



Manufacturing Foundation

Microsoft Business Solutions–Navision

White Paper

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Introduction

A step beyond manual planning, Manufacturing Foundation is designed for the production manager who wants a simple overview of the production process while avoiding the complexity and expense of full Material Resource Planning (MRP).

However, the features are accessed from the main menu of Microsoft Business Solutions-Navision and so are available to all relevant parties within your business not just those responsible for order planning and production scheduling. For instance, a sales manager can access the functionality to advise a customer on the availability of a product or check the production status of urgent orders.

Key Benefits

In summary, Manufacturing Foundation Navision helps you:

- Achieve the adaptability necessary to take advantage of new revenue opportunities
- Develop more responsive customer service
- Continually improve business performance – from shop floor to bottom line

Key Functionality:

The key functionality in Manufacturing Foundation includes:

- Manual Planning
- Graphical Scheduling
- Direct Production Reporting

What is Manufacturing Foundation?

Manufacturing Foundation adapts Microsoft Business Solutions–Navision to suit the needs of small manufacturers as they exist today.

The Manual Planning feature is a simple supply planning tool that functions as a Material Resource Planning (MRP) system, where you make planning decisions on an order-by-order basis.

An alternative to printed production schedules, Graphical Scheduling pushes core information to your desk top, allowing you to adapt your manufacturing methods and process quickly and confidently.

Direct Production Reporting allows you to post and track material flow directly from the context of a production order.

Why has Manufacturing Foundation been created?

The key strategic benefits of Manufacturing Foundation are that it can be easily deployed and adopted by a mass market and that it also appeals to Independent Solution Vendors (ISVs) as a platform for growth. This is critical to the Navision product line.

The key objectives of Manufacturing Foundation drive the strategic goals above by enabling:

- Scalability
- Quick and easy implementation
- Visibility of a work in progress
- Support for Order-by-Order Planning Workflow
- An attractive Entry Price Point and Support for a Phased Implementation

What is the Target Market of Manufacturing Foundation?

The target market for Manufacturing Foundation can best be described as small production companies that do not need all of the advanced manufacturing features of Navision 4.00. They perform some form of manufacturing and/or assembly functionality and have the following approximate characteristics:

- \$4-10 mill revenue
- 20-50 employees
- 5-15 users
- Informal information flow
- Overlapping roles
- Agility
- Manual processes
- Some focus on material planning (assembly-centered)
- Others focus on capacity planning (subcontractors)

The main target user is a Production Manager with many tasks: quoting price and delivery for new item configurations, production planning (mostly manual), material requisition, order reshuffling and prioritization (in cooperation with the Sales Manager), capacity management, production reporting, and after calculations. However, as mentioned above, Manufacturing Foundation can be used by relevant employees across a business.

Why is this functionality important to the Target Market?

The target customers need more than a basic financial package but are not able or willing to handle a full Manufacturing package mainly because of the associated data and skill requirements.

Manufacturing Foundation functionality provides simple planning functionality at an affordable price to the companies that are not in need of advanced material and capacity planning. Manufacturing Foundation will also enable Microsoft Business Solutions to recruit Manufacturing Foundation ISVs with limited manufacturing experience and skills.

Key functionality in Manufacturing Foundation

The Key areas of functionality in Manufacturing Foundation are:

- Manual Planning
- Graphical Scheduling
- Direct Production Reporting

The sections below are selected extracts from 'Quick Guides- Manufacturing Foundation', a word document that is installed on each user's PC under the 'Navision Installation'. This section of the Manufacturing Foundation Whitepaper uses selected key functionality to provide an overview of the functionality and what it can do.

1. Manual Planning

Plan for new demand (Quick guide 1)

This planning task can be performed in the Order Planning window, which displays all new demand along with availability information and suggestions for supply. It provides the visibility and tools needed to effectively plan demand from sales lines and component lines and then create different types of supply orders directly.

Level-by-Level Principle

The Order Planning window uses parts of the MRP logic in Navision, except, it only considers one product level at a time. Therefore, it will only propose to create production orders for one production BOM level at a time, and if those new production orders introduce new demand, the plan must be recalculated (Calculate Plan) to pick up that second-level demand.

Impact on Availability

Order quantities displayed in the Order Planning window are merely proposals, and they are therefore not included in the program's total availability calculations.

Links between Demand and Supply

Supply orders made through the Order Planning window are not necessarily tied to the demand that they were made for - other demand may take this supply at a later stage. This is the normal principle of the MRP logic in the program, and accordingly, there are only 2 ways to tie demand to supply: Using the Make-to-Order manufacturing policy, and using reservations. The Order Planning window supports both and even allows you to reserve directly from the planning line. As alternative to the hard ties represented by reservation, the program can be set up to create soft links automatically between demand and its planned supply. These can be seen in the Order Tracking window under most order documents and also under the Order Planning window. The order tracking entries shown are dynamic and only exist as long as the planned supply is available. To enable order tracking, the item being planned must have the Item Tracking Policy field set up on its item card.

Rules

The level-by-level principle and the high degree of flexibility mean that the Order Planning tool should be used according to certain rules to avoid generating unnecessary dependent demand.

If the window shows multiple demands on different dates, it is advisable to always start with planning lines at the top, those with the earliest demand date, and then make the necessary supply orders before moving down the list.

When you plan for produced items with multiple production BOM levels, it is advisable to plan all levels in the same work flow (create order, calculate plan, create order, calculate plan...) before moving on to planning lines for other items.

If you use the requisition or planning worksheet, you should be aware that supply orders created through the Order Planning window may be changed or deleted during the planning run from these worksheets. This is because the automatic planning uses parameters (on right-hand side of the Planning tab on the item card) and these may not be considered by the user who made the manual plan in the Order Planning window.

The presence of multiple demand lines in the Order Planning window offers an opportunity to make consolidated planning based on the overview provided. For example, in case of multiple demand lines for identical items within the same (or proximate) demand date, you have the opportunity to overview the total needed quantity of several lines and consolidate them in one supply order. However, a certain amount of care must be taken to ensure that changes are only made to intended lines.

To Plan for New Demand

You can enter the Order Planning window in two ways depending on your focus:

To Plan for a Specific Production Order

1. From a planned, firm planned, or released production order, click Order, Planning.
2. In the Order Planning window, click Functions, Calculate Plan.

