

INTRODUCTION TO HOM

1. OVERVIEW

HOM is a software system designed to help mid level managers and owners of small businesses gain competitive advantage from operations. It is also useful for business school students, both undergraduate and graduate, who are trying to analyze cases and problems derived from situations these managers face on a regular basis. We developed this product based on the premise that an organization's operating system is its key source of competitive advantage. While large organizations can rely on internal staffs, well known consulting organizations (Anderson Consulting, A.T. Kearney, etc.) and complex and expensive software systems (SAP, BAAN, etc.) smaller independent organizations or operations within these firms require a different solution approach.

Our philosophy is based on two overlapping concepts. First, managers understand a problem environment and data availability in a language that is different from that required to develop and implement technical solutions to their problems. Second, the trade off between problem precision and rapid scenario evaluations should always come down on the side that facilitates the latter. Thus, our software stresses managerially oriented data inputs and problem formulation philosophy. We also facilitate alternative scenario analysis by having it built in whenever possible with simple, user initiated parameter selection windows.

The current version of HOM addresses five key competitive advantage drivers

- Process improvements by process analysis and waiting line management
- Response time improvement by time management and process analysis.
- Quality management using statistical process control and acceptance sampling.
- Supply chain management by inventory modeling and material requirement planning
- Capacity management by forecasting and aggregate planning.

HOM has been designed so that an unsophisticated user taking advantage of imbedded "How To Solve" help files and Tutorial Case- Master Craftsmen of Newport should be able to start analyzing real problems within a half-hour. This text and the unique "How To Solve" help files in the software can also be used as a stand alone vehicle for delivery of a basic course in operations management as long as key readings are given for every section. A list of such readings is available from the authors.

2. SOFTWARE OVERVIEW

An overview of the capabilities of the software is given below.

2.1 Competitive Advantage from Operations Using HOM

<u>Competitive Advantage</u>	<u>Software Module</u>
<ul style="list-style-type: none"> • Process Improvements 	<ul style="list-style-type: none"> • Process Analysis • Waiting Line Analysis
<ul style="list-style-type: none"> • Supply Chain Management 	<ul style="list-style-type: none"> • Independent Demand Inventory Systems • Material Requirements Planning (MRP) • Facility Location & Transportation (Fall 1999)
<ul style="list-style-type: none"> • Capacity Management 	<ul style="list-style-type: none"> • Forecasting • Aggregate Planning • CPM-PERT-Crashing • Process Analysis
<ul style="list-style-type: none"> • Quality Management 	<ul style="list-style-type: none"> • Statistical Process Control • Acceptance Sampling

2.2 Process Analysis

- Model Up to 15 Products
- Each Product has Unique Task Sequence, Priority, and Lot Size
- Model Several Types of Labor - General and Task Specific
- Each Task can
 - Process Jobs One at a Time, Batch, Continuous Flow
 - Require a Setup in Addition to Run Time
- Randomness Can Occur In Demand Arrival and Task Processing Time
- Job Selection -- FCFS, Set Up Saving
- Results - Production, Capacity Utilization for Each Resource and Delays Due to Labor and/or Material Unavailability, Product Flow Time Distribution

2.3 Waiting Line Management

- Arrival Pattern - Exponential, Erlang, General, Empirical
- Service Time Pattern - Exponential, Erlang, General, Empirical
- Queue Joining Discipline - Random, Shortest Line, Jockey, Cyclic
- Job Selection - FCFS and SPT
- Standard Waiting Line Outputs
- Wait Time Distribution

2.4 Project Management

- Critical Path Analysis
- PERT
 - Simulation Capability
- Crashing
 - Linear Programming Solution
- Output
 - Early/Late Start Gantt Chart Format
 - Completion Time Distribution
 - Criticality Index

2.5 Forecasting

- Techniques Available
 - Exponential Smoothing
 - Trend Regression
 - FIT Smoothing
 - Moving Average
 - Simple Average
 - Best of Above
 - Weighted Moving Average
 - Winter's Method
 - Multiple Regression
- Allows for User Determination or Program Optimization of Parameters
- Allows for De-seasonalization and De-trending of Data

- Automatic Plotting of Data, Results, and Deviations from Actual
- Robust Set of Statistical Measures
- Allows for MAD and Forecast Tailoring

2.6 Inventory

- Models Available
- EOQ -- Finite & Infinite Replenishment Rate, Quantity Discounts, Back Orders, Safety Stock
- Joint Optimization of Order Quantity and Safety Stock
- Periodic Review Model-- Safety Stock
- MRP
 - Low Level Coding
 - Different Batching Rules (FOQ, FPQ, LTL, LUC, LTC, Silver Meal)
 - Rescheduling/Expediting Options

