Unit Outline*

TRLO8515

Inventory and Distribution Management

D9-OFF, 2011
Presented at Shanghai Maritime University

Professor John Taplin

Business School
www.business.uwa.edu.au

* This Unit Outline should be read in conjunction with the Business School Unit Outline Supplement available on the Current Students web site http://www.business.uwa.edu.au/students
UNIT DESCRIPTION

Introduction

Welcome to the study of Inventory and Distribution Management, dealing with key aspects of your professional development in the logistics field. The unit and the instructional material have been developed to give both basic instruction and a degree of challenge in coming to grips with new techniques which will be the way of the future.

The lecturer is Professor John Taplin, a transport specialist with particular interests in goods movement and transport investment. His PhD was done at Cornell University and he has spent 25 years in university research and teaching. Interspersed with this, he has been the Director of the Australian Bureau of Transport Economics, Deputy Secretary of the Australian Department of Transport, and Director-General of Transport in the State of Western Australia. He also built a 37 foot (11.28 metre) yacht and sailed it around Australia and to Indonesia.

Unit content

This unit covers the development of inventory policies in a variety of circumstances, including variability in markets. It also deals with the efficient management of physical distribution. Modelling work includes simulation and optimization of location, warehousing and distribution.

The goal of the unit

The objective is to enable students to develop the judgment and analytical skills needed to apply the right model to any inventory or distribution situation. Computer modelling is a major activity.

This unit develops topics introduced in Supply Chain Management TRLO8506 and Modelling Logistics Systems TRLO8507. We deal with physical movement whereas Logistics Information Systems and Electronic Business TRLO8512 will deal with communication in supply chains. Subsequent units deal with specific logistics topics. The role of transport in distribution is studied in Transport Systems and Policy TRLO8516.

Learning outcomes

On completion of this unit, you should be able to:

- Manage cycle inventory and resupply
- Handle uncertainty to achieve the best outcomes, by dealing with the probability of stockout, expected shortage and fill rate, and safety inventory
- Determine the optimal level of product availability
- Understand the potential of genetic algorithm to find optimal warehouse locations
- Understand the importance of packaging and reverse logistics

You should be equipped with the capacity to apply complex computer tools in a practical way, using the right model to solve inventory and location problems

Educational principles and graduate attributes

In this unit, you will be provided with the opportunity to:

- Identify and evaluate ethical dilemmas related to business decisions, social responsibility and sustainability
- Develop integrative and critical thinking skills to solve problems
- Develop effective communication skills to influence and relate to multiple stakeholders
- Develop the capacity to do independent research work.
TEACHING AND LEARNING RESPONSIBILITIES

Teaching and learning strategies

The thirteen formal lectures in the unit are designed to present the issues. However, most of the learning will be in the hands-on work done by students in the computer lab and understanding will result from doing the computer operations under instruction but with a degree of independence. The level of understanding will then be enhanced by the experience of selecting an assignment project, independently developing a model, producing results and presenting them in the major assignment report.

Two important elements in the unit are the computational exercises and the logistics modelling. The first are somewhat mechanical but it is essential for a logistics manager to be fully conversant with these operations if only to supervise the work of others. The logistics modelling will go beyond the familiar role of computers in doing the tedious work of business. The models in this unit will introduce students to a world of business planning which has opened up as the power and capacity of computers has increased. Developing and using models will give students the skill and freedom to apply their own models as well as professional background for dealing with consultants.

Teaching and learning evaluation

You may be asked to complete two evaluations during this unit; the Student Perception of Teaching (SPOT) and the Students’ Unit Reflective Feedback (SURF). The SPOT is optional and is an evaluation of the lecturer and the unit. The SURF is completed online and is a university-wide survey and deals only with the unit. You will receive an email from the SURF office inviting you to complete the SURF when it is activated. We encourage you to complete the forms as your feedback is extremely important and can be used to make changes to the unit or lecturing style when appropriate.

Feedback is needed so that lectures and labs can be made more beneficial for students.

Attendance

Participation in class, whether it be listening to a lecture or getting involved in other activities, is an important part of the learning process, therefore it is important that you attend classes. More formally, the University regulations state that ‘to complete a course or unit students shall attend prescribed classes, lectures, seminars and tutorials’. Where a student, due to exceptional circumstances, is unable to attend a scheduled class, they are required to obtain prior approval of the unit coordinator to be absent from that class. Any student absent from class without having had such absence approved by the unit coordinator may be referred to the faculty for advice and may be required to withdraw from the unit.

CONTACT DETAILS

We strongly advise students to regularly access their student email accounts. Important information regarding the unit is often communicated by email and will not be automatically forwarded to private email addresses.