The window displays planning lines according to the view filter Production Demand – meaning unfulfilled component lines of all existing production orders. The system deliberately does not show demand only for the production order in context because it is “risky” to plan for one production order without overview of demand for potentially earlier components lines. Planning lines for the production order in context are expanded. (The procedure continues below.)

To Plan for Any New Demand:

1. Click Order Planning (from the Navigation Pane).
2. In the Order Planning window, click Functions, Calculate Plan.

The window displays planning lines according to the view filter All Demand – meaning sales order lines as well as production component lines with insufficient availability. You can change this filter as you like.

When the plan is being calculated, the system analyzes any new demand that has arisen since a plan was last calculated. It calculates the needed quantity, based on total availability, of each demand line found. This calculation is done order-by-order – meaning that the order which includes the demand line with the earliest due/shipment date is considered first, and all other demand lines in that order, irrespective of their individual due/shipment dates, are also calculated for that order. Therefore, all planning lines under one order header line have the same demand date. When the calculation is completed, it displays all unfulfilled demand as planning lines sorted by earliest demand date and with the various quantity fields filled in.

The Order Planning window is filled with order header lines representing orders with unfulfilled demand.

Note: If there is no unfulfilled demand, the system will display a message saying no planning line is created.

The Demand Date field contains the earliest shipment/due date of a demand line in the order.

The Demand Type field shows whether the demand is from sales lines (Sales) or component lines (Production).

The Description field contains:

- The description of the produced item, in case of production demand. (Customer name, in case of production demand from a project production order, see also Plan a Project Order – Use Guide 4)
- The customer name, in case of sales demand

The first planning line has the earliest demand date and you should therefore plan this line first. To see the actual demand lines (sales order lines or component lines) of each order header line, you must expand the line.

3. Click the triangle icon in the Expand field (Ctrl-Shift-A) or click Functions, Expand All to see the underlying planning lines that represent demand lines with insufficient availability.

For each expanded planning line (demand line), you can see values in information fields at the bottom of the window:

- Available for Transfer – if the item exists on another location. You can then look up and select it.
- Substitutes Exist – if a substitute item is created for the item. You can then look up and select it. Note that this feature only applies to components, that is, from demand lines of type Production).
- Quantity Available – showing the total availability of the item (Projected Available Balance).
- Earliest Date Available – shows the arrival date of an inbound supply order that can cover the needed quantity on a date later than the demand date.

4. Select in the Replenishment System field which type of supply order to create.

The default value is that of the item card (or SKU card), but you can change it to one of 3 options:

- Purchase – to create a purchase order
- Transfer – to create a transfer order
- Prod. Order – to create a production order

5. In the Supply From field you must select a value according to the selected replenishment system.

Note: If the field is not filled in, the system will display an error message when you use the Make Supply Order function, and no supply order will be created for the planning line in question. This, however, is not the case if the replenishment system is Prod. Order.

6. From the Supply From field, look up in the relevant list and select where to supply from:

- If replenishment system is Purchase, the field looks up in the Item Vendor Catalog window.
- If replenishment system is Transfer, the field looks up in the Location List window.

In case the demanded item exists on another location, the Available for Transfer field at the bottom shows a value and you can then look up and select the location from which the item should be supplied when you make the transfer order.

In case a substitute exists for the demanded item, the Substitute Exists field at the bottom contains a Yes, and you can then look up to the Item Substitution Entries window and select the substitute.

7. Place a check mark in the Reserve field if you want to make a reservation between the supply order you are creating and the demand line (sales line or component line) that it is created for. It is empty by default.

Note: You can only place a check mark if the item has Optional or Always in the Reserve field on its item card.

8. In the Qty. to Order field, you can enter the quantity that will go on the supply order you are creating. The default value is the same quantity as that in the Needed Quantity field. But you may decide to order more or less than this quantity based on your knowledge of the demand situation. If, for example, you see in the Order Planning window that several unrelated demand lines are for the same purchased item, and they are due around the same date, you can consolidate these by entering the total needed quantity in the Qty. to Order field of one line, and then delete the other, obsolete planning lines for that item.

9. In the Due Date and Order Date fields, you can enter the dates that should apply to the created supply orders. These 2 fields are interrelated according to the Default Safety Lead Time field (under Manufacturing Setup). By default, the Due Date is the same as the Demand Date, but you can change this as you like.

Note: If you enter a date later than the Demand Date, the system will warn you, but *will* allow the change.

To Make Supply Orders

When you have finished your planning work in the Order Planning window, for example defined an alternative way to supply the quantity, you can proceed to create supply orders for one or more of the planning lines.

1. Place the cursor on a relevant planning line and click Make Orders.
2. In the Make Supply Orders window, on the Order Planning tab, select one of the following:
 - For the Active Line – to make a supply order only for the line where the cursor is placed.
 - For the Active Order – to make supply orders for all lines in the order where the cursor is placed.
 - For All Lines – to make supply orders for all lines in the Order Planning window.
3. Define on the Options tab what kind of supply orders, or requisition worksheet lines, should be made.
4. (Please click the Help button to get more information about the options.)

Note: The settings you last made in the Make Supply Orders window will be saved under your user ID so that they are the same the next time you use the window.

5. Click OK to have the system make the suggested supply orders or requisition worksheet lines.

You have now planned for the unfulfilled demand by making respective supply orders. Details about specific work flows when using the Order Planning window would depend on a company's internal policies.

Note: The supply orders you create may introduce new dependent demand, for example for underlying production orders, and you should therefore click Calculate Plan again to find these and deal with them before moving down the list.

(Please reference the online Help for additional information about fields in the Order Planning window. Select a field and press F1, or click the Help button in a window to get overview and procedural descriptions).

2. Graphical Scheduling

Reschedule an Operation (Use Guide 5)

When production orders are first created, either manually or through planning, they have realistic, but not necessarily optimal, start and end times for operations– this is called 'rough scheduling'. In this automatic scheduling, the system considers different requirements, such as capacity need, capacity availability, and due dates and then it places (loads) operations in the calendar backwards from the production order due date. The more production orders created for the same (or proximate) due date, the earlier the starting date of the last one created. This logic functions well and provides a solid foundation, but it does not load the production resources optimally and you may therefore want to perform rescheduling – also called fine scheduling.

