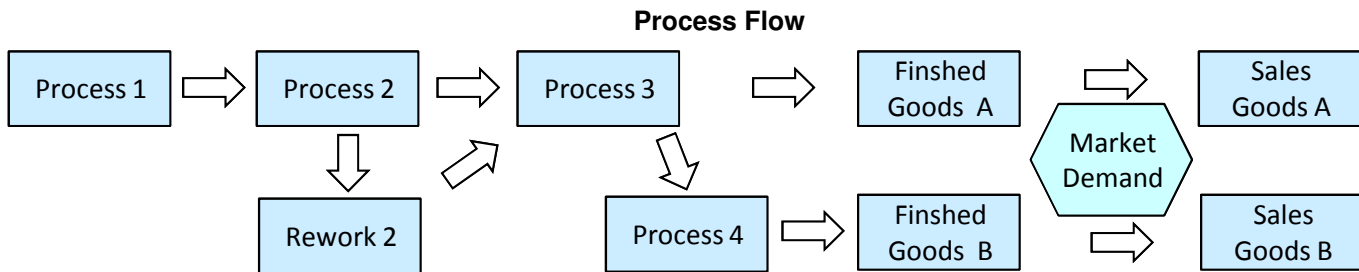


## User Guide for Operations Analysis Template

### Description of the Operations Process Flow Template

Below is a sample of the kind of dynamic (manufacturing or business) process flow that this model can simulate. Not all features are available in the Standard Version.



- The process flow is described by a transition rates between processes that can vary with time.
  - The model tracks yield units and percent and scrap units and percent for each process stage.
  - Each process has capacity limits determined by the number of pieces of processing equipment.
  - Transition rates can vary with time. This particular model has transition rates that are constant over time.
  - You can input outsourced units into any stage in the flow.  
(The model inserts outsourced units only in Process 1 and in finished goods inventory at the first time step.)
- Tracks processing costs by process stage by type of cost input by time period.
  - Reports costs per unit in/processing/out and aggregate costs in/processing/out for each stage.
  - Allocate cost less salvage value of scrapped units to good output units at each processing stage.
  - Separate worksheets show costs with and without breakout of material/labor/capital expense/overhead.
- Tracks accumulated cost of a good unit entering and exiting each stage by type of cost by time period.
- Tracks units scrapped and cost of scrap at each process state by time period.
- Reports costs and accumulated costs per unit, by cost type and by time period.
  - Cost of a good unit entering a process stage
  - Cost of a processing a unit at a process stage
  - Cost of a good unit exiting a process stage
  - Cost of scrapped units at each process stage
  - Allocates cost less salvage value of scrapped units to good output units at each processing stage.
  - Separate worksheets show costs with and without breakout of material/labor/capital expense/overhead.
- Sales
  - Sales of Products A and B are driven by market demand and limited by available finished units.
  - You can sell the output of any process stage. (In this particular model, only output of two stages are sold.)
- Financial results: Model include prices, revenue COGS, and gross margin for units sold.
- Scenarios
  - Handles multiple scenarios to compare alternative processes.
  - This model has two scenarios in which Scenario 2 raises yields and increases input costs in Process 3.
- The model includes Excel charts that provide graphical views of key variables. These charts are part of the model, and they are included by default in exported Excel workbooks. You can add more charts, import them, and the new charts will be included in exported Excel workbooks.

## Instructions for Using Operations Analysis Template

### 1 Let the template tell you how it works

The template has four main facilities to help you learn how it works.

- Throughout the template, section titles, variable names and Excel comments provide information about the template and the computations behind it. The Excel comment for each variable is repeated for each display instance of a variable.
- Worksheet “Labels” contains a glossary of variables and dimensions in the template.
  - It lists all the variables in the model, accompanied on the right by the explanatory comment for each variable.
  - It lists all the dimensions and their dimension items, accompanied on the right by the explanatory comment for each dimension.
- The Excel workbook contains Excel collapsible groups that you can open to see detailed information or close to get an overview of the information on each worksheet.
- Worksheet “Formulas” contains a list of the symbolic formulas that define values of variables in terms of numerical constants and other variables.

The template is derived from these symbolic formulas by ModelSheet. Although these formulas are not executable in Excel, they often provide the quickest route to understanding what the computations are doing, avoiding the need to decode dozens of Excel formulas written in terms of cell addresses.

Of course, you can read the Excel cell formulas.

If you want to follow the model logic, we suggest that you first explore how production units flow through the process, and explore the flow of costs second. The reason for this is that the units flow is smaller and self-contained, whereas the cost flow depends on the units flow, so it involves all the variables in the units flow plus many more.

### 2 Editing Data in the Excel Template

You can enter input data in shaded input cells (usually dark blue). Most of the input data is on worksheet 'Inputs'. You can edit display names of variables and dimension items on worksheet 'Labels' (and in some templates the input cell for Model Start Date is located at the top of worksheet 'Labels'). Putting most inputs in one or two places eliminates the need to search the workbook for input cells.

### 3 Customizing the Excel Template

You can customize the workbook further on the worksheet “Labels”.

- Change the model start date (at the top of the worksheet).
- Change the display name of any variable, dimension or dimension item.
- Edit the comment associated with any variable or dimension. The new comments will not propagate through the workbook.

If you want to include these changes in a future version of the template, you can re-import them into ModelSheet, which will include them in any future version of the template exported from ModelSheet.

## 4 Further Customizations

This template has additional features that can be turned on or added, such as learning curve effects, lot size scale effects, recruiting costs and more.

In addition, ModelSheet Software can extend the template in new directions to meet your requirements, on a project basis.

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### Technical Notes

These facts should help you understand how production units flow through the model.

- At each process stage, units available for processing (UNITS AVAILABLE IN) are either sent for processing (UNITS IN) or, if processing capacity is exceeded, sent to buffer inventory storage (UNITS BUFFER STOCK).
- The Processing capacity (UNITS CAPACITY) of each stage is determined by the number of PROCESSING STATIONS times the CAPACITY/STATION.
- The units that enter each processing stage either emerge as good output units (UNITS OUT), or as scrap (SCRAP UNITS). YIELD % of the units come out good and SCRAP % units come out as scrap.
- At the end of each time period, good units are either sold (UNITS SOLD), or routed by the stage transition matrix (TRANSITION %) to other processing stages for use in the next time period (UNITS AVAILABLE IN).
- The number of units sold is the minimum of the units available for sale at the end of each time period (UNITS OUT), and the amount of market demand (UNITS DEMAND).
- The operation can purchase work-in-process units for any processing stage at the start of any time period (PURCHASED UNITS IN). In this model, the operation purchases material inputs for stage one in each time period, and it purchases finished goods in the first time period to fill the distribution channel.
- The model has two scenarios (SCENARIO) that have different scrap rates and different processing costs in process stage 3.

These facts should help you understand how the costs flow through the model.

- The value of work in process inventory that enters each stage (WIP IN) plus the PROCESS COST equals the value of good units out (WIP OUT) plus the value of scrap (SCRAP COST).
  - Worksheet UNIT COSTS shows cost allocated per production unit for each unit stock or unit flow in the model.
  - The costs are presented in two levels of detail.
    - Worksheet COST FLOW shows the flow of costs with costs of all types aggregated together.
    - Worksheet COST FLOW DETAIL shows the flow of costs with material, labor, overhead, and allocations of fixed expense broken out for each cost variable.
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