2.7 Aggregate Planning

- Up to Three Products
- Up to 24 Time Periods
- Hire/Fire Costs
- Finite Setup Times and Relevant Costs Between Products
- Shift Employment Minimums and Maximums
- Lost Sales, Subcontracting, or Stockout Costing
- Develops Mixed Integer Optimal Solution
- Emulates Chase and Level Production and Workforce Strategies
- Variable Length of Time Periods Allowed

2.8 Quality Management

- Statistical Process Control
- Sampling by Variables (\bar{X} , R, s charts)
- Sampling by Attributes (p, np, c, u charts)
- Several Statistical Tests
- Acceptance Sampling
 - OC Curve
 - Determination of Sampling Plan

3. HOW TO USE HOM

HOM is a powerful software package that allows the user to analyze real-world operating problems. The software is designed to solve problems in the seven key Operations Management areas listed below.

- Project and Time Management
- Process Analysis and Design
- Waiting Line Design and Management
- Quality Management
- Forecasting Demand and Other Variables
- Inventory management and Material Requirements Planning
- Capacity Planning and Management

For detailed information on the capabilities of these modules, please consult their individual help files and technical manuals in the following chapters. The help files will be found in their respective sub-directories under C:\HOM. The technical manuals are WORD documents, and because of their size are placed on the CD-ROM.

The basic operating philosophy behind HOM is to have the user specify (1) broad problem-related input data (i.e., dependent and independent variables for forecasting demand) in a *spreadsheet* format and (ii) data needed for model specification (i.e., the number of periods to forecast in the forecasting model) called *parameters*, in a single dialog box. Data can be exported from and imported to HOM from commercial Windows based spreadsheet packages. Results can be exported to word processing software, commercial spreadsheet programs or saved for future reference. Each HOM module has a unique How to Solve help file, found by using the command line HELP option and then the Index. These help files sequentially move the user through all the steps that are required to solve a particular operations problem. We strongly recommend that the user follow the help steps until he or she has become familiar with a module. In addition to module-specific functions (which are explained in each of the How to Solve help files), there is a set of general capabilities that apply to all modules and are discussed in the How to Get Started help file.

If you are in WINDOWS 3.1, whenever you select HOM, you are always taken to the HOM-module selection window (i.e., the HOM group), which gives you the choice of starting one of the seven HOM analytical modules, the setup icon, or one of several help files. If you are in WINDOWS 95, 98, or NT you will see the HOM on the Start menu under Programs. The manual (the technical assumptions, examples and details that are the analytical underpinnings of each HOM module), and cases (the two comprehensive cases, Ice Queen and United Bank Branch, and the individual cases for each module) are WORD documents and are resident on the CD.

3.1 Menus and Toolbars

The initial window in all modules has the same visual topography: a command line; a tool bar; and an initial spreadsheet window for entering the broad problem input data. It also has the normal Windows dimensioning arrows in the upper right corner and the scroll bars on the bottom and right side for easy horizontal and vertical

spreadsheet movements. As with any Windows-based product, HOM has a tool bar that gives direct access to the most-often-used functions. Again, we use a combination of Windows-specific and HOM-specific icons. The first eight icons are familiar to Windows users and invoke the functions of New, Open and Save files, Print and Preview print files, and information manipulation functions of Cut, Copy and Paste.

The next five icons are unique to HOM. These icons are shown below.



The first icon is in the format of a HOM Parameters Dialog box and allows the immediate jump to this dialog box from any stage in the problem-solving activity. However, if you have not input the basic data on the variables under analysis, the Parameters box will allow you to enter information, but not finally function (i.e., clicking on OK to exit to the next step will produce an error message that reminds you to input the base data, which can be done by clicking on Cancel and returning to and completing the base Data spreadsheet). The second icon unique to HOM is in the form of a graph, and it will automatically plot the data, if feasible, for the last specified variable. If no data exist, it will depict just the x and y axes. The third icon is in the form of a jogger and will automatically Run the last problem that was specified within the Parameters window. The fourth icon is in the form of a graph and text document and will display the Results of the last run. If you want to view a previously saved result, you must use the Results function on the command line and then use the Open option to retrieve any previously saved results. The fifth icon is in the form of a hand writing and is used to create a Log file for a data file or a result file. The log file is time stamped and useful for storing notes about what-if scenario analysis.