Rescheduling can be defined as changes you make concerning:

- The starting and ending times of individual operations
- The production resources that operations are performed at

Prior to rescheduling, you should make any necessary changes to the production order requirements, which influence the capacity need. These include changing components and/or operations, increasing the order quantity, changing the due date, etc. (See Refresh/Replan a Production Order).

Another requirement, which you can change and thereby affect the schedule, is the total capacity (time units) available according to the respective work center calendars used (see Create a Work Center Calendar – Setup Guide 4).

Production Schedule

Rescheduling can be performed in the Production Schedule window, which is a Gantt chart that represents all ongoing production orders and their respective loading of production resources. It is fully integrated with the rest of the system and allows you to reschedule operations by drag and drop in this graphical interface and thus update the related production order data. Note that the Production Schedule window does not provide scheduling functionality that cannot also be done in the underlying production order routings, task lists, load windows, etc. It is primarily a consolidation of all scheduling-specific data in one graphical interface, thus providing much improved overview and simplicity of use for different user roles.

The Production Schedule window is not "live" like other Navision windows. The changes you make in it do not affect other production order data until you click Save (or confirm to save when leaving it).

Interaction Pane

The Production Schedule window is designed around one main interaction pane where process bars representing operations are placed horizontally along a time line, and vertically according to a reference of production order or production resource. The pane can be displayed in 2 different views each setting a different reference on the vertical axis:

- Production Order View - The vertical axis shows which production orders the operations belong to.
- Resource view - The vertical axis shows which production resource each operation is produced at.

You can interact in the pane by dragging operations horizontally along the time scale or vertically along different production orders or resources (as defined by the above view). With every move you make, there is a real-time check against all affected data, which disallows "impossible" actions. The system generally allows much flexibility, and most warning messages concern operations that overlap, have already started, or conflict with simultaneous changes by another user.

When you right-click on an operation, the system provides a function to automatically schedule related operations correctly after you have manually moved one operation out of its sequence. When you right-click anywhere in the interaction pane, you can select to show progress of each operation.

Load Histogram

The Production Schedule window also offers a load histogram, which is placed under the interaction pane. Each load column is directly under the related operations and displays at all times the capacity quantity (in time units) that the operation allocates to the resource. If the allocated quantity exceeds a resource's maximum capacity (e.g. after moving an operation), the load column will show red allocation above the capacity limit of that resource indicating overload - and a need to reschedule.

View Settings

With the Resource View selected, you can define which resources, machine centers and work centers; you want to see load histograms for. This is done in the Show Load column by setting check marks for the resources in question. Note that the split bar above the histogram pane may need to be lifted to show all the load histograms selected with the check marks. Also, the system will not keep in its memory your view settings once you leave the view.

In the Production Schedule Setup window, you can enter a starting date and ending date to define the total horizon of the window's time line. Here you can also set up how to show progress in the interaction pane. (Please read the online Help for more information about these fields.)

Concerning the number of days shown, the initial view (in decreased window size) is set to 4 days after today's date (marked with a red line) and 1 day before today's date. This is the default initial view, but you can drag the time scale forward or backwards to show more or less days within the total horizon defined with starting/ending days.

The Production Schedule window can be opened from several places in the system and this will govern its view setting when it first appears:

- If opened from the main menu, it will show all existing production orders as gray operations.
- If opened from a production order (or production demand line in the Order Planning window), it will show all existing production orders and all operations pertaining to the order in question will be blue.

Information

It is not possible to look up to related information such as production orders or work center cards from the Production Schedule window, but tooltip texts are available for all critical data shown in the window, for example: If you place the cursor on an operation, a tooltip text pops up showing order number, order status, operation starting and ending times, production resource, customer name, and more. The same goes for the different view references, resources or production orders to the left of the interaction pane. While lookups are not possible, you can still toggle back-and-forth from this window and other windows in the program.

Others forms of information are operation progress, shown as a percentage amount on the operation, and operation links in the form of orange lines between interrelated operations. (Show progress and operation links are enabled from the right-click function.)

Save / Close

In this respect the Production Schedule window functions like Microsoft Office applications:

- Click Save when you wish to save changes – and reply Yes or No to the message
- Close the windows without having saved changes – and reply Yes, No, or Cancel to the message
- Close the window after having saved changes or not having changed anything – no message is shown

Reschedule an Operation

You can enter the Production Schedule window from different places each causing a slightly different behavior:

To Enter for a Specific Production Order

1. From a planned, firm planned, or released production order, click Functions, Production Schedule.

Note: The can also open it from the Order Planning window, from a planning line of demand type Production.

The Production Schedule window opens showing all existing production orders (except simulated and finished). The operations for the relevant production order are highlighted with blue color.

Note: The relevant operations may not be visible within the default view when the window opens (see below).

To Enter for any Production Order

1. Open the Production Schedule window (from the Navigation Pane). (See also Check Order Progress.)

Note: You can also open it from the Order Planning window, from a planning line of demand type Sales.

The Production Schedule window opens showing all existing production orders.

1. Locate the operation that you wish to reschedule.

A tooltip text displays all relevant information when you place the cursor over an operation.

To Adjust the View

1. Maximize the Production Schedule window by pressing Alt + space + x or click the Maximize button.

2. Zoom in and out by pressing Shift + keys +/- or press Shift + right/left mouse button.
3. Click and drag the time scale right or left to show more or fewer days.
4. Click the Production Order View/Resource View button to see operations in the context of orders or resources.
5. Click the expand/collapse icons (+/-) to see the production resources performing the operations.

To Move Operations along the Time Scale

The system allows you to move operations along the time scale – within the constraints of the production data.

1. Right-click on the operation and select Show Links from the menu. (This is very useful if there are related operations, see also Step 3)
2. With the cursor on the operation, click and drag the operation bar horizontally to change its starting/ending times.
3. Right-click on the operation and select Schedule previous/next operations to reschedule related operations automatically according to the manual move you have made.
4. Right-click on the operation and select 'Restore Initial Values' to cancel all changes made to the operation(s) since the Production Schedule window was opened or saved.

To Move Operations between Resources

The system allows you to move operations to other production resources – within the constraints of the production order data and resource setup.

