprise. Positions of an alliance are not able to coordinate almost anything.

2. Practical chores of the game are a good way to simulate the daily business facing the real-life mills, hindering them from focusing on the logistically important tasks. In that regard, perhaps computerization of the game is not highly desirable.

3. Divergent sub-chains tend to get rather unbalanced compared with each other. Of two branches, one often is overfed and struggling with high warehousing costs, whereas the other is underfed and accumulating lack penalties.

4. Positions closest to demand tend to accumulate lower sums of costs than positions further upstream. Oscillations amplify towards upstream.

5. Sometimes, despite of its high penalty, it however would be more advisable to use sawlogs to pulping - in certain cases, the accumulated warehousing & penalty costs are higher than the waste cost.

6. Many students of our field (having used this), display yet tendency towards “safe” thinking of producing high quantities, rather than making the suppply chain “lean”.