<table>
<thead>
<tr>
<th>Unit coordinator/lecturer</th>
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</thead>
<tbody>
<tr>
<td>Name:</td>
<td>Professor John Taplin</td>
</tr>
<tr>
<td>Email:</td>
<td><a href="mailto:john.taplin@uwa.edu.au">john.taplin@uwa.edu.au</a></td>
</tr>
<tr>
<td>Phone:</td>
<td>+61 (8) 6488 2081</td>
</tr>
<tr>
<td>Consultation time:</td>
<td>The lecturer will be available for individual or group consultation on Sunday 31 July from 1000 onwards. Students should make appointments.</td>
</tr>
</tbody>
</table>
TEXTBOOK AND RESOURCES

Recommended text

Software requirements
In addition to MS Excel, we use the following software packages:
- For simulation: Extend (Imagine That Inc.)
- For genetic algorithm: Evolver (Palisade Corporation).

Additional resources & reading material

This is an up-to-date text with excellent treatments of a number of topics, particularly with respect to networks

Do not let the mathematics in some of the papers hinder your reading. Look for the arguments and conclusions. Papers used in preparing the lecture material include:


Waller, M., Cassady, C. and Ozment, J. (2006) Impact of cross-docking on inventory in a decentralized retail supply chain, Transportation Research Part E, Logistics and Transportation Review, 42
<table>
<thead>
<tr>
<th>Lect.</th>
<th>Text Reading</th>
<th>Time</th>
<th>Lecture or Lab Topics</th>
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<tbody>
<tr>
<td>1</td>
<td>275-280</td>
<td>Sat 23 July</td>
<td>• Basic inventory models and strategies</td>
</tr>
<tr>
<td></td>
<td>321-322</td>
<td>0900-1015</td>
<td>• Random customer arrivals and sales</td>
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<tr>
<td>2</td>
<td>346-348</td>
<td>1030-1200</td>
<td>• Modelling the effects of highly variable sales</td>
</tr>
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<td></td>
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<td>• Continuous review and economic order quantity (EOQ)</td>
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<tr>
<td>3</td>
<td>281-282</td>
<td>1330-1430</td>
<td>• Changes in demand</td>
</tr>
<tr>
<td></td>
<td>358-368</td>
<td></td>
<td>• Stochastic demand and planned shortages</td>
</tr>
<tr>
<td>4</td>
<td>282-289</td>
<td>1445-1600</td>
<td>• Multiple products in one order</td>
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<tr>
<td></td>
<td></td>
<td>1610-1730</td>
<td>Lab E1: Continuous review simulation to find best re-order point (ROP)</td>
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<tr>
<td>5</td>
<td>289-304</td>
<td>Sun 24 July</td>
<td>• Lot size discounts</td>
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<td></td>
<td>0900-1015</td>
<td>• Discounts based on volume or demand responsiveness</td>
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<tr>
<td>6</td>
<td>317-335</td>
<td>1030-1200</td>
<td>• Safety inventory</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Fill rate and service level</td>
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<td>1330-1430</td>
<td>TEST on Lectures 1 to 6 – especially the Notes.</td>
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<tr>
<td>7</td>
<td>368-382</td>
<td>1445-1600</td>
<td>• Applied inventory and distribution</td>
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<td></td>
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<td></td>
<td>• Stockout and assortment reduction</td>
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<td></td>
<td></td>
<td>1600-1730</td>
<td>Lab E2: Calculate composite order</td>
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<td>E3: Safety inventory and fill rate</td>
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<tr>
<td>8</td>
<td></td>
<td>Mon 25 July</td>
<td>• Postponement and the push-pull boundary</td>
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<tr>
<td></td>
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<td>1830-2000</td>
<td>Lab Modelling 1a: Simulate push-pull boundary</td>
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<td>Modelling 1b: Simulate collection with variable demands</td>
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<td>9</td>
<td></td>
<td>Wed 27 July</td>
<td>• Locating warehouses and shops with genetic algorithm (GA)</td>
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<td></td>
<td></td>
<td>1830-2000</td>
<td>Lab Modelling 2a: Optimize location of warehouses with GA</td>
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<td>Modelling 2b: Optimize supermarket location with GA</td>
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<tr>
<td>10</td>
<td>407-423</td>
<td>Fri 29 July</td>
<td>• Cross-docking advantages and disadvantages</td>
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<td></td>
<td></td>
<td>1830-2000</td>
<td>Lab Modelling 3: Optimize deliveries with time windows (GA)</td>
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<td>11</td>
<td></td>
<td>Sat 30 July</td>
<td>• Reverse logistics</td>
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<td></td>
<td>0900-1015</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>1030-1200</td>
<td>• Packaging for efficient distribution</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>1330-1430</td>
<td>• Introduction to transport pricing</td>
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<td></td>
<td>• Evolutionary optimizer with simulation</td>
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<tr>
<td></td>
<td></td>
<td>1445-1600</td>
<td>Lab Modelling 4: Optimize location and consignment size</td>
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<tr>
<td></td>
<td></td>
<td>1610-1730</td>
<td>Revision questions</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>Sun 31 July</td>
<td>Discuss assignment projects with individual students or groups</td>
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ASSESSMENT MECHANISM

The purpose of assessment

There are a number of reasons for having assessable tasks as part of an academic program. The assessable tasks are designed to encourage you to explore and understand the subject more fully. The fact that we grade your work provides you an indication of how much you have achieved. Providing feedback on your work also serves as part of the learning process.