Note: this is only possible in the Resource View.

1. Select the Resource View.
2. Click once on the operation to enable it for a vertical move, (indicated by black dots around the operation).
3. With the cursor on the operation, click and drag the operation bar vertically to move it to another resource.

During both of the above rescheduling tasks, the system shows different types of messaging:

A tooltip text box is displayed while you drag, showing the changing starting/ending times.

If you drag the operation so far forward in time that it, or a related operation, exceeds the due date (shown as red square), then the operation and all its related operations are shaded with a hatch pattern.

If you drag the operation to a starting/ending time that exceeds those of related operations, the following message is shown: "The operation sequence is violated. Do you want to move the operation anyway?"

In many cases you can click 'Yes' to this message as you are in the process of moving related operations.

If the operation has already started (output is posted), the system will disallow the move and display a message.

If the operation is marked as finished (on the production order routing line), the system will disallow the move and display a message.

If a subcontract purchase order date is violated when moving an operation, the system will show a warning.

If production order data is changed since you last opened or saved the Production Schedule window, a conflict message is shown and those changed operation are indicated in the window with cross-hatch shading. Once an operation has been moved, it will have a red border (until the window is closed).

To Show Load

The load histograms in the bottom of the Production Schedule window are constantly updated to display the total time allocated to resources by the operations immediately above them. You can not interact in the histogram but you can select which resources to see the load columns for.

Note: Values shown in load columns are based on an average time span between starting and ending times.

1. Select the Resource view.

- 2 In the Show Load column at the far left of the window, place a check mark by each resource that you want to see a histogram for.

Note: The split bar above the histogram pane may need to be lifted to show all the load histograms selected with the check marks.

To Show Progress

You can have the system show progress (operation output) on each operation. In the Production Schedule Setup window, you can select whether this progress value should be based on:

- Time – run time and setup time posted
- Quantity – output quantity posted (see Register Consumption and Output – Use Guide 7)

3. Right-click anywhere in the interaction pane and select Show Progress from the functions menu.

The system now shows the progress on each operation in the production order as a percentage figure. This figure is defined as the output posted (actual) as a percentage of the total quantity to be outputted (expected).

Note: Component Availability

In the Production Schedule window there are no system checks concerning component availability after rescheduling. The interrelation between Order Planning and Production Schedule is based on an all manual work flow. There is no automation logic between the two. You can say that one is giving new requirements to the other with every action in this work flow.

Therefore, you may have to manually check availability after every rescheduling performed.

(See Check Availability against Schedule – Use Guide 6)

Check Order Progress - Graphical Scheduling continued (Use Guide 9)

This sort of information gathering may be performed by different staff depending on their focus. Sales staff may want progress information for particular production orders, so they can respond accurately to customer inquiries about the status of their orders. Production staff may want to follow the progress of individual operations as part of the ongoing maintenance of the production schedule (this is covered in Reschedule an Operation – Use Guide 5).

The Production Schedule window can be used by sales staff to obtain an overview of the order schedule and the progress of specific production orders. The window can be made accessible anywhere in the Navigation Pane and the level of interaction is simply defined by the user's permissions to the functionality behind the window. For example, a user can not move an operation if that user is not granted permission to the Prod. Order Routing Line table.

To Open the Production Schedule

1. Click Production Schedule (in the Navigation Pane).

The Production Schedule window opens showing all existing production orders (except simulated and finished).

By default, the period shown when the window is first opened (in decreased window size) is 4 days after today's date (marked with a red line) and 1 day before today's date. This initial view can be adjusted, see below.

2. Select the Production Order View (at the bottom) to see operations in the context of their production orders.

3. Locate the production order – look for the production order number in the Production Order column.

Note: A tooltip text displays relevant information when you place the cursor over data in the column.

To Adjust the View

1. Click and drag the time scale forward (to the right) to show fewer days.
2. Click and drag the time scale backwards (to the left) to show more days
3. Click the expand/collapse icons (+/-) to see the production resources performing the operations.

Note: Even with the resources collapsed under a production order, you can see all operations in the order.

To Show Progress

1. Right-click anywhere in the interaction pane and select Show Progress from the functions menu.

The system now shows the progress on each operation in the production order as a percentage figure. This figure is defined as the quantity finished (or time spent) as a percentage of the total quantity to be outputted.

The Show Progress function is indicated by a small blue line underneath each operation bar.

Note: The critical information for sales staff would be the progress percentage of the last operation as this represents the completion of the whole production order.

3. Direct Production Reporting

Register Consumption and Output (Use Guide 7)

This execution task is performed in the Production Journal window. The journal combines the functions of the separate consumption journal and output journals into one journal, which is accessed directly from a released production order. Its main purposes are to manually post the consumption of components, the quantity of end items produced, and the time spent in operations. The values are posted to ledger entries under the released production order: Consumption quantities are posted as negative item ledger entries, output quantities are posted as positive ledger entries, and times spent are posted as capacity ledger entries. Posted values can also be viewed at the bottom of the journal as actual quantities.

Note: Because consumption data is handled together with output data, this journal offers an opportunity to display linked components and operations in a logical process structure: Components indented under their respective operation. This requires that you use routing link codes (see Create Routing Links – Use Guide 8.)

Components without routing link codes are listed first in the journal.

To Register Consumption and Output

1. From a released production order line which is ready for registration, click Line, Production Journal.

The Production Journal window opens showing journal lines for the selected production order line according to the Prod. Order Component and Prod. Order Routing windows. (These again originate from the production BOM and routing assigned to the item that is being produced, see Create a Production BOM – Setup Guide 2 and Create a Routing – Setup Guide 3)

2. In the Posting Date field at the top of the journal, you can enter a posting date that should apply to all lines. The work date is entered by default. The field is meant as a quick way to align posting dates on all lines – if relevant. Note: Posting date entered on individual lines will override this field.

3. In the Flushing Method Filter field at the top of the journal, you can select to also view consumption and output that is posted automatically (flushed) according to the flushing methods defined for the item and resource respectively. On each type of line in the journal, only the relevant fields are editable – the rest are blank and write-protected.

When the journal is opened, it is preset with the quantities to be posted. If nothing is posted so far, all quantity fields will show by default the expected quantities carried from the production order. If partial postings have been made, the quantity fields on the lines will show the remaining quantities. The quantities and times already posted for the order are displayed at the bottom of the journal as actual entries.

