



Project Plan

MS-E2177

Seminar on Case Studies in Operations Research

Implications of Futures Markets to Pulp Industry: Business Game

Team:

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Client: **UPM**

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1. Background

The paper industry is a global market with an estimated value of US\$ 360 billion in 2010 [1]. In comparison, the aggregated sales of Apple, Microsoft, and Nokia were around US\$ 228 billion in 2011 [1]. Paper and paperboard products are made out of the pulp, which is a wood-based biomaterial. The global commodity wood pulp is traded at a total value of US\$ 35-50 billion annually.

There are three different ways how pulp can be traded between seller and buyer: Annual agreements, a spot market, and since 2015 also with futures [2]. Most of the pulp is sold with long-term annual contracts between a pulp seller and a buyer. The prices are negotiated individually via e-mail or calls between supplier and consumer monthly or they agreed beforehand on a fixed price. Ensured quality and reliability are reasons why buyers chose annual contracts. On the spot market, the pulp is traded on the best price basis. Sellers can offer their products and buyers can buy them for the market price, the competition creates an efficient market without regional price differences. In recent years, futures exchanges have emerged as a new market channel for pulp. Futures are already used for similar commodities such as gold or oil. There are financial futures and physical futures for pulp. Financial futures, also called Swaps, can be dealt OTC (Over the counter) or on the regulated commodity exchange NOREXECO since 2015. The exchange is licensed by the Norwegian Ministry of Finance [2]. Physical futures are dealt with in the Shanghai Futures exchange.

In general, futures are contracts, which involve the obligation to buy a specified quantity of an asset. The contract specifies a fixed future date as well as a fixed price [3]. With a physical future, the buyer receives the fixed amount of the commodity for the fixed price at the delivery date. Financial futures have financial objects as underlying, the market participants bet on the price index of the assets. The buyers receive the difference between the fixed price and the actual price as profit if the actual price rises and is higher than the fixed price. If the actual price is lower, they have to pay the difference to the seller [4]. Therefore, financial futures can be interesting for hedging or speculating, but for sellers also in combination with selling pulp on the spot market, to ensure a fixed price out of the combination of the future and the spot price.

The different market mechanisms can be well illustrated in a business game. Business games use the concept of gamification, which can be described as the use of game elements in other contexts to engage and motivate people and promote learning to solve problems [5]. Business Games provide the opportunity to apply theoretical knowledge in a safe space and in a fun and entertaining way to try out and experience possible consequences of actions. Market simulations of future markets have shown that gamification and simulation are especially valuable if there is uncertainty in the game, the participants gained an understanding of how to deal with price or order execution uncertainties [6]. Competition and discussions further enforced the learning process [6]. Previous literature also describes the limitations of Business Games, such as that not every pattern can exactly be modeled and simplification is needed [6]. According to the 'Play Your Process' method, developed by Moreira de Classe et. al.[7], the design process for a business game is divided

into several phases. The method starts with a context analysis to understand the processes, followed by the process-game mapping to connect process and game elements which are documented in a game design document. Based on this, the game project can be progressed, the designers can use their creativity to design an entertaining and enjoyable game. The game should be prototyped and afterward evaluated and tested before it can get published [7].

2. Objectives

In our project, we will develop a business game for our client UPM. UPM is a Finnish forest-based bioindustry company with six business areas and the aim to create renewable and responsible solutions that replace fossil-based materials [8]. For our project, we will focus on the business area of pulp production and trading. UPM runs four pulp mills in Finland and Uruguay and has over 150 customers in the pulp market. UPM produces both hardwood and softwood pulp.