Assessment mechanism summary

<table>
<thead>
<tr>
<th>Item</th>
<th>Weight</th>
<th>Due date</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEST on handout material for Lectures 1 to 6</td>
<td>10%</td>
<td>24 July</td>
<td>The test will be on the material in Notes 1a, 1b, 2a, 2b, 2c, 3a, 3b, 4, 5a, 5b, 6</td>
</tr>
<tr>
<td>Report on Lab E1 results</td>
<td>5%</td>
<td>29 July</td>
<td>Maximum length: two pages</td>
</tr>
<tr>
<td>Proposal for the Major Assignment (Max: 1 page)</td>
<td>5%</td>
<td>30 July</td>
<td>It is essential for each student to identify a suitable topic at this early stage. (See Assessment Components)</td>
</tr>
<tr>
<td>Final exam</td>
<td>45%</td>
<td>20 Aug</td>
<td></td>
</tr>
<tr>
<td>Major Assignment (See Assessment Components)</td>
<td>35%</td>
<td>29 Aug</td>
<td>Assignments submitted after the due date will lose marks</td>
</tr>
</tbody>
</table>

Note 1: Results may be subject to scaling and standardisation under faculty policy and are not necessarily the sum of the component parts.

Note 2: Your assessed work may also be used for quality assurance purposes, such as to assess the level of achievement of learning outcomes as required for accreditation and audit purposes. The findings may be used to inform changes aimed at improving the quality of Business School programs. All material used for such processes will be treated as confidential, and the outcome will not affect your grade for the unit.

Assessment components

Test (10%) The purpose of the test is to ensure that students understand the basic inventory topics

− The test covers Notes 1a, 1b, 2a, 2b, 2c, 3a, 3b, 4, 5a, 5b, 6

Report on the meaning and significance of Lab E1 results (5%)• Results and comments on them (two-page limit): submit in class Friday 29 July

Proposal for the Major Assignment (5%) to be submitted to the lecturer in class Saturday 30 July

• Choose a problem or situation or system within the general area covered in this unit
  − Although there is no restriction on your choice (so long as it is in the field) you are advised to choose something for which you can obtain information
  − Choose something that you can analyse
  − Say what you are going to do and what methods you intend to use
  − Maximum length of the proposal: one page

Final exam (45%) More information will be given in class.
**Major Assignment (35%)** – to be submitted to the lecturer by email by Monday 29 August

- The purpose of the assignment is to propose improvements to the selected system and to model the effects of these improvements
  - Where there are gaps in your knowledge, it is permissible to make reasonable assumptions
- **Steps**
  - Make a flow chart of the way the system works and summarise the elements of the system
  - Construct an Extend or Evolver or Excel model to represent the system
    - The model should be capable of exploring the issue you have specified
    - Some approximations in representing the real system are permissible.
  - Determine your proposed improvements to the system
    - Focus on some specific aspects
    - Test the proposed improvements by modifying the simulation and comparing the results with the base case simulation
  - Do enough trials to reasonably ensure that the improved system is robust
- Your report should outline the essentials and context of the system and any background knowledge needed to understand the rest of the report
  - Describe how you approached the analysis and modelling and why you took this approach
  - State what you have found and how this relates to the real system
  - Describe the trials you have done and the results obtained
  - Include or attach:
    - An annotated printout of the computer model
    - Relevant input and output such as graphs and tables.

- **Allocation of Assignment marks** is based on the relative importance of each part. The following outline indicates the relative importance to give to each stage of the project and how to structure your report. The grading will allocate marks for each of the following five elements:

  20% **Formulation**
  - Context of the modelling work and any necessary background
  - Specify questions to which you sought quantitative answers

  10% **Investigations**
  - Collect information on the structure of the system and also numerical data.

  40% **Description, Flowchart, Model**
  - Include relevant explanation, the flow chart and a printout of the model.

  20% **Validation and Trials**
  - Say how you satisfied yourself that your model is an adequate representation of the real system.
  - Outline the trials or tests carried out and the results obtained.

  10% **Conclusions and Recommendations**
  - A clear statement of what you have found and how this relates to the real system you were modelling.

Assignments will be **checked electronically with Turnitin** to detect any unacknowledged inclusion of published material. Reasonable quotation of source material is acceptable if the source is acknowledged.
Submission of assignments
Please remember to attach an Assignment Cover Sheet to the front of your assignment. You can
download and print your Assignment Cover Sheet from the Current Students web page
http://www.business.uwa.edu.au/students/assessments

Student Guild
Phone: (+61 8) 6488 2295
Facsimile: (+61 8) 6488 1041
E-mail: enquiries@guild.uwa.edu.au
Website: http://www.guild.uwa.edu.au

Charter of Student Rights and Responsibilities
The Charter of Student Rights and Responsibilities outlines the fundamental rights and
responsibilities of students who undertake their education at UWA (refer

Appeals against academic assessment
The University provides the opportunity for students to lodge an appeal against assessment results