Concerning the quantities in the Output Quantity field, you have the option to set up which values to preset when the journal is first opened. This is done from the Manufacturing Setup window, General tab, in the Preset Output Quantity field. (Please read the online Help for this field.)

4. Proceed to enter the relevant quantities in the editable fields – consumption and/or output. Note: Beware that only the output quantity on the last journal line of entry type Output will adjust the inventory level when posting the journal. So be careful not to post the journal, with the expected output quantity preset on the last output line, until all end items are actually produced.

5. Place a check mark in the Finished field of output lines to indicate that the operation is finished.

6. Press F11 (or click Posting, Post) to register the quantities you have entered and then close the journal. If values remain to be posted, the journal will contain these remaining values next time it is opened and the posted values are shown as actual values in the bottom of the journal.

Note: If an item being consumed is blocked, the journal will not post consumption quantities for from the consumption line in question. If a machine or work center is blocked, the journal will not post output quantities or process times for the output line in question.

Warning: If you close the journal without posting, the changes will be lost. Therefore, the system displays a request message allowing you to stay in the journal if you close it by mistake.

The Architecture behind Manufacturing Foundation

The following User Cases will provide a brief outline of elements of the key functionality including common scenarios in which they will be used. Each section is followed by a brief description (some text and a graphic) of the physical design to illustrate how the user case is implemented.

Manual Planning

Turn a Sales Order into a Production or Purchase order

Aim: To initiate production orders or purchase orders for new sales order lines according to defined priorities.

Trigger: Routine search for new sales orders. Alternatively, the Production Manager has been notified by the Sales Person

Precondition: An unplanned sales order exists (including sales on a return sales order).

Post Condition: The sales order demand will be met by sufficient supply; the sales order has been planned.

Step No.	Action	Reaction
1	Production Manager looks for sales orders that he has not handled yet	System displays a list of unplanned sales order lines by priority (shipment date)
2	Production Manager selects a sales order to be planned	System provides an overview over unplanned sales order lines: <ul style="list-style-type: none"> • Quantity needed • Location (possibly) • Date needed • Quantity Available • Quantity on other locations (possibly) • Possible shortage • Possible date where the need can be covered • Start and Due Date in case of ordering supply • Source type (production/purchase/transfer/calculation) • Source code (possibly) (vendor no., transfer-from location, calculation ID)
3	Productions manager decides to plan for the needed quantities	System suggests to create new orders per item
4	Production Manager confirms	System creates production orders, respectively purchase or transfer orders. System updates the sales line with link to the related orders.

Plan for components

Goal in context: To make certain that components will be available in due time before needed on a production order, and, if needed, to take appropriate action to assure this.

Trigger: A production order is about to be planned and the Production Manager wants to get an overview of availability of components.

Precondition: A production order has been created and all related components have been specified. Availability figures are up to date.

Post Condition: No shortage of components. All deficiencies have been solved. May be the production order has been rescheduled.

Normal Sequence

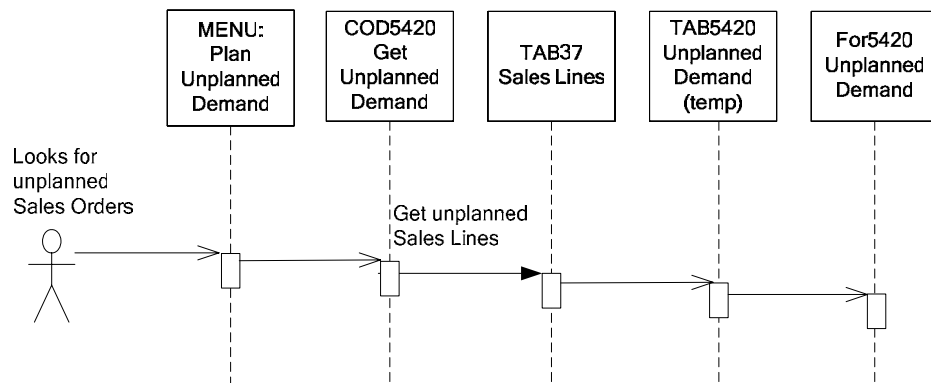
Step No.	Action	Reaction
1	Production Manager opens the production order to see component status	System provides an overview of all related components: <ul style="list-style-type: none">• Quantity needed• Location (possibly)• Date needed• Quantity Available• Quantity on other locations (possibly)• Possible shortage• Possible date where the need can be covered• Lead Time• Source type (production/purchase/transfer)• Source code (possibly) (vendor no., transfer-from location)
2	Production Manager decides to provide the needed quantities	System suggest to create orders
3	Production manager confirms	System creates purchase orders or production orders according to the needed quantity

Extensions

Step	Condition causing branching	Action	Reaction
1a	The component list is very comprehensive	To retain overview Production manager decides to view only components with deficiency problems	System filters out those components that can be covered by the current plans (no shortage)
2a1	Lead time hinders a component from being ready in due time	Production Manager looks for a substitution	System displays possible substitutions and their availability
2a2	Substitute is available	Production Manager selects a substitution	System substitutes the component
2b	Lead time hinders a component from being procured in due time	Production Manager looks for alternative vendors and selects one with a shorter lead time	System changes the vendor for the current need
2c1	Quantity is not available at this location but on other locations	Production Manager wants to search availability on other locations	The system displays availability op the item per location
2c2	System shows that the quantity is available at another location	Production Manager decides to transfer from this location	Systems fills in the source type = transfer and the transfer-from location
3a	The company has a purchasing organization	Production Manager decides to procure needed quantities	System creates requisition lines instead of purchase orders directly.