The last two icons in the HOM icon line allow the user to (1) get more general information about the current model, and (2) use a Bubble help for particular items. The Bubble Help is activated by clicking on the last icon, moving the cursor (notice the question mark comes with you), and clicking again on the item in question once the cursor has been moved to it. An explanation of the topic will then appear on the screen. Certain icons cannot be used during certain parts of a problem analysis. These will appear in light gray and you will be unable to invoke them at that time (e.g., the parameter's icon when a current result is on the screen).

4. INSTALLATION, FILE MANAGEMENT AND DOCUMENTATION

HOM will be installed in the directory C:\HOM. The seven HOM modules and cases are installed under the sub-directories of C:\HOM as shown below.

- Project and Time Management in C:\HOM\PROJMGMT.
- Process Analysis and Design in C:\HOM\PROCESS.
- Waiting Line Design and Management in C:\HOM\QUEUE.
- Quality Management in C:\HOM\QUALITY.
- Forecasting Demand and Other Variables in C:\HOM\FORECAST.

- Inventory Management and Material Requirements Planning (MRP) in C:\HOM\INVENTORY.
- Capacity Planning and Management in C:\HOM\AGGPLAN.
- Quality Management in C:\HOM\QUALITY.
- Cases in the CD.

Help files pertaining to the individual modules will be found in the respective sub-directories. There are eight technical manuals because Independent demand inventory management and MRP modules are described in separate manuals. These manuals are WORD documents located in the CD in a folder called "MANUALS." These can be opened, copied, or printed. The screen shots given in the manual will not appear as clear on the screen as they appear when they are printed. Please contact your Irwin/McGraw-Hill representative to order a copy of a color, indexed, and bound copy of the technical manuals.

Data files in HOM are given the extension DAT with the exceptions of MRP files which have the extension MRP and Quality Management Files (with extensions VAR, ATT and ACP). Result files are given the extension RES. These files unless explicitly specified by the user, will be saved in the respective sub-directories.

4.1 Manuals and Cases

Manuals are located on the CD under the folder called MANUALS. The names of the manuals are listed below.

<u>Module</u>	<u>Manual</u>
Project and Time Management	PROJECT.DOC
Process Analysis and Design	PROCESS.DOC.
Waiting Line Design and Management	QUEUE.DOC.
Quality Management	QUALITY.DOC.
Forecasting Demand and Other Variables	FORECAST.DOC.
Inventory Management and Material Requirements Planning (MRP)	INVENTORY.DOC and MRP.DOC.
Capacity Planning and Management	AGPLAN.DOC.

Several cases are located on the CD under the folder called CASES. The names of the cases are given below.

Project and Time Management -- Toys City in	TOYS.DOC.
Process Analysis and Design –	
Violet Film in	VIOLET.DOC
Mathew's Mug and Muffin in	MATHEW.DOC.
Tenafly Bagels in	TENAFLY.DOC.
Waiting Line Design and Management -- Northeast Island Airs in	NEISLAND.DOC.

Inventory Management -- Nut Case in	NUTCASE.DOC.
Capacity Planning and Management -- CB Check Processing in	TCBCHECK.DOC.
Integrated Cases	ICEQUEEN.DOC
	UNITED.DOC.

A comprehensive tutorial case (Mastercraftsmen of Newport) with data files and sample outputs can be found under the CD folder TUTORIAL. The data files for this tutorial case are found under each module sub-directory (for example, the data files pertaining to inventory, MAKETBLI.DAT & MAKETBLM.MRP, are located in C:\HOM\INVENTORY). In addition to the software and the Tutorial Case, this package contains two integrated cases, Ice Queen Snow Blowers and United Bank Branches, that allow the user to apply many of the above models within a single organizational setting. Ice Queen presents a set of problems faced by a manufacturer of snow blowers, United Bank Branches presents a set of problems faced by a money center bank trying to gain efficiency by merging two branch locations. Cases involving only one task area (for example, Toy City Audit for Project and Time Management), as well as information-only databases for some classic Harvard Cases (for example, forecasting input data for the *Blanchard* case) are also included as listed above. Data files for all sample problems mentioned in the technical manuals are included in each module directory. Solutions to the cases are available upon request from the Authors (please email request to: mmoses@stern.nyu.edu or ssesadr@stern.nyu.edu).

Solutions to the problems in Stevenson Production/Operations Management 6/e and Chase, Aquilano and Jacobs Production and Operations Management 8/e are also available and can be downloaded, after registration, from the world wide web: <http://www.stern.nyu.edu/HOM>.

We recommend that you approach the use of any HOM module by first reading its help file and then working through that part of the Tutorial Case that pertains to the module.