FINAL PROJECT AND MARKING SCHEME

This document describes the marking scheme and gives detailed instructions about the coursework.

MARKING SCHEME

The assessment for this module consists of the final project only. The coursework will be 100% of your overall mark. The overall marks should be interpreted in line with the University's policy on interpretation of marks at the postgraduate level.

Table 1 below lists the topics and their contribution to the final mark.

Table 1 Topic and contribution to mark.

#	Topic	weight
1	Utility function & Data collection	25%
2	Break-Even point	25%
3	Production Mix	25%
4	Distribution Network	25%
5	Facility Locations	25%
6	*Supply Chain Simulation [bonus]*	*25%*

Each part will be marked individually. For each part marks are given according to the following guidelines.

- Context & background: Assumptions are clearly stated, possibly supported by references
- Methods, tools and software are appropriately chosen
- Critical analysis, convincing arguments developed
- Results, conclusions and limitations were clearly stated and discussed
- The workout exceeds set expectations

No final project mark will be given if any of the parts is missing. The bonus question may be used to compensate for missing marks (but grades will be capped at 100%). The final work has to be compiled into one master document. Furthermore, all final project files have to be combined into a single zip-file and emailed to w.garn@surrecy.ac.uk (and CC to xizhaonku@163.com). No hardcopies shall be acceptable.

The deadline for the coursework is **Monday, 19th December 2016 - 4pm** at which all parts of your coursework will be considered for marking. Please be aware of the University's policies in regards to missed deadlines.

Students have to demonstrate the ability to solve Logistics and Supply Chain problems during the course of this module. The final project will test the following four areas.

Developing Knowledge and Understanding

- A systematic, in-depth understanding of the development; issues and influences relevant to discipline of Modern Logistics, Supply Chain Management and its analytical aspects.
- Deep and thorough understanding of quantitative analytical methodologies and hands-on experience with decision-making software and analytical tools.

Cognitive (thinking) skills

- Demonstrate deep learning, understanding of the material and ability to apply the knowledge and demonstrate skills in problem solving in the topic space of the module studied
- Collect and carry out assessments of data, select the appropriate analysis tools, design and execute an analytical methodology, apply adequate visualisation methodologies to present the results and interpret the findings and finally to communicate the results effectively

Practical & transferable skills

- Demonstrate the ability to independently evaluate critical approaches and techniques relevant to Modern Logistics & Supply Chain Management;

Final Project

- Know and apply a range of techniques and tools to analyse data related to business operations;
- Capability of selecting the right methodology and software to solve Modern Logistics & Supply Chain Management issues;
- Relate existing knowledge structures and methodologies to analytical business challenges;
- *Key / transferable skills* An ability of demonstrating competence in a range of skills that are relevant to the needs of future professionals concerned with Logistics & Supply Chains; critical thinking, analysis and synthesis; using computer software for extracting information out of structured and unstructured data; reasoning; problem solving; independent research; presentation; report writing.

Synthesis and Creativity

- An ability to conduct Modern Logistics & Supply Chain Management and produce a high quality final project - this includes the ability to critical investigate, to select, define and focus upon an issue at an appropriate level; to develop and apply relevant and sound methodology; to apply the methodology to analyse the issue; to develop logical conclusions and recommendations; to be aware of the limitations of the work
- An ability to identify modifications to existing knowledge structures and theoretical frameworks and therefore to prose new areas for investigation, new problems, new or alternative applications or methodological applications

Final Project

LOGISTICS & SUPPLY CHAIN CHALLENGE

THE ORANGE FRUIT COMPANY

The orange fruit company is importing oranges. The raw materials are processed and distributed as finished goods. The company has its main plant located in Uxbridge (United Kingdom). You were hired as Logistics & Supply Chain Analyst to help the company in optimising their business operations.

DATA COLLECTION & SUPPLIER UTILITY FUNCTION

The company has asked you to analyse five countries to import Oranges from. The company said they are interested in importing from Turkey, Spain and Italy and two countries of your choice (see figure 1).

Figure 1 Supplier locations.