Manual Planning – Physical Design

Simplified sequence showing objects involved when you need to find and display unplanned sales orders

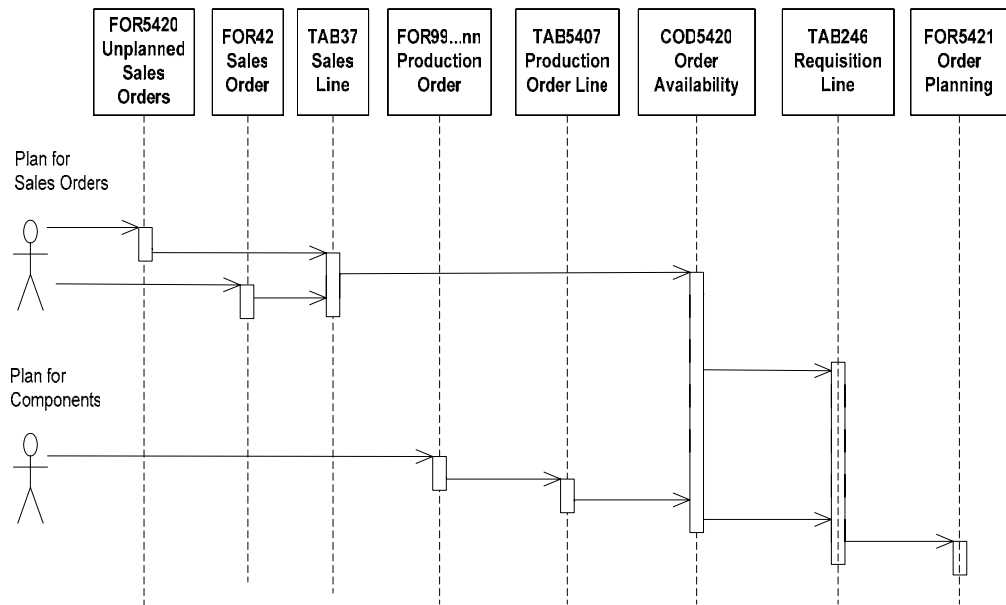


How to meet the demand

Goal for design: To assist the user in creating supply orders to meet the demand from a sales order.

Once the system has aimed at creating a suggestion for a supply order using these settings, the user is able to change any of the default values. For instance, if the item should be purchased instead of produced, the quantity should be something else, and so

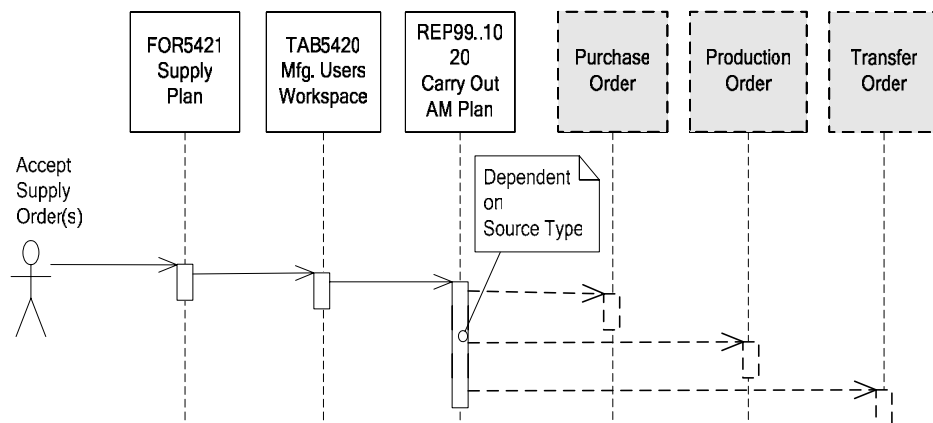
on. If supply from production is the topic, the user should also be able to edit the related routing lines and component lines.



The user has three entry points; the overview of unplanned sales orders, a selected sales order, or, when it comes to planning for component need, a selected production order.

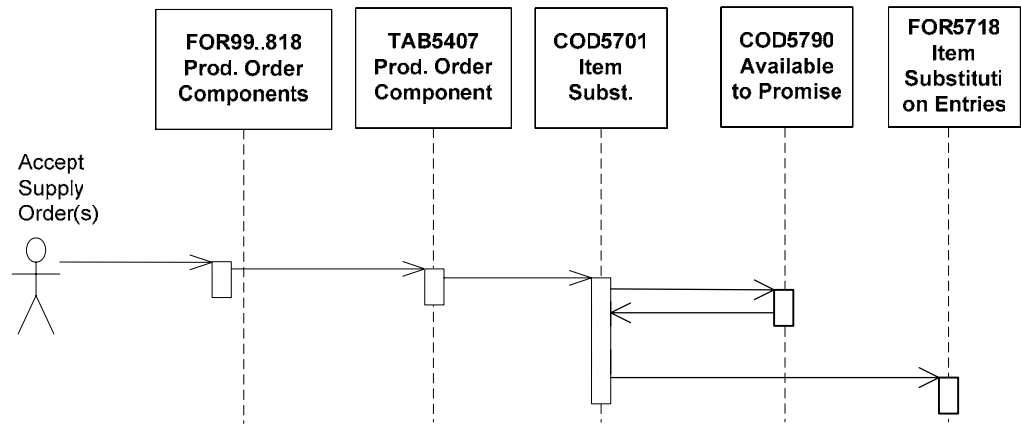
Create Supply Orders

Goal for design: To create supply orders once the user has determined how much to get and from where. Tell the user if orders have been created. Provide the user with a reference to those orders.



Substitutions for components

Objective: To facilitate item substitutions for components in exactly the same way as the current systems offerings for sales orders.



Graphical Scheduling

Schedule Operations

The Production Manager needs a clear overview (preferably graphical) of the current overall production schedule in order to insert the new operation(s) effectively.

Another reason for rescheduling could be that an exception occurs that creates overload in the production, such as a rush order, machine breakdown, etc.

Goal in context: Determine realistic starting/ending dates of each operation in the production order taking into account the current production schedule.

Trigger: Planning for new production orders

An exception (rush order, machine breakdown, etc.) occurred that required rescheduling

Preconditions: Operations and sequence have been defined. Output on existing released operations is registered correctly (UC: Register the Operation Data of a Production Operation). Operations have been roughly scheduled by the system to meet the due date

Post conditions: Automatic scheduled operations are rescheduled manually to fit the capacity situation. Operations of other production order might be rescheduled.