The goal of the business game is to simulate the market activities in the pulp market with the different market channels of the annual contracts, the spot market, and possible implementation of futures. The game aims to provide an opportunity for the players to learn which strategies are effective for buyers (i.e. paper manufacturers) and sellers (i.e. pulp producers) to maximize their profits and how to act when unexpected changes in the operating environment, such as production issues or supply chain incidents happen. The game should include conflicts of interest, uncertainties, and asymmetric information to model the real market. The target group and future players of the game are the UPM pulp management and salespeople. The game should be played in a two-hour session with a short explanation of rules and introduction, the game itself, and some time for discussions afterward. Due to the current pandemic situation, the game should be preferably playable in a remote and digital environment, for example using tools like Microsoft Teams or Google sheets. The form of a business game was chosen in order to help build understanding about the pulp market mechanisms in an easily understandable and especially entertaining and fun way.

3. Task

So far in the Project we have decided the aspects of the market we wish to concentrate on simulating and have created an abstract framework upon which we will implement the project.

The steps of the project include:

1. Deciding a platform (excel, Teams, Boardgame, etc.) for the project.
2. Agreeing on which elements (warehouses, different business transactions, etc.) should be in the final implementation and how the implementation should work in practice. (We will need to conduct further interviews regarding this.)
3. Organize the elements of the game into a working whole (e.g. which parts are dealt with in excel sheets, which in Microsoft Teams and which are handled by the Gamemaster).
4. Build the first version of the game.
5. Run test matches to optimize the game (possibly using the opponent team as test subjects).
6. Refine the game based on feedback to have desired round length, flow, total time duration of a game, warehouse size, define which features should be left out and which ones are necessary, etc.
7. After the game itself is ready, teach key personnel to play it and to teach others in turn how to play the Business Game.
8. Writing the final Report for the project.

4. Schedule

Our schedule after the first deliverables involves:

Deadline	Task
3.3.2021	<ul style="list-style-type: none">- Obtain basic knowledge of the Task and surrounding themes (swaps, futures, etc.).- Develop a model of the Project.- Collect feedback on the model.
09.4.2021	<ul style="list-style-type: none">- Decide on the final implementation templates (e.g. Google Drive) for the project.- Complete an initial implementation of the business game.- Do initial tests for the pace and “balancing” while ensuring that the project maintains value from the perspective of the client.

12.5.2021	<ul style="list-style-type: none"> - Finalize testing and fine-tuning. - Teach the Client personnel to play the Business Game properly. - Clarify and assist the Client with the next steps they will take after the project has ended. - Write the final Report for the project.
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5. Resources

Our team consists of three members with different backgrounds: Severi Saastamoinen, Hanna Lagemann and Marianne Jyrälä. Severi is majoring in Systems and Operations Research and has a background in Systems Analysis in his Bachelor Degree. He is our project manager. Hanna did her Bachelor in Industrial Engineering and Management and is continuing Master studies in the same field as well. Marianne did her bachelor studies in Chemical Engineering and currently, she is a Master student and majoring in Sustainable Energy Systems and Markets. Since, the students have varying backgrounds we will get a different perspective to the project. We have more or less previous knowledge of business games and pulp industry and markets. However, we are excited about the subject and gaming.

Our client has four professionals to help us to execute this project. From the UPM side we are having meetings with: Sauli Järvenpää (Manager, Market Analysis and Strategy), Laura Lundell (Manager, Pulp Business Strategy), Joonas Kaivosoja (Data Scientist, Strategy Team) and Anssi Käki (Vice President, Pulp Supply Chain and Tools & Processes). We have had meetings with the professionals and got excellent support and ideas from them. So far, we have had two meetings with the client.

6. Risks

The risks of the project were determined as likely they could encounter during the project. Table 1. shows the risks that were taken into account. Otherwise, risks were evaluated by their probability, effects, impacts and how to avoid them.

Risk	Probability	Effect	Impact	How to avoid
Too easy Game	Low	Game is not useful	High	Testing before launching

Non-active Team member or member absence	Low	Workload is too much for other people	High	Roles and workload dividing with the team members equally
Communication with the client fails	Low	Game is not realistic or is not what expected	Medium	Meetings and communication with email
Scope of the project is too wide	Medium	Workload too high, complexity and stress.	Medium	Clear plan and testing in an early stage
Non-realistic game/too complex game	Medium	Too high workload and timing.	High	Game testing before launching

Table 1. Risks of the project.

References

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