- Choose two countries
- Determine distances, travel time and freight rate.

The freight rate must be given in pounds per tons per 100 miles and in Euros per ton per 100 km (state your source, or give reasons for your estimations), assume that the freight rate is fixed for the period of the contract. Assume that the maximum number of monthly shipments for the suppliers are in the range between 10 and 25 (randomly assign fixed values using a uniform distribution). One shipment carries 22 tons. Investigate on reasonable values for the cost of raw material. Your output should present:

- Cost of oranges (per supplying country, one supplier per country only, see figure 2 for a typical graph)
- Freight rate (see figure 3 for an example of the freight cost variations)
- Number of shipments (per supplier)
- Develop a utility function and rank the suppliers accordingly.

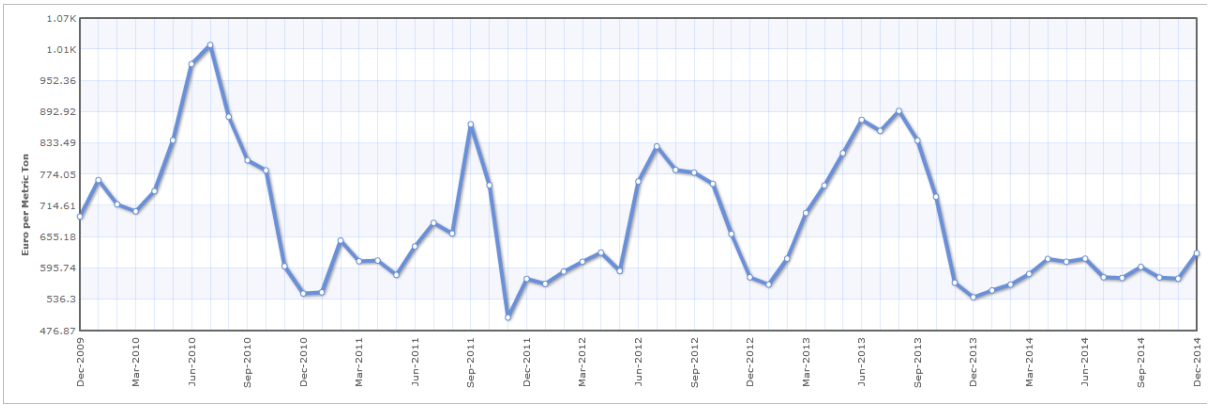


Figure 2 Monthly price for Oranges [Source: World Bank]

Final Project

BREAK-EVEN POINT

The company will purchase oranges from the above identified suppliers. In order to get an idea about the break-even point the cost has to be derived as the average cost from the five suppliers plus the average transportation cost. The company sells the oranges and related products on average for £1,800 per ton. You have looked up staff's salaries; cost for premises and other fixed costs which added up to approximately £17,000 per month (±20%). You have also looked at the actual processing of the oranges. You have checked the material costs, time spent on processing one ton of oranges and came to the conclusion that this costs approximately £500 (±10%).

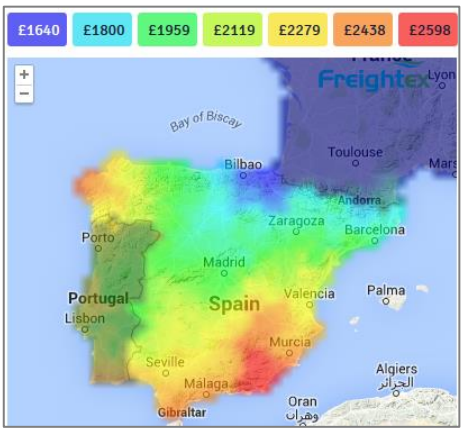


Figure 3 Truck load freight prices [Source: freightex].

- Display essential information in a table;
- Determine the break-even point;
- Visualise the cost relationships.