Normal Sequence

Step No.	Action	Reaction
1	Production Manager chooses a new production order to reschedule and wants overview of current scheduled operations including the new ones.	<p>The system provides an overview showing the due date of the production order together with the main scheduling attributes of both each new operation and the current plans for all other operations at each related capacity resource:</p> <ul style="list-style-type: none">• Associated capacity resource• Start date/time• End date/time• Status/Progress <p>The system also gives insight into the load/utilization over time of the involved capacity resources. The system gives a warning if there is overload.</p> <p>The system only shows production orders that still require capacity (do not show finished production orders).</p> <p>The Production Manager will be warned about the following issues:</p> <ul style="list-style-type: none">• Operations that are not started or ended according to schedule• Ongoing operations that do not show the expected progress

Step No.	Action	Reaction
		<ul style="list-style-type: none"> • Due date is exceeded • If the operations are not scheduled in the sequence defined in the routing (including overlapping operations)
2	Production Manager observes that one of the new operations is creating an overload of the related capacity resource. He looks for available capacity, finds room, and decides to reschedule the operation forward. (This might be repeated for all operations)	The system allows the operation to be rescheduled in a simulation mode. If that is going to violate the operation sequence or will create overlap, the system asks whether to push all the succeeding operations. (If declined, the system disables this warning for the current production order)
3	Production Manager has eventually placed all new operations properly in relation to the available capacity and confirms the simulated schedule.	The system makes the changes visible to other users who want to see the current operations schedule. Only operations that have been rescheduled are updated. Possible change in sequence is updated.

Extensions

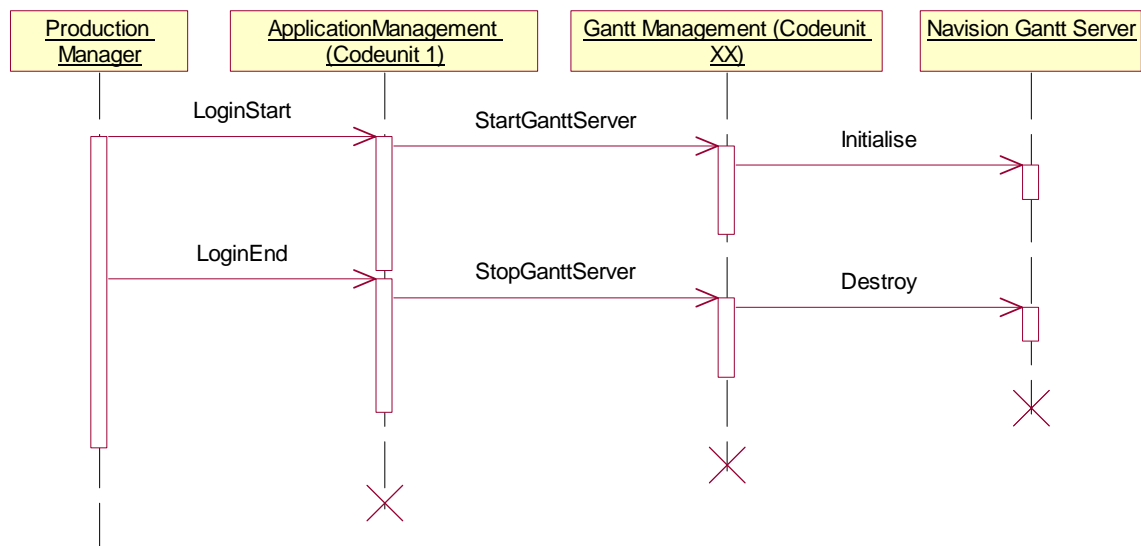
Step	Condition causing branching	Action	Reaction
1a	Production Manager wants to see details on the production order for one of the operations in the current plan	Production Manager selects the operation and calls for details.	The system shows: <ul style="list-style-type: none"> • Production order number • Status • Customer name • Sales order number • Due date • Item name • Quantity
1b	Production Manager wants to see details on the operation	Production Manager chooses to see operation details.	The system shows following details for the operations: <ul style="list-style-type: none"> • Production order number • Work center • Start and end date/time • Operation status including progress (time spent, output)
2a	Production Manager cannot find the needed free capacity on the defined resource	Production Manager finds free capacity on another suited resource and decides to move the operation	The system allows an operation to be moved to another capacity resource and updates the load accordingly
2b	By scheduling forward the production order due date violates the due date of the demand it is going to cover	Production Manager schedules the last operation forward	The systems gives a warning
2c	There is available	Production Manager	The system allows the operation

Step	Condition causing branching	Action	Reaction
	capacity before the current schedule	decides to schedule an operation backwards in time	to be rescheduled in a simulation mode. If that is going to violate the operation sequence or will create overlap, the system asks whether to push all the preceding operations. (If declined, the system disables this warning for the current production order).
2d	The operation has already been started (output has been registered or a subcontracted order has been created)	Production Manager reschedules operation	The system gives a warning
2e	The Production Manager is trying to move a subcontracted operation for which a purchase order already has been created.	Production Manager reschedules operation	The system gives a warning
3f	Production Manager wants to discard all the changes	Production Manager selects to cancel.	The system closes the simulated schedule without updating the current schedule

Graphical Scheduling - Physical design

Launch a Gantt Server

The sequence diagram below shows an instant of Navision Gantt Server.



Navision Gantt Server: This refers to an ActiveX EXE that will wrap Netronic Gantt OCX component. This will be written in Visual Basic.

Gantt Management Codeunit

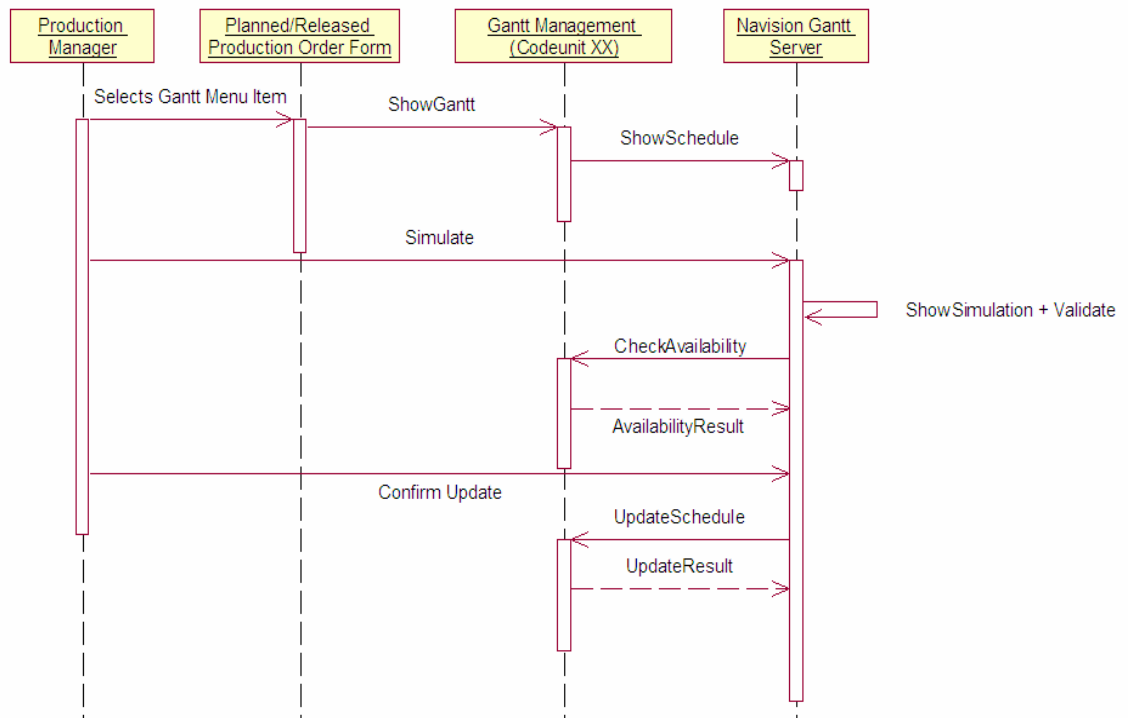
This will be a single instance codeunit, responsible for:

- Instantiating Navision Gantt Server
- Encoding and sending messages to Navision Gantt Server

- Receiving events from Navision Gantt Server

Show Gantt

Diagram below depicts sequence of calls between Navision and Gantt server, when a Production Manager selects to see Production Order schedule on a Gantt.



Direct Production Reporting

Register Operation Data

Problem Scenario: The Production Manager or Machine Operator (MO) must register the progress on operations at specified intervals (end of the day, after a certain quantity, after each unit, end of an operation, end of an order, etc.). This data must be registered into the system so that it can calculate and display items such as:

- status of orders
- what each MO is working on
- possible bottlenecks
- data for after calculation
- inventory updates

The most common registration method is for the MO to hand- write quantities on a physical job card and hand it in to the Production Manager for him to enter into the production order. This involves time consuming manual entry of data that is often crucial to the Production Manager in making quick rescheduling decisions. Therefore, data entry has been made as easy as possible using the production order window directly rather than through a complex posting journal.

The posting of consumption, if not flushed automatically, is also performed easily from the production order form.

Goal in context: To easily register operation data that will provide a production order status overview. Operation data includes: materials consumed, labor and machine usage and material output for an operation.

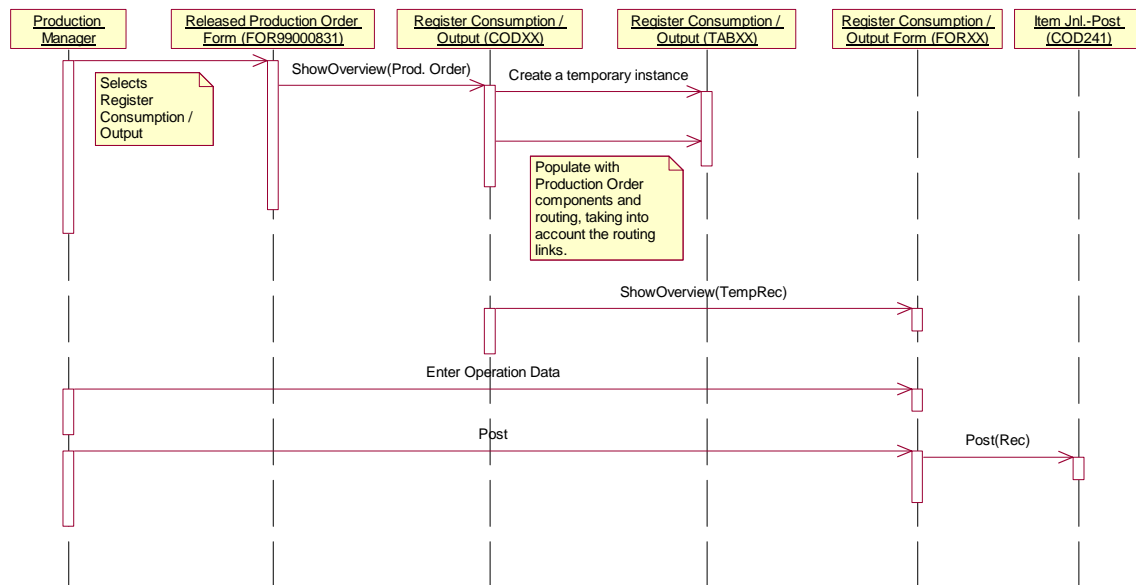
Triggers: A routine procedure of registering all the output data that has been turned in from each operator. An operation has started or has been complicated.

Normal Sequence

Step No.	Action	Reaction
1	Production Manager finds the production order that he wants to register the operation data for.	The system displays all the operations for the production order.
2	Production Manager selects an operation.	System gives him several options to register: materials consumed labor/machine usage material output
3	Production Manager enters the operation data and confirms that the information is correct.	System updates the operation data for the production order.

Direct Production Reporting - Physical design

The data structure that will provide information for the integrated view will be based on the existing tables “Prod. Order Component” (TAB5407) and “Prod. Order Routing Line” (TAB5409).



Above is a sequence diagram showing main interactions.

Dimensions, Item tracking and Bin Contents will be handled as it is now on the consumption/output journals.

Customization examples

Manual Planning: Group order planning lines by item in stead of by order. (Note: Supply planning systems are rarely customized).

Graphical Scheduling: Customizations to graphical UI concerning color, layout, tooltips, etc. Customization to application functionality concerning Finite Loading and the logic behind the load histograms.

Note: Customization requires that you purchase a development license from Netronic.

Direct Production Reporting: Same customizations that would be done to the existing output/consumption journals.

Shop Floor Terminal: Customized form that allows machine operators for post output/consumption on the Production Journal.

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