PRODUCTION MIX

The company would like to find the best production mix for a range of possible products. The production rates are expressed as a multiple of the break-even (BE) volume (per month) determined previously. The rate for "blood-orange" marmalade is three times the BE volume (per month). The rate for "fine-cut" marmalade is four times the BE volume. The factory operates 26 days in a month. Due to other productions the operations/distribution manager cannot allow more than 900 tons of finished goods to be produced per month. The supply manager has arranged 970 tons per month of oranges (raw material, any type and volume configuration) to be available on a monthly basis. The sales team has informed you that the "blood-orange" marmalade generates a revenue of £1,800/t and the "fine-cut" marmalade gives a revenue of £2,100/t. Operations informed you that only 75% of the oranges are utilised (25% will be waste, because of peeling and quality requirements). However, the "blood-orange" finished good volume is still 82% from the original raw material volume. A minimum of 220 tons "blood-orange" marmalade and at least 170 tons of fine-cut marmalade has to be produced due to sales agreements.

- Determine the required raw material

Final Project

- Determine the tonnage of finished goods
- Determine the revenue
- Consider the profit

DISTRIBUTION NETWORK

The company also processes orange juice. They have plants in Uxbridge (UK); Florence (Italy) and Barcelona (Spain). Furthermore, there are distribution centres in Manchester, Uxbridge, Paris, Madrid, Milan and Munich.

- Create a distance matrix
- Create a cost matrix (related to distance matrix)

The plants possible supply volumes and the distribution centres demand is given in the table below.

Table 2 Supply and demand quantities.

Supply		Demand	
Uxbridge (UK)	300 t	Manchester	75 t
Florence (Italy)	270 t	Uxbridge	200 t
Barcelona (Spain)	350 t	Paris	250 t
		Madrid	150 t
		Milan	100 t
		Munich	125 t

- Determine the quantities to be shipped between plants and distribution centres.
- Determine the costs

FACILITY LOCATIONS

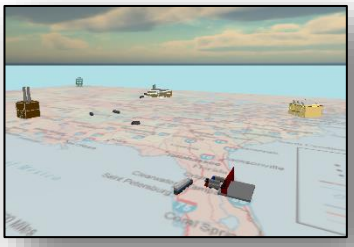
The orange fruit company is considering to reduce their number of distribution centres across Europe. Your task is to use Kruskal's algorithm to find three clusters, use also the supply nodes. Find the centres of the clusters using the centre of gravity. For this you can assume that there is demand at the nodes, which were known as supply nodes in the previous task. The additional demand at Uxbridge, Florence and Barcelona is 20t, 45t and 80t respectively.

- Develop and adapt Kruskal's algorithm;
- find locations for new distribution centres;
- give more information about the new centres, e.g. demand.

Final Project

SUPPLY CHAIN SIMULATION [BONUS QUESTION]

The Orange Fruit Company wants to simulate activities at its Uxbridge plant. It is interested in the transfer of container from the trucks to storage location SL-10. Trucks arrive at a rate of 8 per hour (according to a Poisson process). It takes a team 12 minutes (exponentially distributed) to unload one container from the truck and to move it to the initial storage location SL-10 using a forklift vehicle. A truck carries 11 containers.



- Use an M/M/c queueing system to analytically determine the operational characteristics
- Simulate the same system and compare the operational characteristics

At the initial storage location SL-10 staff performs a quality inspection and records the received containers (on average this takes 15 minutes, normally distributed). On average 3% of the goods fail the quality inspection and are moved to a collection point CP-20. The rest of the material is moved into the main storage area SA-30. It takes one loader between 12 to 18 minutes (uniformly distributed) to move one container to SA-30 (from SL-10). Containers are subsequently processed. Processing one container takes 3.5 hours (constant rate) for one manufacturing line Px-40. After the processing the goods are moved (U[10,16] for one loader) into a dispatch zone DZ-50 and trucks will take them to distribution centres (loading takes 28 minutes on average, exponentially distributed).

- How many containers end up at collection point CP-20?
- How many loaders are required to avoid a bottleneck at SL-10?
- How many containers are on average in storage area SA-30?
- How many manufacturing lines are required to avoid back-logs?
- How many truck have to be used for dispatching the goods?
- How many loaders are needed to move goods into zone DZ-50?